

**CENTERS OF EXCELLENCE PROGRAM
QUARTERLY REPORT**

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30 June 1988**

UTAH CENTERS OF EXCELLENCE
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NEW COMPANIES FORMED FROM CENTERS TECHNOLOGY
SINCE BEGINNING OF CONTRACT

Baron Medical
Salt Lake City, Utah
President: Dr. Young Kwon
Product: Medical Devices
Start-up Date: 1 June 1987
of Employees: 12

Bioprocess Systems
Salt Lake City, Utah
President Dr. U.R. Shettigar
Product: Disposable blood filters
Start-up Date: 10 July 1987
of Employees: 3

Cardiac Research
Salt Lake City, Utah
President: James McCrae
Product: Artificial Heart Valves
of Employees: 5

Smartware
Provo, Utah
President: Todd Moon
Product: Controllers for Computers
of Employees: 5

CAM Software, Inc.
Provo, Utah
President: Howard Millett
Product: Software
of Employees: 7

CIM Training Center (CTC)
Provo, Utah
President: Larry Shumway
Product: Manufacturing Modules
of Employees: 5

Digital Hearing, Inc.
Salt Lake City, Utah
President: Dr. John Harrison
Product: Artificial Ear
of Employees:

IBC Advanced Technologies
Provo, Utah
President:
Product: Chemicals
of Employees: 1

Bonneville Microelectronics
Salt Lake City, Utah
President: Kent Smith
Product:
of Employees: 2

Animate Systems, Inc.
Salt Lake City, Utah
President: Bart Petrini
Product: Robotic Systems
of Employees: 7

Protein Solutions, Inc.
Salt Lake City, Utah
President: Joe Andrade
Product:
of Employees: 3

Icomp, Inc.
Logan, Utah
President:
Product: Software
of Employees:

Relocated Company:

Intraspace
North Salt Lake, Utah
President: Robert D'Ausilio
Product: Satellites
of Employees: 500 (projected)

CENTERS OF EXCELLENCE PROGRAM
SUMMARY
CONTRACT AMOUNTS

Planning Grants:

1. Biotechnology.....	\$	10,000
2. Water Information Science and 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
	Sub-total	\$ 80,000
	Recovered	<u>(15,000)</u>
		65,000

Centers:

1. Advance Combustion Engineering.....	\$	500,000
2. Advanced Supercritical Fluid.....		276,440
3. Aerospace Technology.....		175,000
4. Artificial Hearts.....		125,000
	Plus 2nd Contract:.....	100,000
5. Base Technical Education.....		85,000
6. Biotechnology.....		500,000
7. Biopolymers.....		150,000
8. CAD/CAM.....		450,000
9. Chemical Separations.....		200,000
10. CIM, CAM Software Lab.....	Sub-Contract from USU	
11. Computer Integrated Network Research.....		100,000
12. Communications Research.....		170,120
13. Computer Based Education.....		180,000
14. Coal Research.....		150,000
15. Controlled Chemical Delivery.....		246,000
16. Engineering Designing.....		340,000
17. Laser Institute.....		100,000
18. Materials.....		180,700
19. Microelectronics.....		244,080
20. Quality and Integrity Design.....		200,000
21. Sensor Technology.....		75,000
22. Signal Processing.....		310,000
23. Space Engineering Research.....		675,000
24. Utah Research Institute.....		300,000
25. X-ray Imaging Systems.....		<u>90,000</u>
	TOTAL:	\$5,987,340

CENTERS OF EXCELLENCE PROGRAM
SUMMARY
MATCHING FUNDS CONTRACT AMOUNTS

1.	Advance Combustion Engineering.....	\$13,427,479
2.	Advanced Supercritical Fluid.....	1,572,645
3.	Aerospace Technology.....	990,737
4.	Artificial Hearts.....	8,577,305
5.	Base Technical Education.....	483,222
6.	Biotechnology.....	883,904
7.	Biopolymers.....	437,980
8.	CAD/CAM.....	3,915,959
9.	Chemical Separations.....	493,706
10.	CIM, CAM Software Lab.....	351,155
11.	Computer Integrated Network Research.....	513,707
12.	Communications Research.....	687,920
13.	Computer Based Education.....	1,463,604
14.	Coal Research.....	859,832
15.	Controlled Chemical Delivery.....	6,689,618
16.	Engineering Designing.....	6,441,700
17.	Laser Institute.....	6,858,000
18.	Materials.....	5,742,763
19.	Microelectronics.....	7,864,986
20.	Quality and Integrity Design.....	494,000
21.	Sensor Technology.....	1,206,075
22.	Signal Processing.....	2,134,475
23.	Space Engineering Research.....	67,967,905
24.	Utah Research Institute.....	659,000
25.	X-ray Imaging Systems.....	<u>360,511</u>
	TOTAL:	\$141,078,188

Amount of Contracts: \$ 5,987,340
Matching Funds Required by the Legislature 11,974,680
Actual Matching Funds 141,078,188

Match Ratio of 23.56 to 1

New Companies Formed: 12

Companies Relocated: 1

ENGINEERING RESEARCH

L. Douglas Smoot, Brigham Young University

The main focus is on development of new combustion technology that will improve the U.S. competitive position in the international market, with an emphasis toward the clean and efficient use of low-grade fossil fuels, particularly coal.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Advanced Fuel Research, Inc.		647,050.00
Air Force		75,000.00
Angus Chemical		12,727.00
Babcock and Wilcox		49,666.00
Chevron Research		15,000.00
Combustion Engineering, Inc.		65,001.00
Consolidated Coal		65,001.00
Convex Computer Corp.		45,000.00
Coordinating Research Council		40,000.00
Corning Glass Works		15,000.00
Department of the Navy		213,180.00
Dow Chemical USA		35,000.00
Electric Power Research Institute		132,352.00
Empire State Electric Energy		279,124.00
EPA		185,437.00
Foster Wheeler Corporation		49,666.00
Gas Research Institute		45,000.00
Gas Research Institute (2nd Contract)		136,075.00
General Electric Corporation		15,000.00
General Motors Corporation		15,000.00
Idaho National Engineering Lab		15,000.00
International Fuel Cells		15,000.00
Los Alamos National Laboratory		5,000.00
Los Alamos National Laboratory		62,294.00
Morgantown Energy Technology Center		683,709.00
National Institute of Health		116,587.00
National Science Foundation		9,700,000.00
National Science Foundation (Grant #2)		138,570.00
Pittsburgh Energy Technology Center		165,441.00
Pratt & Whitney		18,802.00
Pyropower Corporation		15,000.00
Questar Corporation		15,000.00
Shell Development		15,000.00
Southern California Edison Co.		15,000.00
Tennessee Valley Authority		72,822.00
TRW		15,000.00
Utah Power & Light		157,381.00
Utah State		66,666.00
	TOTAL	\$ 13,427,479.00

Companies Associated Since Beginning of Contract

1. Chevron Research
2. Convex Computer Corporation
3. Corning Glass Works
4. Dow Chemical USA
5. Gas Research Institute
6. General Electric Corporation
7. General Motors Corp.
8. Idaho National Engineering Lab
9. International Fuel Cells
10. Los Alomas National Laboratory
11. Pyropower Corp.
12. Questar Corp.
13. Shell Development
14. Southern California Edison
15. TRW Inc.

Center for Advanced Combustion Research: Contract #87-0350

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
01 May 86	\$ 500,000	-0-

CENTER FOR ADVANCED SUPERCRITICAL
FLUID SEPARATION TECHNOLOGIES

CONTRACT AMOUNT: 150,000.00

Milton L. Lee, Brigham Young University

The main focus is on research in three main areas: capillary column supercritical fluid chromatography, supercritical fluid extraction and fractionation for analytical purposes, and determination of the thermodynamic properties of supercritical fluids.

In May of 1988, Lee Scientific Received one of seven awards given in Boston by the Innovation Development Institute for "SBIR Awardee of the Year." Research at BYU Funded by the Centers of Excellence Program has provided results and information that have been used in preparing proposals for the SBIR (Small Business Innovative Research) Programs. To date, Lee Scientific has been awarded over \$1.5 million in SBIR grants.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DOE - Identify Genotoxic Components		\$ 279,000.00
DOE - Supersononic Jet Spectroscopy		154,293.00
Gas Research Institute		149,897.00
National Science Foundation		90,000.00
Department of Energy		59,893.00
Coordinating Research Council		40,000.00
Dow Chemical		8,000.00
Exxon Educational Foundation		8,000.00
DOE		133,000.00
Gas Research Institute		150,000.00
National Science Foundation		80,000.00
Department of Energy		61,643.00
Shell Development Company		20,000.00
Monsanto		17,500.00
Harvard Medical School		10,000.00
Department of Energy		81,189.00
Gas Research Institute		148,990.00
National Science Foundation		69,240.00
Monsanto		<u>12,000.00</u>
	<u>TOTAL</u>	\$ 1,572,645.00

Companies Associated Since Beginning of Contract

1. Dow Chemical
2. Exxon Research & Engineering
3. Finnigan Corporation
4. Harvard Medical School
5. Monsanto
6. Shell Development Co.

Center for Advanced Supercritical Fluid: Contract #87-2279

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
01 Jun 87	\$ 10,928.48	\$ 139,071.52
01 Jun 87	7,781.99	131,289.53
22 Jun 87	10,114.58	121,174.95
23 Jul 87	29,083.46	92,091.49
07 Dec 87	19,145.25	72,946.25
01 Jun 87	10,612.82	62,333.43
Ammendment/add \$	126,440.00	188,773.43
02 Feb 88	92,936.74	95,836.69
02 May 88	23,076.62	72,760.07
28 Jun 88	6,087.12	66,672.95

Total Payments: \$209,767.00

TECHNOLOGY

Robert J. Twiggs, Weber State College

The main focus is to design and manufacture useful aerospace experiments, devices or systems, and to support similar enterprises in space industries and in other Utah schools and organizations.

Working with Intraspace, the program jointly is developing the NUSAT II and the T-Sat satellite, including support services, flight qualifications, operational performance test requirements, environmental performance testing, and facilities and equipment support.

<u>Matching Funds:</u>	<u>In-Kind</u>	<u>Cash</u>
Source		
Federal Aviation Administration		\$ 24,000.00
Federal Aviation Administration		14,000.00
Browning Manufacturing		125.00
Lundahl-Astro Circuits		3,500.00
Bonneville Scientific		4,700.00
Pensar, Inc.		1,240.00
Federal Aviation Administration		1,500.00
Iomega Corp.		4,700.00
Federal Aviation Administration		800.00
Federal Aviation Administration		1,000.00
Federal Aviation Administration		1,000.00
Richland Community College		3,000.00
Federal Aviation Administration		1,000.00
Technology Incubator Program		30,000.00
TRW		500.00
WSC Zoology Dept.		6,000.00
Orchid Engineering		519.00
Orchid Engineering		242.00
Option Technologies		712.00
Hill Airforce Vibration Facility	27,500	
Spectro Labs	3,600	
Affiliated Metals	1,091	
Microtech Research, Inc.	850	
Hexcel Corporation	500	
Peterson Specialized Fabracators	475	
TRW, Inc.	470	
Deutsch Fastener Corp.	170	
ADS, Inc.	100	
Narmco Materials	100	
American Cyanmid	100	
Stanley Tools	75	
Neulink, Inc.	68	

Affiliated Metals	5,000	
Intraspace, Inc.	26,000	
Intraspace, Inc.	17,000	
Volunteer Student & Engineering Labor	<u>809,000</u>	
Subtotals	\$ 892,199	\$ <u>98,538.00</u>

TOTAL: \$ 990,737

Companies Associated Since Beginning of Contract

1. Ballalis
2. Bonneville Scientific
3. Browning Arms
4. Computer Science Corp.
5. EGNGG
6. Eagle Canyon Research Assoc.
7. Federal Aviation Assoc.
8. Globesat
9. Intraspace
10. Lundahl Astrocircuits
11. Morton Thiokol
12. Niagara Mohawk Power
13. Ogden City Development
14. Orchid Engineering
15. Orion International Technical
16. Pensar

Center for Aerospace Science Technology: Contract #88-1430

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
04 May 88	\$ 25,000	\$ 150,000

CENTER FOR TOTAL ARTIFICIAL HEARTS
& BIOMEDICAL DEVICES

CONTRACT AMOUNT: \$225,000.00

Donald B. Olsen, University of Utah

The main focus is on the development of artificial organs such as the heart and monitoring and diagnostic devices, artificial fallopian tube, urinary bladder, urethra, sphincter and ureter.

A patent has been applied for on Non Invasive Measurement of Pressure in an Artificial Heart. Proposals have been submitted for Thrombogenesis in Blood Pumping Devices, and 100ml Stroke Volume Elliptical TAH in 50kg Recipients, to the National Institute of Health.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Symbion surgical training		328,378.00
Dr. Kwon (electromechanical heart)		70,000.00
NIH Immune Response		512,855.00
NIH Artificial Heart		5,592,112.00
NIH Grant - Small Art. Heart		1,281,060.00
NIH Grant - Artificial Peptide		568,600.00
Nimbus		144,923.00
Deseret Med.		5,000.00
Murex: Vacuum Formed TAH Studies		32,000.00
VTechnical Research Assoc.		500.00
VA Hospital		25,000.00
Catheter Technologies		7,500.00
A Hospital		<u>9,377.00</u>
	<u>TOTAL</u>	<u>\$ 8,577,305.00</u>

Companies Associated Since Beginning of Contract

1. ADAHF/NBS (Branko Tomazic)
2. Alexander Hospital, Athens, Greece, (Anastasis Poyiadjis).
3. BBC, London, (John Palfryman).
4. Braci, Argentina, (Daniel Bracco)
5. Bristol Myers, (Bob Ripps)
6. Buckhart University, (Ruth Aachen)
7. Chirrng Klinik Charito, Berlin, GDR, (Bernar Schubel)
8. Cleveland Clinic, (Michiaki Matsushita, M.D.)
9. Dept. Anesthesi, Rea Hosp.Cardio, Lyon, France (Claude Girard).
10. Dr. S.W. Kim Group, (K. Mukae)
11. Eagle Place, Inc. (Glenn Stuart)
12. Eli-Lilly Co., (David Lipson)
13. Evogelismos Los, Athens, Greece (Christos Charitos).
14. Frankfort Institute, (Prof. Dr. Klaus Gersonale)
15. Funacion Fauloro Senatorrio Guemes, Argentina (Jorge Issac Menolez).

16. Hospital Corp. Jordan Valley, (Stu Brerson)
17. Inst. of Medicine, Genetics, Moscow, USSR, (Nikolai Bochkov)
18. Johns Hopkins School of Medicine, (Jon Peters)
19. Kyoritu College of Pharmacy (Tohiko Oese)
20. Kyushu University, (A. Takahara)
21. L'Express, Paris, France, (Charles Gilbert)
22. McClur of Condiotey Llensu Acoleui of Uedinno, Poland, (Todeun Petelur)
23. Medical Council of the Latieur SSR Health Manistry, (Igor Stepanov)
24. Moscow, All-Union Cardiology Research Centre, (George Dzhibladze)
25. Mountain View Pediatrics, (Dr. David Folland)
26. National Center of Surgery, USSR, (Sergei G. Dzemeslkevich)
27. Nelson & Associates, Inc. (Dan Nelson)
28. Nimbus, Inc., (Richard Warple)
29. Okayama University, (Hiroyuki Irie)
30. Ottawa Heart Institute, (E.M. Farrell)
31. Oxian Jiaotong, Xian, China, (Dazong Jiang)
32. PSR-Utah, (Karen Glynn)
33. Physicians for Social Responsibility, (Nancy Moorehead)
34. Salt Lake Tribune, (Anne Palmer & Jeff Allred)
35. Soviet C-TTEE of Physicians, Moscow, USSR, (Alexei Dmitriev)
36. Time Magazine, (Jon D. Hall)
37. Tokyo Medical & Dental University, (N. Yui)
38. Tokyo University (Nabuharu Takai)
39. Tokyo Women's Medical College, (K.Kataoka)
40. Tyobo, (K. Nakamisan)
41. U C & D Medical Center, (Tsuyosti Kawamura, M.D.)

Center for Artificial Hearts: Contract #87-0532

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
26 Oct 87	\$ 41,667.00	\$ 83,333.00
26 Oct 87	8,334.00	74,999.00
02 Feb 88	8,334.00	66,665.00
27 May 88	8,334.00	58,331.00
30 Jun 88	8,334.00	49,997.00
Total Payments:	\$75,003	

New Contract:		\$100,000.00
30 Jun 88	21,428.58	78,571.42
Total Payments:	\$21,428.58	

Carol Weller, University of Utah

The main focus is on commercialized base technical curriculum and assessment products and human products in the form of base technically educated, skilled, and adaptable members of the Utah workforce. The goals of this project include consolidation of teaching technologies with advanced technologies required by industries, and develop and commercialize unique curriculum and assessment products for use in maintaining and enhancing research, development, and transference linkages with industry..

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Federal Grants:		
Teacher Preparation		\$ 30,157.86
Rural Transition Preparation		30,894.17
Transition Preparation		58,491.63
Research in Transition		41,263.69
Rural Collaboration		78,296.00
Rural Teacher Preparation		87,107.00
Transition Leadership Training		80,000.00
Preparation of Transition Teachers		<u>77,012.00</u>
	TOTAL:	\$ 483,222.35

Companies Associated Since Beginning of Contract

1. Allyn & Bacon
2. Beehive International
3. Chaffin Educational Software, Co.
4. College Hill Press
5. Developing Assessment Products
6. IBM
7. Jordan School District
8. Kessler, AFB
9. Megawest Systems
10. Microsoft
11. National Assessment Institute
12. Sculpture Software
13. Teachers College Press
14. Utah School for the Blind
15. Utah School for the Deaf
16. Wicat Systems Inc.
17. Work Opportunity Rehabilitation Consolidated

Center for Base-Technical Education: Contract #88-2412

<u>Payments:</u>	<u>Amount</u>	<u>Balance</u>
01 Aug 88	\$ 21,250	\$ 63,750
01 Aug 88	21,250	42,500

Total Payments: \$ 42,500

The main focus is development of recombinant DNA technology in plant breeding, use of microbiologicals in agriculture, use of monoclonal antibodies in disease control of livestock animals, and to enhance enzyme production for food processing and engineering control.

The Applied Biosystems Model 477 Peptide Sequencer with the dedicated Model 120 PTH Analyzer was installed at the beginning of May. Several proteins have been placed on the instrument for sequencing. The Monoclonal Laboratory receives requests for hybridoma from companies and outside researchers.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
University of Louisville		\$ 162,918.00
U.S. EPA		140,000.00
NIH Variability of Sod & Other Enzymes		24,405.00
DuPont DeNemours & Company		45,000.00
Utah Power & Light		486,366.00
Proctor & Gamble		<u>25,215.00</u>
	<u>TOTAL</u>	\$ <u>883,904.00</u>

Companies Associated Since Beginning of Contract

1. ARI
2. American Cyanamid
3. Arthur Young Intl.
4. Breakthrough
5. City Development, Inc.
6. ERM Southwest
7. General Dynamics, Convair Div.
8. Hiltech
9. Hoechst Cleanese Corp.
10. International Technology Corporation
11. Merrell Dow Research Institute
12. Morrison-Knudsen Engineering
13. Penwalt Corp.
14. Proctor and Gamble Co.
15. Remediation Technologies Inc.
16. Rutgerswerke
17. Shell Development
18. Spectrum Sciences & Software, Inc.
19. Uniroyal Chemical Co.
20. Utah Innovation Center
21. Utah Power and Light

Center for Biotechnology: Contract #88-3118
Payments: Amount Balance
(no payments to date)

The main focus is to develop a thorough understanding of interfacial interactions essential for the control of processes and the design of products in many areas of industry including food processing, medical devices, scientific instruments, pharmaceuticals, cosmetics, soaps and detergents, sensors and controls, coatings, and many areas of biotechnology.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Bausch & Lomb		\$ 45,000.00
Becton-Dickinson		45,000.00
Ciba-Geigy		45,000.00
DuPont Biomed		45,000.00
Eastman Kodak		45,000.00
Eli Lilly		45,000.00
Johnson & Johnson		45,000.00
Proctor & Gamble		45,000.00
Travenol		45,000.00
Allergan Optical		45,000.00
Industry Fellowship Grants		22,500.00
NIH 1R 23A I22898-01		<u>46,480.00</u>
	TOTAL	\$ 437,980.00

Companies Associated Since Beginning of Contract

1. 3 M
2. Alcon
3. Allergan Optical
4. Basf
5. Bausch & Lomb
6. Baxter Health Care Corp.
7. Becton-Dickinson
8. Berol Inc.
9. Biosym Technologies
10. Celanese
11. Ciba-Geigy Corp.
12. DSM Corporation
13. DuPont Biomedical Products
14. DuPont de Nemours & Co.
15. Eastman Kodak Co.
16. Eli Lilly & Co.
17. Exxon
18. Fuji
19. Genetech
20. Hercules

21. Hoorchest
22. Hyclone
23. Johnson & Johnson
24. Kabi
25. Medical Research Industries
26. Nygene Corporation
27. Pharmacea
28. Proctor & Gamble
29. Protein Solution Inc.
30. Silicon Graphics, Inc.
31. TTI
32. Technical Research Association
33. Terumo
34. Travenol Laboratories
35. WL Gore

Biopolymers at Interfaces Contract #87-0352

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
27 Feb 87	\$ 15,000.00	\$ 70,000.00
27 Feb 87	5,000.00	55,000.00
07 Dec 87	5,000.00	50,000.00
07 Dec 87	5,000.00	45,000.00
16 Feb 88	5,000.00	40,000.00
27 May 88	5,000.00	35,000.00
30 Jun 88	5,000.00	30,000.00

Total Payments: \$45,000

& MANUFACTURING

Warren F. Phillips, Utah State University

The main focus is research in computerized drafting, 3-D design, solid modeling, finite element modeling, numerical controlled manufacturing, robotics, facilities management, plant monitoring and control, data base management and inventory planning.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Structural Dynamics Co.		\$ 168,000.00
Dassault Systems Co.		146,000.00
Lockheed Co.		82,000.00
Mac-Neal Schwendler		48,000.00
Morton-Thiokol		25,000.00
NASA		168,310.00
Consulting by Consortium	\$ 42,717.00	
IBM		3,235,932.00
Subtotals	42,717.00	3,873,242.00

TOTAL: \$3,915,959.00

Companies Associated Since Beginning of Contract

1. Alca Engineers
2. Atascadero Mutual Water Co.
3. B & A Engineering Inc.
4. Central Utah Water Conservancy District
5. Coldwell Richards & Swensen
6. Department of Natural Resources, Div. of Water Resources
7. ELC Electron Cousulting Spa (Italy)
8. Emery Mining
9. Engineering Dept. of Bountiful, Utah
10. Getty Mining Co.
11. Jones & Associates
12. NASA

Center for Computer Aided Design and Manufacturing Contract #87-0441

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
16 Jan 87	\$ 19,855.76	\$430,144.24
07 Dec 87	10,318.57	419,825.67
23 Jul 87	9,605.42	410,220.25
07 Dec 87	21,384.31	388,835.94
17 Feb 88	54,361.79	334,474.15
27 May 88	9,870.10	324,604.05

Total Payments: \$ 125,395.95

The main focus is to design and construct pilot plants for three separation systems based on existing laboratory scale operations, reduction of the level of unwanted and toxic species from municipal and other water supplies, recovery of high value metals from waste solutions, and the design and construction of new disposable electrodes for the qualitative detection of selected elements.

An SBIR proposal to EPA was funded through IBC Advanced Technologies (IBCAT). This grant will be used to develop materials for the efficient and economical removal of toxic heavy metals at the ppb level from potable water. Patents will be filed for a number of new processes. A pilot plant has been built and is being tested.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
National Science Foundation		\$ 53,500.00
Department of Energy		100,000.00
Gas Processor Association		45,000.00
Electric Power Research Institute		138,099.00
American Chemical Society		17,500.00
Office of Naval Research		98,608.00
Serpentix		<u>41,000.00</u>
	TOTAL:	\$ 493,706.00

Companies Associated Since Beginning of Contract

1. Ace Battery Corp.
2. AMAX
3. American Research Institute, Marcus Hook, PA
4. Arkansas River Project
5. Battelle Northwest, Richland, Washington
6. Dr. Richard Bartsch-Texas Tech. University
7. Cotter Corp.
8. Data Chem
9. Dionex
10. Electrical Power Research Institute
11. Environmental Protection Agency (SBIR Grant)
12. Galtech
13. Gdansk Technical University (Poland)
14. Genexus
15. Idaho National Engineering Laboratory
16. Johannesburg Consolidated Investment C.,Ltd.
17. Kerr McGee
18. LDS Foundation (Tom Henrie)
19. Dr. Jerry Lowry (EPA) Univeristy of Maine
20. NWT
21. Oak Ridge National Laboratory

22. Phillips Petroleum Co.
23. RSR, Inc.
24. Saba Resources, Inc.
25. Serpentix
26. Tronac
27. U.S. Bureau of Mines
28. University of Kiel
29. University of Idaho
30. ViraTek
31. Y-TeX

Center for Chemical Separations

Contract #88-1351

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
29 Oct 87	\$ 50,000.00	\$150,000.00
21 Mar 88	50,000.00	100,000.00
28 Jun 88	50,000.00	50,000.00

Total Payments: \$150,000.00

CENTER FOR COMPUTER INTEGRATED
MANUFACTURING

(Sub-Contract From USU in
the amount of \$132,000.00)

Dell K. Allen, Brigham Young University

The main focus is on development and application of software, hardware, and courseware, required for manufacturing systems integration; including software for variant and generative process planning, knowledge-based systems, electronic component selection and a shop-floor data collection system.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Hewlett Packard		\$ 15,000.00
DCLASS Software Royalties		9,600.00
Avco Lycoming		125,555.00
Avco Lycoming		40,000.00
Autodesk	\$ 1,000.00	
Textron Lycoming		<u>160,000.00</u>
Subtotals	<u>\$ 1,000.00</u>	<u>350,155.00</u>
	TOTAL: \$	351,155.00

Companies Associated Since Beginning of Contract

1. Autodesk, Inc.
2. Berrett Consulting
3. CAM Software, Inc.
4. CIM Training Center
5. InfoQuest
6. Northrup Corp.
7. Oracle Corp.
8. SmartWare, Inc.
9. Visher Systems
10. Whirlpool Corp.

Center for Computer Integrated Manufacturing Sub- Contract

(payments to Utah State University)

NETWORKS

Bruce R. Peterson, Utah State University

The main focus is to develop computer assisted methods for the design, analysis, and simulation of large computer information networks.

Center Director, Bruce Peterson visited Korea where potential sponsors were recruited. Novell was host for the fifth semiannual conference where technical presentations were made on 7 completed and ongoing projects.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Apple Computer		50,000.00
Bell of Pennsylvania		50,000.00
Drexel University		\$ 114,030.00
Drexel University		119,677.00
Northern Telecom		50,000.00
Novell Systems		50,000.00
Pennsylvania ATC-BFP		50,000.00
UNISYS		<u>30,000.00</u>
	TOTAL:	\$ 513,707.00

Companies Associated Since Beginning of Contract

1. AT&T
2. Apollo
3. Apple Computer
4. Bell of Pennsylvania
5. Boeing
6. Bourns
7. Campbell Scientific
8. Computer Products
9. Data Communications Corp. of Korea
10. Design Analysis Associates
11. Digital Equipment Corporation
12. Digitran
13. EG&G Reticon
14. Evans and Sutherland
15. Ford Foundation
16. Foundation for Advanced Research
17. Globesat, Inc.
18. General Motors
19. Hewlett Packard
20. Hughes
21. Hyosung-Hitachi Data Systems, Ltd.
22. Hyosung-Nas
23. IBM

24. IDT
25. Icomp, Inc.
26. Iomega
27. Ines Co., Ltd.
28. Innovative Technologies
29. Intel
30. Keizaikai Co., Ltd.
31. Lundahl Astro Circuits
32. Korea Chamber of Commerce & Industry
33. M + R Forwarding Ltd.
34. Martin Marietta
35. Microsoft
36. Morton Thiokol
37. Mountain Bell
38. Northern Telecom
39. Novatech, Inc.
40. Novell
41. Omnidata
42. Oriental Telecommunications Company, Ltd.
(OTELCO)
43. Pacific Telesis
44. Pennsylvania ATC-BFP
45. QSI
46. Ricoh Company, Ltd.
47. SCADA Engineering Co., Ltd.
48. Shimizu Corporation

Center for Computer Information Networks Research Contract #88-2413

(no payments to date)

CENTER FOR COMMUNICATIONS
Craig Rushforth, University of Utah

CONTRACT AMOUNT: \$170,120

The main focus is on research on computer/communications networks, data compression, application of signal processing algorithms, coding, modulation and spread spectrum.

The major activities during the past quarter are in four main fields of imaging activity; 1) medical imaging; 2) nondestructive testing; 3) geophysical imaging; and 4) surveillance and other imaging areas (radar, sonar, satellite, etc.).

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
UNISYS		\$ 230,780.00
National Science Foundation		200,000.00
NCI, NIH, PHS Research Grant		123,087.00
NHLBI, NIH, PHS Research Grant		<u>134,053.00</u>
	TOTAL:	687,920.00

Companies Associated Since Beginning of Contract

1. Morton Thiokol
2. R-CON Intern'al
3. Techniscan, Inc.
4. Unisys

Center for Communications Contract #87-2894

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
26 Oct 87	\$ 16,450.00	\$108,550.00
Amendment +	90,120.00	198,670.00
02 Feb 88	9,868.41	188,801.59
27 May 88	9,868.41	178,933.18
Total Payments:	\$674,954.77	

CENTER FOR COMPUTER-BASED EDUCATION
Gordon Stokes, Brigham Young University

CONTRACT AMOUNT: \$180,000.00

The main focus is on developing software for the delivery of instruction, development of authoring productivity tools that incorporate object-oriented design, data-base management, and graphics production facilities, and adaptive teaching systems.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Calico		\$ 292,220.00
Digital Equipment Corp.		75,000.00
DOD		366,601.00
IBM		100,000.00
National Security Agency		129,783.00
Sun Microsystems		<u>500,000.00</u>
	<u>TOTAL</u>	<u>\$1,463,604.00</u>

Companies Associated Since Beginning of Contract

1. 3M Corp.
2. Calico
3. DOD
4. Defense Language
5. Digital Equipment Corp.
6. IBM
7. National Security Agency
8. Pioneer Communications of Am.
9. Sony
10. Sun Microsystems
11. Tandberg Research
12. WICAT Systems

Center for Computer-based Education Contract #88-1352

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
20 Oct 87	\$ 45,000.00	\$135,000.00
26 Apr 88	45,000.00	90,000.00

Total Payments: \$90,000.00

The main focus is the development of new markets for Utah coals, to promote processing, upgrading and preparation of Utah coals, and to promote efforts between institutions of the state and local industry in student and technician training for coal research. Also, to implement new technologies in coal/water slurry transport, differential liquefaction and resin extraction, and to find new markets for coals and their products.

Activities include negotiations and contracts with CPS, Tosoh (Japan), Utah Power and Light Company, Amax, Penelec (Pennsylvania Electric Co.), HydroProcessing Mining Ltd., Consolidation Coal Co., and Geneva Steel. Licensing agreement negotiations are underway for technology to be used for resin recovery. Research is proceeding on production of high purity resin by flotation techniques.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
DOE (Fossil Fuel Liquefaction)		\$ 170,000.00
BYU (NMR Studies: Solid Crystalline)		100,772.00
DOE (5-27138)		76,769.00
DOE (5-27118)		135,000.00
Utah Power & Light		90,000.00
EG & G Idaho, Inc.		39,937.00
NSF (5-22205)		145,000.00
Univ. of Kentucky		12,194.00
Brigham Young University		75,160.00
CPS Corporation		<u>15,000.00</u>
	TOTAL	859,832.00

Companies Associated Since Beginning of Contract

1. CPS/Fossil Resin
2. Consolidation Coal Co.
3. Division
4. Finnigan - MAT
5. Geneva Steel
6. Hydroprocessing, Mining Ltd.
7. Penelec, GPU
8. Somatogen Inc.
9. Tosoh Corp.
10. Utah Power & Light

Center for Advanced Coal Technology Contract #87-1078

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
02 Feb 88	\$ 12,500.00	\$137,500.00
26 Apr 88	12,500.00	125,000.00
30 Jun 88	12,500.00	112,500.00

Total Payments: \$ 37,500.00

DELIVERY

Sung Wan Kim, University of Utah

The main focus is to develop new and effective methods for the delivery of pharmaceutical and chemical agents.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Theratech Inc.		\$ 600,000.00
Theratech Inc.		900,000.00
Ciba-Geigy		1,200,000.00
Hisamitsu		15,000.00
Sam Yang Company		10,000.00
NIH (S. W. Kim)		1,744,204.00
NIH (J. Kopecek)		424,830.00
NIH (W. I. Higuchi)		940,000.00
NIH (K. Knutson)		<u>855,584.00</u>
	TOTAL:	\$ 6,689,618.00

Companies Associated Since Beginning of Contract

1. Baron Technologies
2. Ciba-Geigy
3. Pfisher
4. Research Medical Inc.
5. Theratech Inc.

Controlled Chemical Delivery Contract #87-0352

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
27 Feb 87	\$ 20,001.00	\$225,999.00
25 Mar 87	6,667.00	219,332.00
20 Jun 87	6,667.00	212,665.00
26 Oct 87	6,667.00	205,998.00
02 Feb 88	6,667.00	199,331.00
27 May 88	6,667.00	192,664.00
30 Jun 88	6,667.00	185,997.00

Total Payments: \$ 60,003.00

The main focus is on projects including artificial limbs, drug delivery systems, physiological signal monitors, artificial kidneys, robots and microelectro-mechanical systems.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
DARPA		\$ 5,000,000.00
Sarcos		290,000.00
Sarcos		83,700.00
System Development Foundation		66,000.00
Ciba Giegy		400,000.00
Sarcos		430,000.00
NCI		<u>162,000.00</u>
	TOTAL	\$ 6,441,700.00

Companies Associated Since Beginning of Contract

1. Advanced Manufacturing Technology
2. Affiliated Industrial Products
3. Affiliated Metals
4. Applied Hydraulics
5. Automatic Detection Devices
6. B and K Machine
7. Ballard Supply
8. Bell Industries
9. Bell Laboratories
10. Bimco Machine
11. Bolt and Nut Supply
12. C and H Machine and Weld
13. Central Utah Tool
14. Circuit Graphics
15. Dee's Machine Shop
16. Digital Equipment
17. Diplomat Ectronics
18. Falcon Sheet Metal
19. Fetzer's, Inc.
20. Future Electronics
21. Gilman's Screen Printing
22. W. W. Grainger
23. R. S. Hughes
24. Hallmark Electronics
25. High Tech Welding and Machine
26. Howell's Photo
27. Industrial Heat Treat
28. Industrial Supply

29. Inkley Photo
30. Interstate Hydraulics
31. JMW Acquistitions
32. Jacob's Machine and Design
33. Kaman Bearing
34. Kierulff Electronics
35. Kimball Supply
36. Lance Machine
37. MBI, Inc.
38. The Machine Shop
39. Marshall Industries
40. Martin's Machine
41. Metal Finishing
42. Missile Supply
43. Modyne Machine and Manufacturing
44. Merck
45. Motion Control
46. NASA
47. New York University
48. Pat's Precision Machine
49. Paxton Production Tools
50. Peterson's Specialized Fabricator
51. Rains Company
52. Replicolor
53. Rockwell
54. Rocky Mountain Machine
55. Sarcos
56. Standard Supply
57. Stuart Electric
58. Sunn Micro Systems
59. Symbion, Inc.
60. System Development Foundation
61. T.V. Specialists
62. Time Electronics
63. Time Saver Industrial
64. Tneumetrek, Inc.
65. Trembly Associates
66. United Precision and Engineering
67. University Book Store
68. Utah Tool and Dye
69. Utah Bearing
70. Walt Disney Imagineering
71. Western Precision
72. Winco
73. Wright Patterson Air Force Base
74. Yost Office Systems

Center for Engineering Design Contract #87-0435

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
18 Dec 87	\$ 28,571.42	\$271,428.58
29 Sep 87	28,571.42	242,857.15
29 Sep 87	28,571.42	214,285.72
29 Sep 87	28,571.42	185,714.29
29 Oct 87	28,571.43	157,142.86
29 Oct 87	28,571.43	128,571.43
02 Feb 88	128,571.43	-0-

Amendment add \$40,000.00

Total Payments: \$300,000.00

Richard C. Straight, University of Utah

The main focus is the development of cardiac surgical laser devices, drugs (photosensitizers), fluorescence sensors, laser fibers and laser power sources in the photodynamic therapy of cancer, and multiple wavelength treatment capabilities for laser surgery.

Recent developments include the attraction of American Cyanamid who owns Lederle, who is interested in the photodynamic area, and other development. The Strategic Defense Initiative Technology Transfer Contractors Meeting was held at the Laser Institute, and invited the program to submit for housing and installation of a free electron laser.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Phaser-R Corp. Flashlamp Pumped Dye		\$ 35,000.00
Cooper LaserSonics Copper Vapor Laser		70,000.00
Treadwell Foundation		35,000.00
Virginia Zambukas Estate		43,000.00
Cooper Gold Vapor Laser		39,000.00
Phase-R Medical Stone Fragmentation		20,000.00
Wolf Corp. Lithotripter		70,000.00
HGM Engineering Support for Angioplasty & Endoscopy		8,000.00
Sharplan, Inc.		38,000.00
Naval Research SDIO 84-88-C-0029		4,500,000.00
Office of Naval Research - Lasers in Biomed.		1,200,000.00
Office of Naval Research - Lasers in High Energy		<u>800,000.00</u>
	TOTAL	\$ 6,858,000.00

Companies Associated Since Beginning of Contract

1. 3M
2. Cooper Lasersonics
3. Eder Instruments
4. HGM Medical Lasers
5. Lasers for Medicine
6. Luxtron
7. Olympus Corp. of America
8. Pfizer Hospital Products
9. R. Wolfe
10. SLT
11. Treadwell Foundation
12. Xanar

Laser Institute Contract #87-0352

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
27 Feb 87	\$ 20,000.00	\$ 80,000.00
27 Feb 87	6,667.00	73,333.00
29 Sep 87	6,667.00	66,666.00
26 Oct 87	6,667.00	59,999.00
02 Feb 88	6,667.00	53,332.00
27 May 88	6,667.00	46,665.00
30 Jun 88	6,667.00	39,998.00

Total Payments: \$ 60,002.00

MANUFACTURING

Joel DuBow, University of Utah

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
DOE: Alumina-Tetragonal Zirconia Composites		\$ 349,154.00
ARO: Paritally Stabilized Zirconia		289,325.00
NASA: Structural Ceramics in Multiaxial Loading		197,569.00
GRI: Solid Electrolytes for Solid Oxide Fuel Cells		50,000.00
DARPA: Toughening Ceramics		65,000.00
Dow: Toughening Ceramics		30,000.00
Ceramic Matrix Composites		14,983.00
NASA: Properties of Carbon Fibers		130,000.00
NASA: Fractography of Composite Delamination		90,000.00
NASA: Fraction and Wear of TPS Fibers		90,000.00
NASA: Carbon Fiber Composite Strength		56,000.00
Liquid Phase Chromatography	15,000.00	
Hercules		39,000.00
Morton-Thiokol		12,000.00
NASA: Advanced Composite Structures		193,575.00
DuPont		10,000.00
Quality Composites		600.00
Hercules: Impact Damage Modeling		40,000.00
Hercules: Scaling		19,000.00
Hercules: Impace Apparatus		16,500.00
Hercules: Fatigue Tests		9,900.00
Lawrence Livermore: Compressive Strength		75,678.00
Atlantic Research		10,000.00
National Science Foundation		194,200.00
DOD: Ion Trap Mass Spectrometry		58,000.00
NATO: Particulate Matter Pyrolysis		5,000.00
IBM: X-Ray Spectroscopy System		25,000.00
Galtech		10,000.00
IBM: Carbonaceous Residue		202,771.00
Winding Tech Corp.	12,000.00	
BYU Tech	14,000.00	
SAMPE	2,000.00	
BYU Chemistry	500.00	
Shell Oil	33,668.00	
Grumman Aircraft	6,850.00	
R Cubed Composites	1,500.00	
Misc.	1,982.00	
NSF: Crystalline Polymers		230,000.00
USA ROD: Polar Polymeric Dielectrics		185,000.00
DuPont: Polymers		1,000.00
ACS/PRF: Fracture in Polymers		18,000.00
DuPont: Fracture of K Polymer Composites		15,000.00
DuPont: Surface Embrittlement of Polymers		5,139.00
DuPont: Test System for Composites	35,000.00	

NACE: Erosion of SiC Ceramics		20,000.00
NASA: Multiaxial Loading		64,500.00
Studies of Mixed-Mode Stress Fracture		27,533.00
Navy: Interphase in Carbon Fiber-Polymer		138,000.00
DOE: Characterization of Impact Damage		79,000.00
NAVY: Fiber Surface Properties		80,000.00
NSF: Fiber Stress Transfer in Carbon Fiber		166,000.00
NSF: Microheterogeneity of Thin Films		160,000.00
NAVY: Failure of Composite Shells		30,000.00
Morton-Thiokol: Bonding of Composites		12,000.00
Morton-Thiokol: Composite Microcracking		223,135.00
NSF: Ultrasonic Pulse Techniques		140,579.00
Characterizing the Fracture Toughness		185,009.00
ARO: Fiber Bridging		18,893.00
NSF: Thin Films		210,000.00
ONR: Chemical Beam Epitaxy		298,916.00
Norton Christensen		20,000.00
H.P. San Hose	42,000.00	
NAWC: Chromatograph/Mass Spectrometer		330,000.00
DOE: Characterization of Polycrystalline		440,000.00
NHLBI: Fluid Dynamics		<u>212,304.00</u>
Subtotals:	<u>149,500</u>	<u>5,593,263.00</u>

Total: \$ 5,742,763.00

Companies Associated Since Beginning of Contract

1. ARI
2. Abbott Critical Care, Murray, UT
3. Aberdeen proving Ground, Aberdeen, MD
4. Advanced Research Corporation, Santa Barbara, CA
5. AEROCOR Corporation, Ogden, UT
6. Aerodyne, Inc., Ballerica, MA
7. Air Force Aeronautical Systems Div., Wright Patterson AFB, OH
8. Air Force Systems Command, Washington DC
9. Ames Research Center, Moffett Field, CA
10. American Chemical Society
11. American Cyanamide
12. Applied Health Physics, Albany, NY
13. Army Missile Command, Redstone Arsenal, AL
14. Army Armament Research, Dover, NJ
15. Army Laboratory Command, Adelphi, MD
16. Arthur Young Intl.
17. Avantek, Inc., Santa Clara, CA
18. Bausch & Lomb, Rochester, NY
19. Boeing, Seattle, WA
20. Bourns Precisions/Controls, Ogden, UT
21. Breakthrough
22. Campbell Scientific, Inc., Logan, UT

23. Center for Research in MSE, Austin, TX
24. Chrysler Corporation, Highland Park, MI
25. City Development, Inc.
26. Contour Composites, Woods Cross, UT
27. Delmed, Inc., Ogden, UT
28. Deseret Medical Inc., Sandy, UT
29. Diversified Tech Inc., Sandy, UT
30. DOE Chicago Operations
31. Dow Chemical, Midland, MI
32. Dugway Proving Ground, Dugway, UT
33. Eastman Kodak Co., Rochester, NY
34. EDO Western, Salt Lake City, UT
35. E.I. DuPont de Nemours & Company, Philadelphia, PA
36. Employment & Staffing Specialist, Elgin AFB, FL
37. Engineering Research Center, Boulder, CO
38. ERM Southwest
39. Ford Aerospace & Communications, Newport Beach, CA
40. Galtech Semiconductors, Mt. Pleasant, UT
41. Garrett Turbine Engine Company, Phoenix, AZ
42. General Dynamics, Convair Div.
43. General Motors Corp., Detroit, MI
44. GeoCenter
45. George C. Marshall Space Flight Center, Marshall Flight Center, AL
46. Grumman Aircraft Systems, Bethpage, NY
47. Hercules Aerospace Corporation, Magna, UT
48. Hercules, Inc., Magna, UT
49. Hercules, Inc., Wilmington, DE
50. Hewlett Packard Co. Palo Alto, CA
51. Hill Air Force Base, UT
52. Hiltech
53. Hodson Chemical Construction, North Salt Lake, UT
54. Hoechst Celanese Corp.
55. Honeywell Systems & Research Center, Minneapolis, MN
56. Hughes Aircraft Co., Los Angeles, CA
57. Huntsman Chemical, Salt Lake City, UT
58. IBM, Inc. San Jose, CA
59. ICI, Inc., Wilmington, DA
60. ICSB/DPCS, Langley AFB
61. Institute for Reliability, AFIT, Dayton, OH
62. Institute for Study of Fatigue, Washington, DC
63. International Technology Corporation
64. Jet Propulsion Laboratory, Pasadena, CA
65. Kansas State University, Manhattan, KS
66. Korean Institute of Science & Technology, Seoul, Korea
67. Langley Research Center, Hampton, VA
68. Litton Industries, Salt Lake City, UT
69. Litton Industries, San Carlos, CA
70. Massachusetts Institute of Technology, Cambridge, MA
71. McDonnell Douglas Astronautics Co., Huntington Beach, CA

72. McDonnell Douglas Helicopter, Phoenix, AZ
73. Mercury LPE, Philadelphia, PA
74. Merrell Dow Research Inst.
75. Morrison-Knudsen Eng., Inc.
76. Morton Thiokol, Inc., Brigham City, UT
77. Mountain West Plastics Corporation, Logan, UT
78. National Security Agency, DOD, Ft. George G. Meade, MD
79. Naval Air Propulsion Center, Trenton, NJ
80. Naval Research Laboratory, Washington, DC
81. New Mexico State University, Los Cruces, NM
82. North American Weather Consultants, Salt Lake City, UT
83. Pacific Engineering, Reno, NV
84. Parker Hannifin Corporation, Salt Lake City, UT
85. Penwalt Corp., Pharmaceutical Div.
86. Phillips 66 Company, Bartlesville, OK
87. Proctor and Gamble Co.
88. Purdue University, West Lafayette, IN
89. Quality Composites, Inc., Riverton, UT
90. R Cubed Composites, Inc., Murray, UT
91. Rand Corporation, Santa Monica, CA
92. Raychem Corp., Menlo Park, CA
93. Raydex Inc., Salt Lake City, UT
94. Recruitment Manager, Edwards AFB, CA
95. Remediation Technologies Inc.
96. Research Triangle Institute, Research Triangle Park, NC
97. Rockwell International, El Segundo, CA
98. Rutgerswerke
99. Shell Development Co., Houston, TX
100. Spectrum Sciences & Software, Inc.
101. TJ Products, Inc., West Jordan, UT
102. Technical Research Associates, Inc., Salt Lake City, UT
103. Teledyne, Inc., Albany, OR
104. TerraTek, Salt Lake City, UT
105. Texas A & M University, College Station, TX
106. UNISYS Corporation, Salt Lake City, UT
107. Uniroyal Chemical Co., Inc.
108. US Army Corp of Engineers, Washington, DC
109. University of Florida, Gainesville, FL
110. Utah Engineering Experimental Station, Salt Lake City, UT
111. Utah Innovation Center
112. VaporFab Inc., Salt Lake City, UT
113. Varian, Palo Alto, CA
114. Washington University, St. Louis, MO
115. Wayne State University, Detroit, MI
116. Westinghouse
117. Winding Technologies Corp., Springville, UT
118. Williams International, Inc., Ogden, UT
119. Williams International, Walled Lake, MI
120. White Sands Missile Range, White Sands, NM

Center for Materials & Manufacturing Contract #88-2414

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
26 Apr 88	\$ 45,175	\$ 135,525
28 Jun 88	45,175	90,350

Total Payments: \$90,350

CENTER FOR MICROELECTRONICS

CONTRACT AMOUNT: \$244,080.00

Gerald B. Stringfellow, University of Utah

The main focus is to develop new material for semiconductor devices, new technology for processing of these new materials into useful devices and circuits, new integrated circuit design tools for existing silicon circuits and for the new devices.

The National Science Foundation has funded a joint Japan/US Workshop on "Alloy Semiconductor Physics and Electronics." The workshop is co-sponsored by the Japanese Society for the Advancement of Science.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Department of Energy		\$ 735,552.00
DARPA		5,003,496.00
UNISYS		277,000.00
American Cyanamid		77,682.00
NASA		70,000.00
General Instrument		500,000.00
National Science Foundation		214,531.00
ONR		162,922.00
ATM		19,177.00
ONR/NRL		<u>451,008.00</u>
	TOTAL	\$ 7,864,986.00

Companies Associated Since Beginning of Contract

1. Advanced Technology Materials
2. Bonneville Microelectronics
3. General Instrument
4. NSF
5. ONR/NRL
6. Purdue Fredrick Co.

Center for Microelectronics Contract #87-2893

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
04 Dec 87	\$ 32,116.00	\$211,964.00
16 Feb 88	19,269.00	192,695.00
27 May 88	19,269.00	173,426.00
30 Jun 88	19,269.00	154,157.00

Total Payments: \$89,923.00

CENTER FOR QUALITY AND INTEGRITY DESIGN

CONTRACT AMOUNT: \$200,000

David W. Hoepfner, University of Utah

The main focus is to deal with the significant expansion of a Quality and Integrity Design Engineering Center, established at the University of Utah. It specifically deals with developing additional knowledge and an improved engineering educational system to help prevent our loss of manufacturing capability and our increased liability problems related to failures.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
Rolls Royce		\$ 200,000
Hercules Aerospace		50,000
MTS Systems Corp.		10,000
Cerametek		5,000
Air Force		100,000
FAA		29,000
NSF		<u>100,000</u>
	TOTAL:	\$ 494,000

Companies Associated Since Beginning of Contract

1. Rolls Toyce
2. Hercules Aerospace
3. MTS Systems Corp.
4. Cerametek
5. Air Force
6. Federal Aviation Association
7. National Science Foundation

Center for Quality and Integrity Design

Contract #88-2754

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
28 Jun 88	\$83,333.35	\$116,666.65

Total Payments: \$83,333.65

CENTER FOR SENSOR TECHNOLOGY
Jiri Janata, University of Utah

CONTRACT AMOUNT: \$ 75,000.00

The main focus is on integration of solid state electronics, chemistry, physics and biology and investigation and application of the physiological and biochemical principles of sensing.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
NIH - Remote Monitoring of Proteins		\$ 281,016.00
Office of Naval Research		285,879.00
Whitaker Foundation		143,977.00
NIHR		195,203.00
Boeringer Mannheim (5 yr)		75,000.00
Ciba Corning (5 yr)		75,000.00
IC Sensors		75,000.00
Sorin Biomedica (5 yr)		<u>75,000.00</u>
	TOTAL	\$ 1,206,075.00

Companies Associated Since Beginning of Contract

Sensor Technology - Jiri Janata 581-3837

1. Baxter Travel
2. Boehringer Mannheim
3. Ciba-Corning
4. Eli Lilly
5. I. C. Sensors
6. Sorin Biomedica (Italy)
7. Unilever

Center for Sensor Technology Contract #87-0352

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
25 Mar 87	\$ 15,000.00	\$ 60,000.00
20 Jul 87	10,000.00	50,000.00
27 Oct 87	5,000.00	45,000.00
27 May 88	5,000.00	40,000.00
27 May 88	5,000.00	35,000.00
30 Jun 88	5,000.00	30,000.00

Total Payments: \$ 45,000.00

CENTER FOR SIGNAL PROCESSING
SYSTEMS

CONTRACT AMOUNT: \$ 310,000

Douglas M. Chabries, Brigham Young University

The main focus is on five closely related research efforts: (1) VLSI research into the design and miniaturization of integrated circuit devices; (2) image processing research focused on compression techniques to allow video teleconferencing; (3) speech processing with adaptive technology which has focused on the elimination of noise and compensation for the hearing impaired; (4) robotics research focused on both visual and automatic speech recognition to be used with robots in a manufacturing environment; and (5) optimal estimation theory research applied to the needs of local industry.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Environmental Research		\$ 25,000.00
ESL		51,139.00
ESL		24,563.00
FBI		25,000.00
FBI		100,000.00
Hewlett Packard	\$ 680,000.00	
Hewlett Packard	453,000.00	
Hewlett Packard	381,434.00	
Hughes		54,000.00
Hughes		30,997.00
Hughes		50,000.00
ICON	25,000.00	
Netline		10,000.00
Office of Naval Research		39,942.00
Space Dynamics Lab		90,000.00
Tektronix	20,000.00	
Tektronix	19,400.00	
UNISYS		40,000.00
Westinghouse		<u>90,000.00</u>
Subtotals	\$1,578,834.00	\$ 555,641.00
	TOTAL	\$ 2,134,475.00

Companies Associated Since Beginning of Contract

Signal Processing - Doug Chabries 378-4012

1. Antin
2. Digital Hearing
3. Excalibur
4. FBI
5. Federal Bureau of Investigation
6. Hewlett Packard
7. Hughes

8. Office of Navel Research
9. Tektronix
10. UNISYS
11. Westinghouse

Center for Signal Processing Contract #87-0523

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
18 Dec 86	\$ 92,500.00	\$157,500.00
16 Jan 87	21,432.00	136,068.00
11 Sep 87	51,024.00	85,044.00
Amendment +	60,000.00	145,004.00
16 Feb 88	34,016.00	111,028.00
28 Jun 88	40,167.57	70,861.00
29 Jul 88	35,446.57	35,414.43
Amendment +	86,334.00	121,748.43

Total Payments: \$274,585.57

The main focus is to bring University Space Engineering resources to bear on the support of locally based space enterprises, encourage innovative research leading to spinoffs of new industry, attract new space industry to Utah, and produce experience graduates ready to join an expanding state employment base in space industries.

A new company, ICOMP, has been formed to market the data compression technology developed at USU. This technology development has enormous market potential. The CIRRIIS has been manifested for an early 1990 flight on the space shuttle.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
Globesat Inc.		\$ 200,000.00
UNISYS		30,970.00
Space Systems Engineering		12,705.00
Morton-Thiokol		223,100.00
Learn Inc.		14,060.00
Fibertek		7,200.00
McDonnell Douglas		50,252.00
USAF/Spirit II		18,400,000.00
USAF/ARII		16,108,739.00
DNA/EXCEED		2,950,209.00
USAF/AFGL (056)		3,396,168.00
NASA/Space Exp. Design		300,000.00
USAF/CIRRIIS		1,229,534.00
NASA/Space Sys. Design		44,968.00
DOD/SDI		<u>25,000,000.00</u>
	TOTAL	\$ 67,967,905.00

Companies Associated Since Beginning of Contract

1. Aerodyne Research
2. Aerojet Research
3. ASTRON Res. and Eng.
4. Ball Aerospace, Co.
5. Boeing Aerospace Corp.
6. Fiberscience Corp.
7. Fibertek
8. Globesat Inc.
9. Hercules Aerospace
10. Honeywell Space Systems
11. Hughes Aircraft, Co.
12. ICOMP
13. Intraspace, Inc.

14. Irvine Sensors, Inc.
15. Learn Inc.
16. Lockheed Space & Missiles
17. Martin Maitetta Space
18. McDonnell-Douglas
19. Morton-Thiokol
20. Nichols Research, Co.
21. Orbital Sciences, Corp.
22. Rockwell International
23. SAIC
24. Sensor Systems Group
25. Space Data Corporation
26. Space Systems Engineering
27. UNISYS

Center for Space Engineering Contract #87-0351

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
17 Jan 87	\$ 16,335.92	\$458,664.08
01 Jan 87	32,651.59	426,012.49
23 Jul 87	82,268.57	343,743.92
23 Jul 87	52,093.32	291,650.60
10 Dec 87	149,329.02	142,321.52
21 Mar 88	41,107.04	101,214.48
Amendment +	200,000.00	301,214.48
05 Apr 88	200,000.00	101,214.48

Total Payments: \$ 573,785.46

The main focus is to establish a policy objective of improving the technology base for economic development in Utah. This Center furthers that objective by: (a) encouraging interdisciplinary research in targeted areas; (b) strengthening the interaction and cooperation between university and industry; and (c) thereby accelerating the application and commercialization of university research.

URI has completed the high level architecture required for the major project, Parts on Demand System (PODS). Consortium team members are presently defining the individual module architecture. Ten of the twenty-three target industries have been visited and are in the review process at this time. Each is being asked to be a PODS sponsor for \$1.25 million over a five year period.

<u>Matching Funds</u>	<u>In-Kind</u>	<u>Cash</u>
<u>Source</u>		
(Consortium of Companies)		\$ 45,000.00
Rust Engineering		60,000.00
Marine Dynamics Biometrics		54,000.00
IBM		<u>500,000.00</u>
	TOTAL	\$ 659,000.00

Companies Associated Since Beginning of Contract

1. AFWAL
2. Air Italia
3. Army Tooele Depot
4. Arthur Anderson & Company
5. The BDM Corporation
6. Battell
7. Clyde Digital
8. Datacatcher
9. Dynamac
10. Dynamics Research Corporation
11. ERC
12. Emerson Electric
13. First Productivity
14. GA Technologies
15. GTE Government Systems
16. General Dynamics
17. Geometric Computing, Inc.
18. HQ AFLC
19. Hughes Aircraft
20. IBM
21. ISC Technologies
22. Iomega

23. Japan Air
24. Korean Air
25. Logtec
26. Marine Dynamics Biometrics
27. McDonnell-Douglas
28. Morton Thiokol
29. McDonnell Douglas - IMET
30. McDonnell Douglas, Longbeach
31. National Bureau of Standards
32. NESCO Telecommunications
33. Northrop
34. Ogden ALC
35. Ogden Air Logistic Center
36. Ogden Machine
37. Ogden ALC Material Mgmt.
38. Okalahoma ALC
39. Pratt & Whitney
40. Reynolds Aluminum
41. Rockwell
42. Rolls-Royce
43. Rust Engineering
44. Sacramento ALC
45. Samsung
46. San Antonia ALC
47. Simulator Engineering Division
48. South Carolina Research Authority
49. Standard Electric Lorenz
50. Sundstrand
51. Sverdrup
52. VSE
53. Warner Robbins ALC
54. Westinghouse

Utah Research Institute Contract #88-2102

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
10 Feb 88	\$ 72,263.35	\$227,736.65

Total Payments: \$ 72,263.35

Larry Knight, Brigham Young University

The main focus is to use X-Ray microlithography to achieve the small pattern dimensions necessary for the next generation of computer chips, as well as for improved medical imaging - both conventional and microscopic, for nondestructive testing of semiconductor chips, welds, etc., and for plasma diagnostics for nuclear fusion and underground tests.

MOXTEK Corp. is negotiating sales contracts with several large companies for x-ray vacuum windows that will significantly improve analysis of light elements. Philips Corp. and Tracor have finished extensive evaluation of the products. Sales have been made to Philips, and HNU-Ortec.

<u>Matching Funds</u> <u>Source</u>	<u>In-Kind</u>	<u>Cash</u>
L. Livermore National Lab		\$ 98,321.00
(L Division)		44,928.00
(Y Division)		109,922.00
Department of Energy		<u>107,340.00</u>
	TOTAL	\$ 360,511.00

Companies Associated Since Beginning of Contract

1. ARL
2. Bede X-Ray
3. Brookhaven National Lab
4. Caneca
5. Darsbury Laboratory
6. Eimtek
7. Galtech
8. JEOL
9. Jordan Valley
10. KeVex Corp.
11. L. Livermore National Lab
12. Lee Scientific
13. Link (England)
14. Marconi Electronic
15. Maxwell Labs
16. Microspec
17. Moxtek
18. Nicolet
19. North American
20. Osoma
21. Oxford Instrument
22. Peak
23. Phillips

- 24. Rigaku
- 25. Seamans
- 26. Signetics
- 27. Stanford University
- 28. Texas Instruments
- 29. Texas Nuclear
- 30. Tracor x-Ray
- 31. Tracor Northern
- 32. University of Rochester Laser Energetics
- 33. Vanderbilt University

Center for X-Ray Imaging Contract #88-1353

<u>Payments</u>	<u>Amount</u>	<u>Balance</u>
16 Feb 88	\$ 22,500.00	\$ 67,500.00
28 Jun 88	45,000.00	22,500.00

Total Payments: \$ 67,500.00

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