

## Appendix A – Centers of Excellence Summaries

### Aerospace Cluster

<u>Center for ADVANCED SATELLITE MANUFACTURING</u>	
<p>The Center for Advanced Satellite Manufacturing is seeking to create a viable Utah-based satellite manufacturing enterprise based upon years of expertise and projects within Utah State University and its Space Dynamics Laboratory. The Center is pursuing the development of novel advanced manufacturing and design techniques to reduce the cost and time involved with satellite manufacturing while improving quality and performance.</p>	<p><i>USU</i> <i>Funded 2004-</i></p>
	<p>Brent Stucker (435) 797-8173 <a href="mailto:brent.stucker@usu.edu">brent.stucker@usu.edu</a></p>
<u>Center for AEROSPACE SCIENCE TECHNOLOGY</u>	
<p>The center focuses on the development of small, low-earth orbiting satellites and related aerospace technology. The center exploits opportunities with expertise developed in the design, manufacture, and operation of small satellites to commercialize technologies.</p>	<p><i>WEBER STATE</i> <i>Funded 1987-1992</i></p>
	<p>Robert J. Twiggs (650) 723-8651 <a href="mailto:Bob.Twiggs@Stanford.edu">Bob.Twiggs@Stanford.edu</a></p>
<ul style="list-style-type: none"> <li>The Center has developed and flown two satellites: NUSAT I and WEBERSAT; receiving world-wide recognition as a leader in small satellite development.</li> <li>Some of the Center research was transferred to Stanford University with Twiggs, It is now being used to develop <a href="#">CUBESAT</a></li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">One Stop Satellite Solutions, Inc.</a></li> <li><a href="#">Wasatch Aerospace Co.</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>Intraspace, Inc.</li> <li>Simulacrum, Inc.</li> <li>Wasatch Research &amp; Engineering</li> </ul>
<u>Center for MINIATURE UNMANNED AIR VEHICLES</u>	
<p>The Center focuses on the rapid design of airframes and miniaturized autopilot and guidance systems for tiny UAVs that can be operated by novices. The Center has earned the attention of both military and civilian agencies.</p>	<p><i>BYU</i> <i>Funded 2004-</i></p>
	<p>Tim McLain (801) 422-6537 <a href="mailto:mclain@byu.edu">mclain@byu.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Procerus Technologies</a></li> <li><a href="#">Flying Sensors</a></li> </ul>

<b><u>Center for SPACE ENGINEERING</u></b>	
<p>Established in 1986, the center is Utah's leader for new technology developments involving space remote and in-situ sensing systems, image compression technology and small satellite systems. Sensing equipment developed at the center was the primary experimental effort on a previous shuttle mission. Technologies include:</p> <ul style="list-style-type: none"> <li>• Infrared instrumentation</li> <li>• Sensor calibration</li> <li>• Upper atmosphere measurements &amp; modeling</li> <li>• Plasma diagnostics</li> <li>• Data analysis</li> <li>• Image compression technology</li> <li>• Cryogenic systems</li> <li>• Program management</li> <li>• New technology developments in space remote and in-situ sensing systems</li> </ul>	<p><i>USU</i> <i>Funded 1986-1992</i></p>
	<p>Dr. Frank Redd <a href="mailto:fjredd@usu.edu">fjredd@usu.edu</a></p>
<ul style="list-style-type: none"> <li>• Center has flown 350 payloads, 75 of which involved cryogenics</li> <li>• Joint composites projects with BYU Center and Hercules Corp.</li> <li>• Success of CIRRIS 1A experiment aboard space shuttle Discovery promises increased business opportunities</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• CXT, Inc.</li> <li>• Globesat Holding Co.</li> <li>• ICOMP, Inc.</li> <li>• Interactive Resources Co.</li> <li>• Medcom, Inc.</li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Hercules</li> <li>• <a href="#">Thiokol</a></li> <li>• <a href="#">Space Dynamics Lab</a></li> </ul>

### ***Competitive Accelerators Cluster***

<b><u>Center for ADVANCED ARCHAEOLOGIC &amp; PALEONTOLOGIC IMAGING &amp; MODELING</u></b>	
<p>The center provides an opportunity to utilize leading edge technology to implement a revolutionary approach to the creation of museum reproductions, models and miniatures. The overall objective is to integrate CAD-CAM technologies in the areas of archaeology and paleontology</p>	<p><i>College of Eastern Utah</i> <i>Funded 1992-1993</i></p>
	<p>Dr. Don Burge</p>
<ul style="list-style-type: none"> <li>• Remodeling of the Huntington Canyon Mammoth</li> <li>• Two recently discovered dinosaur species will be molded by the Center</li> </ul>	

**Center for ADVANCED COMPOSITES MANUFACTURING & ENGINEERING**

Established as the focal point and coordinator of technical resources in Utah in the areas of composite materials, plastics, and other advanced materials. ACME assists existing industry and start-up companies and also conceives, invents, develops, and spins-out new and enhanced products into commercial enterprises.

*BYU*  
*Funded 1989-1995*

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**Spin Out Companies**

- [Advanced Laminate Technology](#)
- [American Vitrolite](#)
- [Baal](#)
- [Emily Rose](#)
- [Fiber Dynamics](#)
- [Futura Propulsion Systems](#)
- [IsoTruss](#)
- [Merrell Enterprises](#)
- [Rocky Mtn. Composites](#)
- [Synergy Marketing](#)

**Benefiting Companies**

- [AeroTrans](#)
- [American Polymer](#)
- [Ashton Aerospace](#)
- Automated Process Control
- B&M Enterprises
- Beckwith Technology
- [Bemsco](#)
- BGA
- Blue Cow, Inc.
- Bradley Instruments
- Creative Composites
- Dimensional Research
- CRP/Springlite
- Curecrete
- DAH Inc.
- Delta Fiberglass
- [EDO](#)
- [Evolution Skis](#)
- [Fiber Tek](#)
- H K Corporation

	<ul style="list-style-type: none"><li>• <a href="#">Haelan Medical</a></li><li>• <a href="#">Hexatron</a></li><li>• Ideas to Products</li><li>• <a href="#">INCO VaporFab</a></li><li>• International Biokenetics</li><li>• LCC Fabrications</li><li>• Legends Technologies</li><li>• <a href="#">MATCO</a></li><li>• Medi-Sight</li><li>• Medilight</li><li>• Mountain High Engineering</li><li>• Mountain Land Support</li><li>• Performance Composites</li><li>• Potter Management</li><li>• Pro Design Corporation</li><li>• Red Hawk, Inc.</li><li>• <a href="#">Rotomolding of Utah</a></li><li>• Sound Composites</li><li>• Springlite</li><li>• <a href="#">Terra Tek</a></li><li>• TRA</li><li>• Ultralite of America</li><li>• UP International</li><li>• Utah Rocketry</li><li>• Van Patten Corporation</li><li>• Wasatch Engineering</li><li>• <a href="#">Wasatch Technology Group</a></li></ul>
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<b>Center for ADVANCED CONSTRUCTION MATERIALS</b>	
<p>The center's major emphasis is in the development of new and recycled construction materials, and innovative techniques for inspecting the condition of constructed facilities. Core technologies include:</p> <ul style="list-style-type: none"> <li>Automated facilities management system (AFMS) to measure and analyze pavement cracks to schedule maintenance strategies</li> <li>Tire added latex concrete blocks, to use waste materials and to improve performance</li> <li>New construction product testing and evaluation services</li> </ul>	<p><i>UU</i>  <i>Funded 1993-1994</i>  <i>1996-1997</i></p>
	<p>Hosin Lee  (319) 384-0831  <a href="mailto:hlee@engr.uiowa.edu">hlee@engr.uiowa.edu</a></p>
<ul style="list-style-type: none"> <li>Two software modules, PicCrack and MapCrack have produced great results in four Utah cities</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>Green Hill Recycling</li> <li><a href="#">Soil Stabilization Inc.</a></li> <li><a href="#">uniAMS</a></li> </ul>

<b>Center for ADVANCED JOINING OF MATERIALS</b>	
<p>The Center for Advanced Joining of Materials (CAJM) is developing enhancements and new technologies based on friction stir welding (FSW). FSW is a relatively new, innovative joining technology which is revolutionizing the way in which aluminum, copper and other materials are being joined. The objectives are to develop enhancements to this existing technology that will broaden the use of this process in new materials and applications, and to transfer these technologies to local, national and international companies.</p> <p>The Center has been focused on the development and marketing of three technological aspects of FSW:</p> <ul style="list-style-type: none"> <li>Tooling that will last longer, offer the ability to join a wider range of advanced materials, and enable better control of the resulting quality of the weld and its properties</li> <li>New control systems and hardware for large scale, three-dimensional FSW capabilities</li> <li>New methods and novel tooling for joining polymeric materials</li> </ul>	<p><i>BYU</i>  <i>Funded 2000-2004</i></p>
	<p>Tracy Nelson, Ph. D.  (801) 378-6233  <a href="mailto:tracy_nelson@byu.edu">tracy_nelson@byu.edu</a></p>
<ul style="list-style-type: none"> <li>11 pending and 2 issued patents</li> <li>Utah spin-out company Megastir</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Megastir</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Advanced Metal Products</a></li> </ul>

**Center for ADVANCED MATERIALS & MICROELECTRONICS**

This center provided unique testing facilities, technical expertise and problem solving assistance to Utah industry. Composite, ceramic and semiconductor materials were explored for structural, aerospace and electronic applications. Technologies included:

- Multiple layer epitaxy
- III/V compound chip design
- Ceramics as solid electrolytes and structural components
- Composite materials
- Organometallic vapor phase epitaxy

*UU*

*Funded 1987-1992*

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**Benefiting Companies**

- Beta Power, Inc.
- Bonneville Microelectronics
- [Ceramatec](#)
- Concoyle Oilfield Tools, Inc.
- Edo Western
- [Evans & Sutherland](#)
- Fisher Co.
- Hercules
- Nova Tech
- Space Systems Engineering
- [Thiokol](#)
- Westcott Co.

<b>Center for <u>ADVANCED STRUCTURAL COMPOSITES</u></b>	
<p>The objective of the Center for Advanced Structural Composites is to commercialize the IsoTruss technology. The IsoTruss enables the creation of super lightweight grid structures with the potential for revolutionizing industries as diverse as civil infrastructure (e.g., communication and construction), aerospace, automotive, marine and sporting structures and virtually any application area requiring high strength, high stiffness, light weight and superb corrosion resistance.</p> <p>The core technology consists of an ultra-lightweight composite structural shape known as the IsoTruss. The IsoTruss is a novel, patented, three-dimensional structural form that takes advantage of the highly directional properties of high strength composites to produce an extremely efficient and lightweight structure. The IsoTruss incorporates stable geometric configurations with helical members that spiral in opposing directions around a central cavity, coupled with longitudinal members that pass through the intersections.</p>	<p><i>BYU</i> <i>Funded 1999-2004</i></p> <p>David W. Jensen (801) 378-2094 <a href="mailto:david@byu.edu">david@byu.edu</a></p>
<ul style="list-style-type: none"> <li>• Spin-out IsoTruss Structures Inc., is selling products, aiming to first displace wooden utility poles.</li> <li>• Conventional poles weigh half a ton and last 5-40 years, while IsoTruss poles weigh 300 pounds and are expected to last 60-100 years for the same price, while costing less to transport and install.</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">IsoTruss</a></li> <li>• Patterned Fiber Composites, Inc</li> <li>• TauRuss</li> </ul>

<b>Center for <u>APPLICATIONS FOR MATERIALS ENGINEERING</u></b>	
<p>The center was an important resource in Utah for technical knowledge and capability in the areas of plastics, composite materials and metallurgy. The center assists existing start-up companies and also conceives, invents, develops and spins off into commercial enterprises new or enhanced products. The center has patented the following technologies:</p>	<p><i>BYU</i> <i>Funded 1996-1997</i></p>
<ul style="list-style-type: none"> <li>• Cure and contamination sensing devices</li> <li>• Damping of composites through unique orientation of fibers</li> <li>• Improvement of fiber binding on thermoplastic composites</li> <li>• Forming technique for large thermoplastic composites</li> </ul>	<p>Paul Eastman (801) 422-2759 <a href="mailto:paul_eastman@byu.edu">paul_eastman@byu.edu</a></p>
<ul style="list-style-type: none"> <li>• Assisted 164 companies</li> </ul>	

<b>Center for CHEMICAL REACTORS</b>	
<p>The center focused on the development of fluid-bed technology for catalytic reactions and biological leaching technology for recovery of gold from refractory ores.</p>	<p><i>UU</i> <i>Funded 1989-1990</i></p>
	<p>A Lamont Tyler <a href="mailto:lamont.tyler@m.cc.utah.edu">lamont.tyler@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>Biological leaching of refractory gold ores supported by Kennecott and EIMCO</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Kennecott</a></li> <li><a href="#">EIMCO</a></li> </ul>

<b>Center for CHEMICAL SEPARATION</b>	
<p>Researchers with backgrounds in organic chemistry, inorganic chemistry and chemical engineering studied the full development of a new ligand bonded silica gel technology. The resulting products are used in a variety of separation systems. A few applications of center technology include precious and base metal refining, heavy metal and organic clean-up and nuclear waste management.</p>	<p><i>BYU</i> <i>Funded 1987-1992</i></p>
	<p>Dr. Reed Izatt (801) 422-2315 <a href="mailto:reed_izatt@byu.edu">reed_izatt@byu.edu</a></p>
<ul style="list-style-type: none"> <li>Set up pilot plants in four of the largest precious metal refineries in the U.S.</li> <li>Processes for separating Paladium and Rhodium represents a 40%-60% cost reduction to the industry</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">IBC Advanced Technologies</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">ASARCO</a></li> <li><a href="#">Cascade Refining</a></li> <li><a href="#">DataChem</a></li> <li><a href="#">GalTech Semiconductor</a></li> <li><a href="#">Johnson Matthey</a></li> <li><a href="#">Parish Chemical</a></li> <li>Tronac, Inc.</li> </ul>

**Center for COMPLIANT MECHANISMS**

The objective of the Center for Compliant Mechanisms is to direct the development and commercialization of compliant mechanism technologies and associated product applications so that they can be effectively licensed to existing or new companies in Utah. The Center also seeks to develop approaches that will accelerate this development, and promote co-development with interested Utah companies.

Compliant mechanisms are devices that obtain their motion from the deflection of flexible component parts rather than pin joints, thus offering advantages of lower manufacturing costs (reduced part count, elimination of assembly), increased performance (reduced friction, increased precision, reduced weight, etc.), and ability to miniaturize (including microelectromechanical systems). Brigham Young University is a recognized leader in compliant mechanisms and is uniquely poised for helping companies exploit the advantages of compliant mechanisms.

- 12 patents issued and 4 pending
- "Near Constant-Force Electrical Contact," patented and exclusively licensed to ATL, Springville, Utah.
- "Compliant, Ortho-Planar, Linear Motion Spring," patented and non-exclusive license for a specific application granted to Flowserve, Springville, Utah.
- "Continuously Variable Transmission," patented and exclusively licensed to Recreational Systems, Inc., Kaysville, Utah

*BYU  
Funded 2000-2003*

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**Benefiting Companies**

- [ATL](#)
- ICON
- [MityLite](#)
- [Grandway USA](#)
- [Flowserve](#)
- Recreation Systems

<b>Center for COMPOSITES IN CONSTRUCTION</b>	
<p>The Center has a primary focus on composite materials that may be used to strengthen or reinforce precast concrete structures such as bridge columns, freeway overpass beams, concrete walls and other structural components. The basic technology utilizes fiber-reinforced polymers woven into industrial fabrics that can be used to wrap structures or be imbedded in precast concrete designs.</p> <p>The Center develops design guidelines and specifications for the strengthening of columns and seismic retrofit of bridge caps and joints with FRP composites.</p>	<p><i>UU</i> <i>Funded 1998-1999</i></p>
	<p>Chris P. Pantelides, Ph.D. (801) 585-3991 <a href="mailto:chris@civil.utah.edu">chris@civil.utah.edu</a></p>
<p>.</p> <ul style="list-style-type: none"> <li>• The Center has developed a patent application for "Fiber Reinforced Polymer" (FRP) composite connections of precast concrete walls.</li> <li>• More than 70 columns of I-80 bridges will be retrofitted with the composite wraps.</li> <li>• In addition, the State Street bridge on I-80 will get a seismic retrofit using FRP composites.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Thiokol</a></li> <li>• Waterpoint</li> <li>• <a href="#">Monroc, Inc (Eagle Precast Co.)</a></li> <li>• <a href="#">EDO Fiber Science</a></li> <li>• <a href="#">Sika</a></li> <li>• <a href="#">Hydrotech</a></li> </ul>

<b>Center for COMPUTATIONAL DESIGN AND TESTING</b>	
<p>The objective of this new Center is to commercialize computational engines that facilitate and accelerate the design and testing of novel materials and device elements, with a special focus on nanostructured materials and devices.</p> <p>The center is focused on two computational engines: Materials Designer (MaDes) and Device Simulator (DeSim). The algorithms of MaDes predict the structural and mechanical properties of new materials based on first principles analysis at the level of atomic forces, while De- Sim models the electrical properties and performance of components constructed with novel materials.</p>	<p><i>UU</i> <i>Funded 2002-2004</i></p>
	<p>Feng Liu (801) 587-7719 <a href="mailto:fliu@eng.utah.edu">fliu@eng.utah.edu</a></p>
<p>.</p> <ul style="list-style-type: none"> <li>• A patent is now pending on the design for a carbon nanotube electromechanical pressure sensor</li> <li>• A web based user interface for on-line computational applications has been successfully demonstrated</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Visco</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Fairchild Semiconductor</a></li> </ul>

## Center for COMPUTER AIDED ENGINEERING, DESIGN & MANUFACTURING

The center's focus is research in computerized drafting, 3-D design, solid modeling, finite element modeling, numerical controlled mfg, robotics, facilities management, plant monitoring and control, database management and inventory planning.

The center has developed six software products:

- Promodel
- ROBLINE
- OPTDESX
- CATS
- Movie(c-Quel.byu and movistar.byu)
- MAXXICAD
- GEOSOLID.BYU

- Products are marketed exclusively through three spin-out companies
- Over 1,600 licensed users of Center generated software

BYU  
Funded 1988-1992

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### Spin Out Companies

- [CIMETRIX](#)
- [PROMODEL Corp](#)
- [Design Synthesis](#)

### Benefiting Companies

- [AgriDyne Technologies](#)
- Albion Technologies
- [Arrow Dynamics](#)
- Artistic Precision Enterprises
- Bel Viso Labs
- Vuena Ventura
- [Bureau of Mines](#)
- C.T. Film, In c.
- [Cache Valley Cheese](#)
- [Chromalox](#)
- [Del Med, Inc.](#)
- [Evans & Sutherland](#)
- Great Basin Brine Shrimp
- [Great Salt Lake Mineral](#)
- Hercules
- [Hewlett-Packard](#)
- [Hill AFB](#)
- Industrial Research
- [IOMEGA](#)
- [KEMGAS](#)
- Miller Labs
- Morton Automotive
- Reilly Wendover
- [Schreiber Foods, Inc.](#)
- [Solaray](#)
- SusumuConstruction
- [Thiokol](#)
- Trysan
- VALTEK
- [Viewpoint Animation](#)
- Western Zirconium
- [Williams International](#)

<b>Center for CONTROL OF FLOW IN MANUFACTURING</b>	
<p>The Center is applying flow control technology to improve manufacturing processing including particle sorting and thermal sprays. This Center was assigned a business team in 2005-06.</p>	<p><i>USU</i> <i>Funded 2006-</i></p>
	<p>Barton Smith (435) 797-3278 <a href="mailto:barton.smith@usu.edu">barton.smith@usu.edu</a></p>

<b>Center for DIRECT MACHINING AND CONTROL (DMAC)</b>	
<p>This Center is commercializing a disruptive technology for manufacturing: A new paradigm of one controller for many devices. That is, multiple machine tools can be run by one operator, through a network, rather than by individual operators. Instead of every machine having its own control panel, one program and one controller could theoretically manage all the machines within a plant—creating dramatic cost savings. A related application of the core technology (VMAC) is being developed for the home automation market.</p> <p>The DMAC technology is based on the development of an open architecture controller and supporting control algorithms for general control of advanced mechanisms such as 5-axis machine tools. This controller uses a dual CPU PC/controller so that the CAD/CAM application can run under Windows, while the real time control software can run under a second CPU. The motors and machine Input/ Output (I/O) are commanded over a high speed network such as fiber optic and IEEE 1394 (firewire). The control software consists of object oriented libraries that integrate motion planning, trajectory generation, servocontrol, communication, and user interfaces.</p>	<p><i>BYU</i> <i>Funded 2002-2005</i></p>
	<p>Ed Red (801) 422-5539 <a href="mailto:ered5@comcast.net">ered5@comcast.net</a></p>
<p>.</p> <ul style="list-style-type: none"> <li>• Four patents pending</li> <li>• Multiple contracts from major industrial partners.</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Direct Controls, Inc.</a></li> </ul>

<b>Center for ENGINEERING DESIGN</b>	
<p>The center exists to develop original solutions for technological challenges. By utilizing state-of-the-art equipment and research facilities, the CED can and will continue to bring innovative ideas in the form of superior products to the marketplace.</p>	<p><i>UU</i> <i>Funded 1987-1993</i></p>
	<p>Stephen Jacobsen (801) 581-6499 <a href="mailto:s.jacobsen@sarcos.com">s.jacobsen@sarcos.com</a></p>
<ul style="list-style-type: none"> <li>• RDT (rotary displacement transducer) is an integrated chip-based rotary position encoder</li> <li>• The Dextrous Telescoping System surpasses the severely limited, traditional robotic manipulators</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Sarcos Medical</a></li> </ul>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Animate Systems</li> <li>• MicroJet, Inc.</li> <li>• <a href="#">Sarcos Research Group</a></li> </ul>

<b>Center for FUNCTIONALLY GRADED AND DESIGNED CEMENTED TUNGSTEN CARBIDE AND POLYCRYSTALLINE DIAMOND COMPOSITE MATERIALS</b>	
<p>Advanced composite materials with predictable wear and failure characteristics designed for demanding applications such as mining, drilling, and grinding.</p>	<p><i>UU</i> <i>Funded 2006-</i></p>
	<p>Zak Fang (801) 581-8128 <a href="mailto:zfang@mines.utah.edu">zfang@mines.utah.edu</a></p>

<b>Center for HARSH ENVIRONMENT ELECTRONICS</b>	
<p>The Center for Harsh Environment Electronics (formerly the Center for Flat Panel Displays) developed micro-miniature thermionic vacuum emitter (MTV) display panels. As the MTV technology matured and license agreements were signed, the center moved its focus to electronic circuits and devices for operation in high temperature environments.</p> <p>The center also provided services in the following areas: prototype development and testing; development of high-temperature electronics based on MTV technology; and development of tools to test flat panel display technologies.</p>	<p style="text-align: center;"><i>UU</i> <i>Funded 1995-2000</i></p> <p style="text-align: center;">Laurence P. Sadwick, Ph.D. (801) 581-8282 <a href="mailto:sadwick@ee.utah.edu">sadwick@ee.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Innosys</a></li> <li>• <a href="#">Radiant Labs</a></li> </ul>
<ul style="list-style-type: none"> <li>• Enhanced flat panel display was patented</li> </ul>	

<b>Center for MAGNETIC SENSOR &amp; ACTUATOR MATERIALS</b>	
<p>Working to commercialize a novel magnetostrictive alloy exhibiting a large physical effect in response to small magnetic fields, which may find use in applications from antilock brakes to nanomachining and ultrasonic devices.</p>	<p style="text-align: center;"><i>UU</i> <i>Funded 2005-</i></p>
	<p style="text-align: center;">Sivarman Guruswamy (801) 581-7217 <a href="mailto:sguruswa@mines.utah.edu">sguruswa@mines.utah.edu</a></p>

<b>Center for NANOSIZE INORGANIC MATERIAL POWDERS</b>	
<p>Commercializing a novel, cost-effective process (molecular decomposition) for the manufacturing of nanosize powders, the building blocks for myriad nanotechnology applications, as well as nanostructured ceramic membranes and other devices.</p> <p>The main focus of this new Center has been to synthesize nanosize oxide powders by a low-cost, commercially scalable process using low-cost precursors. These powders find applications in numerous technologies. During the past year, one patent application was filed and one patent was issued. During the year, the use of nanosize powders in sensors and as a material for fuel cells, an energy conversion device which converts chemical energy of fuels directly into electricity was explored.</p>	<p><i>UU</i> <i>Funded 2004-</i></p> <p>Anil Virkar (801) 581-5396 <a href="mailto:anil.virkar@m.cc.utah.edu">anil.virkar@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• One venture will be started this year. Fact Sheet has been sent to over 130 potential clients.</li> <li>• ZrO<sub>2</sub>, CeO<sub>2</sub>: Fuel cells, structural ceramic components. Cells to be supplied to Versa Power Systems and FuelCell Energy this year.</li> <li>• TiO<sub>2</sub>, ZnO, SnO<sub>2</sub>: Optics, coatings. Samples supplied.</li> <li>• Fe<sub>2</sub>O<sub>3</sub>, CeO<sub>2</sub>, TiO<sub>2</sub>: Environmental clean-up. Samples being evaluated by the MAC Center.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Versa Power Systems</a></li> <li>• <a href="#">FuelCell Energy</a></li> <li>• <a href="#">Materials and Systems Research, Inc. MSRI</a></li> </ul>

<b>Center for NOVEL TITANIUM BORIDE SURFACE HARDENING TECHNOLOGY</b>	
<p>This Center is commercializing a novel method for hardening the surface of components fabricated from Titanium. Originally developed with government funding for use in creating lightweight Titanium armor, their approach for the first time makes this strong metal suitable for use in applications such as hip replacements, bearings and cutting tools where superior hardness coupled with wear resistance create a superior product.</p>	<p><i>UU</i> <i>Funded 2003-</i></p> <p>Ravi Chandran (801)-581-7197 <a href="mailto:ravi@mines.utah.edu">ravi@mines.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Two patents have been filed.</li> <li>• License signed with Ortho Development Corporation, a Utah company, for the development and FDA validation of orthopedic implants using the TiB coating</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Ortho Development Corp.</a></li> </ul>

<b>Center for ADVANCED PYROMETALLURGICAL TECHNOLOGY</b>	
<p>The goal of the Center was to test the feasibility of a clean, pollution-free and energy efficient new technology for producing copper from the sulfide minerals.</p> <p>The technology investigated at this Center was aimed at copper smelters which were using technologies that generated large amounts of sulfur dioxide emissions and were not efficient in terms of energy consumption. The industrial feasibility of a closed and continuous copper smelting technology based on bottom gas injection was evaluated and confirmed. The technology was proven to be technically sound and environmentally superb. During the Center project a patent on a entirely new and different technology on solvent extraction processes was developed: H. Y. Sohn, "Continuous Solvent Extraction with Bottom Gas Injection," U.S. Patent No. 5,641, 462, June 24, 1997.</p>	<p><i>UU</i> <i>Funded 1988-1989</i></p> <p>H. Y. Sohn (801) 581-5491 <a href="http://myprofile.cos.com/sohnh18">myprofile.cos.com/sohnh18</a></p>
<ul style="list-style-type: none"> <li>• Patent issued on new low pollution, energy efficient copper smelter technology.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Kennecott</a></li> </ul>

<b>Center for QUALITY AND INTEGRITY DESIGN</b>	
<p>QIDEC was originally established with the goal of "developing additional knowledge and an improved engineering educational system to help prevent our loss of manufacturing capability and decrease our liability problems related to failures" within the engineering community in the U.S. The center expanded the goal to address the shorter tem needs of industry and government in their increasing efforts to regain control over technical issues affecting product quality, safety and reliability, and organizational productivity. Work is centered on three major industrial sectors:</p> <ol style="list-style-type: none"> <li>1. Medical device reliability</li> <li>2. Aircraft and aerospace structural integrity</li> <li>3. Structural fatigue and reliability of mechanical systems</li> </ol>	<p><i>UU</i> <i>Funded 1989-1991</i></p> <p>David W. Hoepfner (801) 581-3851 <a href="mailto:hoepfner@eng.utah.edu">hoepfner@eng.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• License agreements with FASIDE Int'l and Technology Management Assoc.</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">FASIDE International</a></li> <li>• <a href="#">HOLSIP (organization)</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Technology Management Associates</li> </ul>

**Center for RAMAN TECHNOLOGY**

<p>This center was established to commercialize Raman technology for chemical monitoring in natural gas, metal processing, and medical applications. Advances in instrumentation have made Raman scattering attractive as a general purpose analytical technique for measuring chemicals in solid, liquid and gaseous samples. Raman spectroscopy is the measurement of the wavelength and intensity of inelastically scattered light from molecules. The Raman scattered light occurs at wavelengths that are shifted from the incident light by the energies of molecular vibrations. Typical applications are in structure determination, multicomponent qualitative analysis, and quantitative analysis. Technology development is focuses on the following areas:</p> <ul style="list-style-type: none"> <li>• Laser diode configuration</li> <li>• Sample handling schemes</li> <li>• Fiber coupling techniques</li> <li>• Data-analysis algorithms</li> <li>• Modifications to the core Raman detection systems.</li> </ul>	<p align="center"><i>UU</i> <i>Funded 1996-1998</i></p>
<ul style="list-style-type: none"> <li>• Patented laser (U.S. Patent No. 6,100,975), spectrograph (U.S. Patent No. 6,028,667), and 18 channel multiplexer (U.S. Patent No. 6,859,581)</li> <li>• Process Instruments has its Raman systems in some of the largest refinery and petrochemical plants in the U.S.</li> </ul>	<p>Dwayne Westenshow, Ph.D. (801) 581-6393 <a href="mailto:drw@ee.utah.edu">drw@ee.utah.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Process Instruments, Inc.</a></li> </ul>

**Center for RAPID PRODUCT REALIZATION**

<p>The center was established to provide manufacturing technology extension services designed to assist small manufacturing companies, to bridge the gap between new product concepts and manufacturing realization, and to develop innovative technologies which will result in products, patents, and related economic benefits for the state. The center went on to become Utah's Manufacturing Extension Partnership.</p>	<p align="center"><i>BYU</i> <i>Funded 1993-1996</i></p>
<ul style="list-style-type: none"> <li>• Assisted over 171 individuals and companies with new product development, prototyping and testing.</li> </ul>	<p align="center">David Sorensen and Brent Strong (801) 863-7901 <a href="mailto:dsorensen@mep.org">dsorensen@mep.org</a></p> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Accuserve</a></li> <li>• American International</li> <li>• Bolick, Co.</li> <li>• CellTek, Int'l</li> <li>• GWH</li> <li>• Hatch Biomedical</li> <li>• Tile Roof Associates</li> <li>• <a href="#">Manufacturing Extension Program</a></li> <li>• Youth Reclamation, Inc.</li> </ul>

**Center for RAPID PROTOTYPING**

The Center for Rapid Prototyping is focused on commercializing technologies related to ultrasonic sensing for injection molding processes, and physical and virtual geometric modeling for computer aided design.

The Center has been working on multiple projects, including:

- Machining techniques that allow the prototyping of geometric objects of arbitrary complexity on a 3 axis CNC mill with limited tools and little operator skill required
- A series of new sensors and controls for improved polymer processing
- Personal Prototyping System (PPS) that makes rapid prototyping affordable for small companies and perhaps even the average consumer
- Low cost 3-D scanning technologies that make the acquisition of 3-D geometric data practical and affordable for reverse engineering, medical imaging/reconstruction, etc
- A device that is capable of producing very large prototypes (Shapemaker)
- A photopolymer-based technique to create prototypes in a single step (Inverse Tomographic Construction)
- New micro and nano-scale polymer manufacturing techniques have been developed, including a micro-forging technique and a nanoscale injection molding machine.

- Production of the first micro-scale injection molded parts
- Completion and testing of a production-type prototype high temperature ultrasound transducer and control system
- Production and test marketing of individualized replicas of human faces captured in a polymer based collectible
- One spin-off company already formed.

*UU*

*Funded 2001-2004*

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**Benefiting Companies**

- [Accuserve](#)
- American International
- Bolick, Co.
- CellTek, Int'l
- GWH
- Hatch Biomedical
- Tile Roof Associates
- [Manufacturing Extension Program](#)
- Youth Reclamation, Inc.

<b>Center for THERMAL MANAGEMENT TECHNOLOGIES</b>	
Technologies for extremely high performance thermal management in the context of physical and vibration isolation, in part from collaboration with Utah State University's Space Dynamics Lab.	<i>USU</i> <i>Funded 2006-</i>
	Clair Batty (435) 881-1325 <a href="mailto:clairbatty@comcast.net">clairbatty@comcast.net</a>
	<b>Benefiting Companies</b>
<ul style="list-style-type: none"> <li>• Provision patent application in August 2006</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Starsys</a></li> </ul>

<b>Center for UTAH RESEARCH INSTITUTE</b>	
The main focus of the Center was "Parts on Demand System (PODS)," a cooperative effort among Utah's largest universities to implement a paperless order and production process for small parts. Combined resources have enabled URI to successfully compete for military and industrial contracts.	<i>UU, USU, BYU, WSU</i> <i>Funded 1988-1992</i>
<ul style="list-style-type: none"> <li>• \$4.5M contract for CALS/PODS program at Ogden Air Logistics Command</li> <li>• \$380K contract to provide software engineering services to the Air Force Software Technology Support Center.</li> <li>• \$3.7M contract to help develop, test and install a Spare Parts Productions and Reprocurement System (SPARES) for Ogden Air Logistics Center.</li> </ul>	David Norton <a href="mailto:dave.norton@usurf.usu.edu">dave.norton@usurf.usu.edu</a>

## Defense and Homeland Security Cluster

<u>Center for ADVANCED IMAGING LADAR</u>	
<p>The Center for Advanced Imaging LADAR was formed to commercialize a now patented camera technique that uniquely combines laser distance measurement with digital color imaging, resulting in detailed, 3-D color images that can be captured in real time and also stored for later analysis and manipulation in virtual reality environments. Civilian and military markets exist for stationary, airborne and spaceborne versions of the technology.</p> <p>CAIL's technology couples existing 3D LADAR (Laser Detection and Ranging) technology with 2D digital color imaging in the unique 3D Texel Camera. Previously, distance and spectral datasets had to be collected separately, carefully registered, and then superimposed – laborious reprocessing that often required days to weeks. The CAIL technology works in real time – the first system to enable precise 3D color imaging when either the scene, the camera or both are moving.</p> <ul style="list-style-type: none"> <li>• Key Patent Issued</li> <li>• Utah company IntelliSum is marketing land based LADAR system</li> </ul>	<p><i>USU</i> <i>Funded 2003-</i></p>
	<p>Robert T. Pack (435) 797-7049 <a href="mailto:rtpack@cc.usu.edu">rtpack@cc.usu.edu</a></p> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">InteliSum (Rapidmapper)</a></li> </ul>

<u>Center for SELF ORGANIZING &amp; INTELLIGENT SYSTEMS</u>	
<p>The center provides design services to Utah companies to develop intelligent systems solutions for new and improved commercial products. The center maintains a national and international reputation as a leading contributor to the advancement of intelligent systems research.</p> <p>Intelligent systems include any device and/or software concept which attempts to artificially emulate the unique cognizance and control abilities of the human mind.</p> <ul style="list-style-type: none"> <li>• Leader in Unmanned Ground Vehicles (UGVs)</li> <li>• \$4MM in defense contracts</li> <li>• Research contract with nation's largest agricultural equipment manufacturer</li> </ul>	<p><i>USU</i> <i>Funded 1992-2000</i></p>
	<p>Kevin Moore, Ph.D. <a href="mailto:snowvax@cc.usu.edu">snowvax@cc.usu.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Autonomous Solutions Inc.</li> <li>• Kachemak Research and Development</li> <li>• Monetary Services, Inc.</li> <li>• <a href="#">Visionary Products Inc.</a></li> </ul>

**Center for SMART SENSORS**

In a general sense, Smart Sensors meld sensor, signal processing, and computer technologies to create new functionalities such as the ability to probe the environment and modify sensor function in order to improve their data gathering capability. Applications envisioned by this Center span medicine, precision agriculture, electronics manufacturing, wireless communication, transportation and radar.

The Center for Smart Sensors focuses on two core technologies which have the greatest commercial potential:

- Circuitry for measuring length, distance or impedance; this enables a Smart Wire inspection system that can detect and locate faults or insulation breaks in aircraft wiring in real time.
- Imbedded Microstrip Antenna (IMA), which can sense or communicate in a buried environment.

Both families of technologies are based on simple ideas and simple circuits that result in two critical characteristics -- Small and Cheap. This makes them applicable to a wide array of applications.

- Single IMA antenna can both sense and communicate
- 12 pending patents
- 1 issued patent
- Commercialization of aircraft wiring fault detection has over \$1MM in funding from FAA and aircraft firms

*USU/UU  
Funded 2000-2005*

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**Spin Out Companies**

- [LiveWire Test Labs, Inc.](#)
- [RF Sensor Innovations](#)

## Energy and Natural Resources

<u>Center for ACOUSTIC COOLING</u>	
<p>The Center for Acoustic Cooling Technologies was originally established to commercialize novel high frequency thermoacoustic engines for cooling applications. One important application for this technology is in the heat management of computers and other devices employing dense arrays of microcircuits. Subsequent work has resulted in the demonstration of a prototype device capable of converting heat into electricity at high efficiency.</p> <p>The Center for Acoustic Cooling is leveraging fundamental developments in miniature thermo-acoustic devices supported by the Office of Naval Research and DARPA. The Center's technology is based on two effects in thermo acoustics: The first is that heat can be converted into sound energy, and the second is that sound can pump heat. Both have been employed in devices with dimensions ranging from 4 cm to 0.8 cm. Piezoelectric materials have now been incorporated in order to recover electricity in some cases.</p>	<p><i>UU</i> <i>Funded 2000-2004</i></p>
	<p>Orest G. Symko 801-581-6132 <a href="mailto:orest@physics.utah.edu">orest@physics.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Intel and HP interested in acoustic refrigerator</li> <li>• Involved in \$27MM DoD project with Washington State and University of Mississippi</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Coen Co.</a></li> <li>• <a href="#">Parvus Co.</a></li> </ul>

<b>Center for ADVANCED COMBUSTION ENGINEERING &amp; RESEARCH</b>	
<p>Established in 1986 as a joint collaboration between Brigham Young University and the University of Utah for the purpose of advancing combustion engineering research, education, and technology. The principle focus is on clean and efficient use of fossil fuels including coal, oil, and natural gas as well as the combustion of toxic and municipal solid wastes. The center research program consists of 35 active research projects among 62 participants focused on 6 thrust areas.</p> <p>The nation's basic and high-technology industries rely upon the adequate supply of high-quality energy, the production of which depends upon combustion technology. The international competitiveness of these industries depends in part on their ability to more efficiently use low-cost fuel resources such as coal, heavy oil, oil shale, and tar sands, which are abundantly available in the western United States and particularly in Utah.</p> <p>Specific center technologies include:</p> <ul style="list-style-type: none"> <li>• Mechanisms of fossil-fuel combustion and pollutant and soot formation</li> <li>• The relationship between fuel properties and conversion</li> <li>• Computer models to control and record the performance of particular combustion chambers</li> <li>• Pollution formation/control and waste incineration</li> </ul>	<p><i>BYU</i> <i>Funded 1987-1995</i></p> <p>L. Douglas Smoot, Ph.D. (801) 422-8930 <a href="mailto:lds@byu.edu">lds@byu.edu</a></p>
<ul style="list-style-type: none"> <li>• The center is one of 18 highly sought-after national engineering centers.</li> <li>• More than 60 licensing agreements</li> <li>• Provides ongoing consulting services to Utah companies</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Combustion Resources</a></li> <li>• <a href="#">Reaction Engineering Intl.</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Animate Systems</li> <li>• Combustion Services Inc.</li> <li>• <a href="#">Ford, Bacon, Davis</a></li> <li>• <a href="#">Geneva Steel</a></li> <li>• <a href="#">GMH Engineering</a></li> <li>• <a href="#">Hercules</a></li> <li>• IOMED</li> <li>• <a href="#">Pacific Corp.</a></li> <li>• <a href="#">Questar</a></li> <li>• <a href="#">Sarcos Research Corp</a></li> <li>• <a href="#">Sarcos, Inc</a></li> <li>• <a href="#">Thiokol</a></li> <li>• <a href="#">Utah Power &amp; Light</a></li> </ul>

<b>Center for COAL AND OIL RESEARCH</b>	
<p>The main focus of the center is the development of new markets for Utah coals and their products. The center promotes efforts to bring university and industry researchers together to develop and implement advanced methods of processing, upgrading, and preparing Utah coal and tar sand resources including coal/water slurry transport, differential liquefaction and resin extraction.</p>	<p><i>UU</i> <i>Funded 1987-1991</i></p>
	<p>Dr. Larry Andersen <a href="mailto:larry.anderson@utah.edu">larry.anderson@utah.edu</a></p>
<ul style="list-style-type: none"> <li>Nine patents issued</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">FemtoScan Corp.</a></li> <li><a href="#">International Resin Resources</a></li> </ul>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Advanced Processing Technology</a></li> </ul>

<b>Center for COAL PROCESSING TECHNOLOGY</b>	
<p>The center was established to provide the advanced processing technology required to extract coal resins economically and promote the development of a coal resin industry in Utah.</p>	<p><i>UU</i> <i>Funded 1996-1998</i></p>
	<p>J.D. Miller (801) 581-5160 <a href="mailto:jdmiller@mines.utah.edu">jdmiller@mines.utah.edu</a></p>
<p>The center has three proprietary technologies which will have applicability to Utah's coal industry</p> <ul style="list-style-type: none"> <li>Processing technologies for the efficient retrieval and refining of organic resins from coal</li> <li>X-ray CT technology for the analysis of coal wash-ability</li> <li>Methods for cleaning coal and the development of air-sparged hydrocyclone technology</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">TerraTek</a></li> </ul>

<b>Center for MINERALS TECHNOLOGY</b>	
<p>The Center's focus is on developing new technologies for minerals processing. Specific areas of expertise include the design of high efficiency grinding mills using state of the art computer simulation software, advanced mill analysis and monitoring methods, technologies for the in-line monitoring and measurement of particle size on moving conveyor belts, and the real-time control of industrial milling processes.</p> <p>Computer software, on-line instruments and laboratory procedures for the design, monitoring, control and analysis of industrial grinding machines and operating mineral recovery plants have been demonstrated and are now available for application in industry.</p> <ul style="list-style-type: none"> <li>• An instrument to measure the distribution of sizes of particles on moving conveyor belts has been developed and successfully tested at industrial sites.</li> <li>• Millsoft software was sold to Process Engineering Resources, Inc., a Utah company.</li> </ul>	<i>UU</i> <i>Funded 1995-1999</i>
	R. Peter King, Ph.D. <a href="mailto:rpking@mines.utah.edu">rpking@mines.utah.edu</a>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Mineral Tehnologies, Inc.</a></li> <li>• <a href="#">Milltech Engineering</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Process Engineering Resources, Inc.</a></li> </ul>

<b>Center for MODIFIED ACTIVATED CARBONS TECHNOLOGY</b>	
<p>The Center is focused on modifications to existing activated carbon products and expanding into new products based on modifications to various organic (carbon) materials.</p> <ul style="list-style-type: none"> <li>• Technology #1: Magnetic activated carbons</li> <li>• Technology #2: Biological modified activated carbon</li> <li>• Technology #3: Inorganic modified activated carbon</li> </ul> <p>All current technologies deal with removal of materials from fluid streams.</p>	<i>UU</i> <i>Funded 2005-</i>
	Jack Adams (801) 585-7349 <a href="mailto:jadams@mines.utah.edu">jadams@mines.utah.edu</a>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Inotech</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Benefiting Co</li> </ul>

**Center for PETROLEUM RESEARCH**

<p>The Petroleum Research Center (PERC), which is an integral part of the Department of Chemical and Fuels Engineering at the University of Utah, is developing practical, cost-effective solutions to liquid hydrocarbon production, handling and transportation. PERC specifically works to understand problems related to the production, transportation and processing of waxy and asphaltenic crude oils, and alleviate those problems by developing a variety of methods and software tools (models) for the efficient and optimal production of oil and gas from underground reservoirs.</p> <p>The Center is commercializing products in three areas:</p> <ul style="list-style-type: none"> <li>• Flow Assurance (tools to help keep oil products moving through pipelines)</li> <li>• Oil Simulants (environmentally safe yet accurate substitutes for crude oil)</li> <li>• Reservoir Simulators (finite-element models for optimizing production from geometrically complex oil and gas fields)</li> </ul> <p>With funding from the U.S. DOE and the petroleum industry, the PERC coordinates basic and applied research in the physical properties and physical and chemical thermodynamics of naturally occurring hydrocarbons.</p>	<p align="center"><i>UU</i> <i>Funded 2000-2005</i></p> <p align="center">Milind Deo (801) 581-7629 <a href="mailto:mddeo@eng.utah.edu">mddeo@eng.utah.edu</a></p> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Systems Engineering and Simulation</li> <li>• LT Industries</li> <li>• <a href="#">Trans Alaskan Pipeline</a></li> <li>• <a href="#">Exxon Mobil</a></li> </ul>
<ul style="list-style-type: none"> <li>• 2 patents issued on Oil Simulants</li> <li>• Pursuing copyrights on several software products - Chemometric Database and Finite Element Reservoir Simulator</li> </ul>	

**Center for PROFITABLE USES OF AGRICULTURAL BYPRODUCTS**

<p>The Center for Profitable Use of Agricultural Byproducts was established to commercialize technologies utilizing agricultural production and processing byproducts. Waste materials of little or no value are transformed into energy and other salable items using technology developed at the center.</p>	<p align="center"><i>USU</i> <i>Funded 2000-2004</i></p>
<p>The USU technology has two basic components: 1) an induced sludge bed anaerobic reactor that can produce energy (biogas) and soil amendment from manure and food processing waste, and 2) a high rate aerobic (drum composter based) bioreactor that make the system more cost effective, and the products produced by the process more valuable. The scalable, modular system is reliable and easily managed.</p>	<p align="center">Conly Hansen (435) 797-2188 <a href="mailto:chansen@cc.usu.edu">chansen@cc.usu.edu</a></p>
<ul style="list-style-type: none"> <li>• At least three operational plants in Utah producing electricity.</li> <li>• One of these generates enough electricity to power its own farm <u>and</u> put \$1,000 worth of electricity back into the grid monthly.</li> <li>• One issued and one pending patent.</li> <li>• A new Utah company, Andigen, has been formed to build the anaerobic systems.</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Andigen</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Inrepid (ITR)</a> - Idaho</li> <li>• <a href="#">Agrimass</a> – California</li> <li>• HHE</li> </ul>

<b>Center for SOLID OXIDE FUEL CELL TECHNOLOGY</b>	
<p>The center was established to develop solid oxide fuel cell (SOFC) technology for the direct conversion of chemical energy of a variety of fuels, such as natural gas, coal gas and other reformed logistic fuels, into electricity at a very high efficiency. Center technologies are based on the design and fabrication of novel, anode-supported solid oxide fuel cells with highly efficient electrodes that have a very low resistance. This concept makes it possible to develop a cost effective, compact power unit for direct conversion of chemical energy of fuels into electricity for remote and residential applications.</p>	<p><i>UU</i> <i>Funded 1996-2001</i></p>
	<p>Prof. Anil V. Virkar (801) 581-5396 <a href="mailto:anil.virkar@m.cc.utah.edu">anil.virkar@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Based on IP generated by the SOFC Center, a Fuel Cell Consortium was formed for commercialization of SOFC technology</li> <li>• (MSRI) co-founded by the Center Director, won an Advanced Technology Project (ATP) from the Department of Commerce (DOC) totaling \$2M</li> <li>• 3 patents issued</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Materials and Systems Research, Inc. (MSRI)</a></li> <li>• <a href="#">Versa Power Systems</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">FuelCell Energy</a></li> </ul>

<b>Center for SOLID WASTE RECYCLING</b>	
<p>The center was established to pursue realistic and comprehensive solutions designed to overcome the social and economic problems our environment faces in the elimination of solid waste. In conjunction with the Huntsman Environmental Research Center, research will focus on four areas:</p>	<p><i>USU</i> <i>Funded 1990-1993</i></p>
	<p>Reed M. Nielsen</p>
<ul style="list-style-type: none"> <li>• Recycling</li> <li>• Improving air quality</li> <li>• Degradability</li> <li>• Conservation of trees</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Recycling Technologies Corp.</li> <li>• <a href="#">Huntsman Chemical Corporation</a></li> </ul>
<ul style="list-style-type: none"> <li>• Polymax 5000 Polystyrene Foam Densifier makes it economical to ship polystyrene to facilities where it can be recycled</li> </ul>	

<b>Center for SOLVENT SEPARATION OF HEAVY OILS</b>	
<p>The center is focused on the development of commercially viable applications and processes for exploiting Utah's reserves of heavy oil resources, and to continue its efforts in developing hydro chemical remediation processes. Development is concentrated in the following:</p> <ul style="list-style-type: none"> <li>• Production of flux oil and adhesives from the Great Salt Lake Oil</li> <li>• Cleaning of oil from contaminated soils</li> <li>• Removal of waste oil from engine filters</li> <li>• Production of high performance road asphalt from tar sand bitumen.</li> </ul>	<p style="text-align: center;"><i>Weber State</i> <i>Funded 1996-1997</i></p> <p style="text-align: center;">E. Park Guymon, Ph.D. (801) 626-6953 <a href="mailto:eguymon@weber.edu">eguymon@weber.edu</a></p>
<ul style="list-style-type: none"> <li>• Two license agreements</li> <li>• 1 patent filed</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Crown Energy</a></li> <li>• Oasis Industries</li> </ul>

<b>Center for SUPERCRITICAL FLUID SEPARATIONS</b>	
<p>The center provides a focal point for research and development, education and training in the area of chemical analysis where high resolution separation and high sensitivity detection are emphasized. Technologies:</p> <ul style="list-style-type: none"> <li>• Supercritical fluid chromatography and extraction</li> <li>• Radio frequency plasma detection</li> <li>• Time-of-flight mass spectrometry</li> <li>• Capillary chromatography and electrophoresis</li> </ul>	<p style="text-align: center;"><i>BYU</i> <i>Funded 1987-1991</i></p> <p style="text-align: center;">Milton Lee, Ph.D. (801) 378-2135 <a href="mailto:milton_lee@byu.edu">milton_lee@byu.edu</a></p>
<ul style="list-style-type: none"> <li>• New technology for deactivating small diameter spherical silica packing materials in the pharmaceutical industry</li> <li>• Director Milton L. Lee received <b>The R&amp;D 100 Award</b> for the technologically most significant products developed nationally</li> <li>• Transitioned to "Distinguished Center" in 1991</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Lee Scientific</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Dionex Corp.</a></li> <li>• Sensor Corp.</li> </ul>

## Life Sciences Cluster

<u>Center for ALTERNATE STRATEGIES FOR PARASITE REMOVAL</u>	
<p>The center to commercialize a safe, nontoxic and rapid treatment for Pediculosis (head lice), a multibillion-dollar, increasingly resistant problem afflicting some 25% of children by the time they are teenagers.</p> <p>The Centers is currently testing a safe, effective, non-chemical treatment for head lice, <i>Pediculus humanus</i>. We have secured funding from Utah Centers of Excellence program and approval from the University of Utah Institutional Review Board to perform our treatment on children six and older, and adults in the Salt Lake Valley.</p>	<p><i>UU</i> <i>Funded 2004-</i></p>
	<p>Dale Clayton (801) 581-6482 <a href="mailto:clayton@biology.utah.edu">clayton@biology.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Larada Sciences</li> </ul>

<u>Center for APPLIED MOLECULAR GENETICS</u>	
<p>Useful DNA based probes are being evaluated. The technologies being developed for selecting DNA markers include: random amplified polymorphic DNA (RAPD), restriction fragment length polymorphisms (RFLP) and sequence characterized amplified regions (SCAR). The objective is to identify probes that correlate with useful qualitative and or quantitative traits.</p> <p>Swine markers showing correlations with specific traits are: back-fat (9), feed intake (4), and growth rate (11). The search for DNA markers in dairy cattle to correlate with milk and protein yield, has resulted in the identification of 3 useful markers.</p>	<p><i>BYU</i> <i>Funded 1995 –1998</i></p>
	<p>Robert L. Park, Ph.D. (801) 378-6871 <a href="mailto:robert_park@byu.edu">robert_park@byu.edu</a></p>
<ul style="list-style-type: none"> <li>• DNA markers have been established for a serious disease (spontaneous cardiomyopathy) in turkeys, which could be used for the benefit of Utah's turkey industry.</li> </ul>	

<b>Center for ARTIFICIAL HEARTS AND BIOMEDICAL DEVICES</b>	
<p>Established to develop the first electro-hydraulic artificial heart (an advanced version of the JARVIK-7) which utilizes a single energy converter and unified ventricles that will fit in humans. Other implant projects included the urinary bladder, urethra, ureter and a sphincter. The center's scope of research includes: conceptualization, prototype development, fabrication, bench and implant testing and assessment.</p> <ul style="list-style-type: none"> <li>• Engineering-miniature hydraulics, device design, design analysis, CNC machining capability, computer machining capability, device fabrication, polymers, plastics, metallics and QA/QC</li> <li>• Electrical design &amp; fabrication</li> <li>• Integrated circuits &amp; VLSI</li> <li>• Device testing</li> <li>• Animal experimentation-surgery, radiology, hematology, immunology, biochemistry, pathology, device retrieval analysis</li> </ul>	<p><i>UU</i> <i>Funded 1987-1992</i></p>
	<p>Dr. Donald B. Olsen (801) 323-1122 <a href="mailto:don.b.olsen@m.cc.utah.edu">don.b.olsen@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Developed Rotary Blood Pump</li> <li>• Involved in Pneumatic Heart Development</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Medquest Products</a></li> <li>• <a href="#">Medquest Manufacturing</a></li> <li>• <a href="#">Utah Artificial Heart Center</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• St. Jude Medical</li> <li>• CardioWest</li> <li>• Symcardia</li> </ul>

<b>Center for BIOMEDICAL MICROFLUIDICS</b>	
<p>The Center focuses on engineering technology that controls the movement of fluids in channels smaller than a human hair. Micropumps that can deliver tiny quantities of drugs and improved devices for DNA screening are some product examples.</p>	<p><i>UU</i> <i>Funded 2004-</i></p>
	<p>Bruce Gale (801) 585-5944 <a href="mailto:gale@eng.utah.edu">gale@eng.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Wasatch Microfluidics</a></li> </ul>

**Center for BIOMEDICAL OPTICS**

The Center for Biomedical Optics was established to commercialize optical technologies for diagnosis, therapeutic treatment, and disease risk assessment in medicine. The center capitalized on advancements in laser materials and laser spectroscopy to enable noninvasive assessment.

The center developed several new optical laser instruments to detect antioxidants in living human tissue. Specifically, the instruments detect the concentration and spatial distribution of carotenoid compounds, which are a family of antioxidants thought to prevent a number of degenerative diseases.

One application allows for the detection of carotenoids in the human retina. This will be useful to assess a subject's risk for developing age-related macular degeneration, which is the leading cause of blindness in the elderly. In the past, no reliable noninvasive test procedure existed. The new laser detection technology makes it possible to noninvasively test the concentration and spatial distribution of antioxidants in the retina through undilated eyes within a fraction of a second. The test results provide the physician with valuable information regarding the health of the retina and potentially required intervention strategies.

Another application is the use of the technology to detect the level of antioxidants in the human body by taking a reading of skin carotenoid levels. A link exists between the level of antioxidants in the human body and the immune system, which is being researched.

- The success connected to the technology licensed by NuSkin Pharmanex has impacted Utah's economy with jobs and increased revenues, and also generated a significant annual royalty income stream to the University of Utah.
- The level of antioxidants in the eye and skin can now be measured using noninvasive techniques

*UU*

*Funded 1999-2003*

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**Spin Out Companies**

- [Nutriscan](#)
- [Caroderm, Inc.](#)
- [Spectratek, LLC](#)

**Benefiting Companies**

- [NuSkin/Pharmanex](#)

<b>Center for BIOMOLECULAR TECHNOLOGIES</b>	
<p>The center was established to develop and commercialize technologies aimed at improving the efficiency of detecting rearrangements in the human genome and reducing the high cost of genetic microarrays (i.e. "gene chips") which are ideally suited to unraveling complex genetic information. Each of these aims to remove major technological impediments in the biotechnology and health fields. For example, the inefficient methods to detect chromosome rearrangements have hitherto limited their use in the early detection of cancer, environmental health, and population genetics, even though such rearrangements are known to provide important diagnostic information.</p>	<p><i>UU</i> <i>Funded 1998-2000</i></p>
	<p>Tore Straume, Ph.D. (801) 581-6853 <a href="mailto:t.straume@m.cc.utah.edu">t.straume@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>Two patent applications have been filed</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">GenMetrix, LLC</a></li> </ul>

<b>Center for BIOPOLYMERS AT INTERFACES</b>	
<p>The center was established to increase knowledge and understanding of the interaction of proteins, nucleic acids, and cells with synthetic surfaces. This mission is important to the development of artificial organs and implants, production of contact lenses and diagnostic devices, and for biotechnological process development.</p>	<p><i>UU</i> <i>Funded 1986-1991</i></p>
	<p>Dr. Karin D. Caldwell <a href="mailto:karin.caldwell@ytbioteknik.uu.se">karin.caldwell@ytbioteknik.uu.se</a></p>
<ul style="list-style-type: none"> <li>11 patents issued</li> <li>2 patent applications</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>Cell-Link (now Allvivo)</li> <li><a href="#">Protein Solutions, Inc.</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">Becton Dickinson Critical Care Monitoring</a></li> <li><a href="#">Cardiopulmonics, Inc</a></li> <li><a href="#">Hyclone Labs</a></li> <li>Research Industries</li> <li><a href="#">Silicon Graphics</a></li> <li><a href="#">CIBA Vision</a></li> </ul>

<u>Center for BIOREMEDIATION</u>	
<p>The Center for Bioremediation develops, refines, and implements innovative biotechnologies for the removal of heavy metal and other inorganic contaminants. The Center's technology focus is biological selenium removal. Additional technologies include technologies for arsenic removal and cyanide degradation with an emphasis on enzymatic cyanide degradation.</p> <ul style="list-style-type: none"> <li>• Field-proven biotechnologies include Selenium reduction, Arsenic Reduction and Cyanide Biooxidation Technology.</li> <li>• The Center's technology has been demonstrated to be approximately 1/10 the cost of EPA's past BDAT and removes selenium to lower levels.</li> </ul>	<p><i>Weber State</i> <i>Funded 1996-2003</i></p>
	<p>Jack Adams (801) 585-7349 <a href="mailto:jadams@mines.utah.edu">jadams@mines.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Applied Biosciences</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Non-invasive Geotracking - now called <a href="#">Willowstick</a></li> </ul>

<u>Center for BIOTECHNOLOGY</u>	
<p>The Center for Biotechnology was based on the phenomenon that fungi not only degrade organic materials, but inorganic materials as well. A technology was developed that breaks down pollutants such as TNT, DDT, and PCB. The process must be adapted based on where the chemicals are located, i.e., in soil or in water. If the pollution is in soil, the soil makeup and moisture content must be considered.</p> <ul style="list-style-type: none"> <li>• Issued seven patents that provided for blanket environmental clean-up.</li> </ul>	<p><i>USU</i> <i>Funded 1987-1992</i></p>
	<p>Steven D. Aust (435) 797-2730 <a href="mailto:sdaust@cc.usu.edu">sdaust@cc.usu.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">INTECH One-eighty Corp.</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Agridyne Technologies</li> <li>• <a href="#">EarthFAX</a></li> <li>• Natural Product Services</li> </ul>

**Center for CANCER GENETIC EPIDEMIOLOGY**

Established to study the genetic causes and origins of common cancers (e.g. breast, melanoma, colon, and prostate) and to develop DNA based diagnostics. Focus is on developing approaches to gene mapping and gene isolation for future applications in cancer diagnosis and therapy.	<i>UU</i> <i>Funded 1990-1995</i>
	Mark Skolnick (801) 584-3643 <a href="mailto:mark@myriad.com">mark@myriad.com</a>
<ul style="list-style-type: none"><li>• The Center has cloned the 17q linked breast cancer gene and the 9p linked melanoma gene.</li><li>• Myriad Genetics employs 770 people with revenues of approximately \$100MM</li></ul>	<b>Spin Out Companies</b> <ul style="list-style-type: none"><li>• <a href="#">Myriad Genetics</a></li></ul>

**Center for CELL SIGNALING**

Cell signaling consists of the set of biochemical interactions that mediate physiological changes within and between living cells. When a ligand binds to a receptor, for example, the interaction causes a biochemical response within the cell. Many diseases are associated with signaling pathways that have gone awry -- cancer, allergy, asthma, and acute inflammation are all examples of cellular responses unchecked by normally self regulating pathways. The absence of a single protein or lipid can result in the disruption of a pathway that may be crucial for cellular function. The CCS Faculty seeks to understand these fundamental signaling pathways. By identifying technologies to manipulate the signaling processes, highly selective pharmaceutical agents can be developed to treat cancer, diabetes, and cardiovascular disease.

- New technology from CCS has also been developed and licensed by Echelon to create a molecular sensor for directly monitoring heparin levels in blood.
- A microbiological assay platform invented by Dr. C. D. Poulter for identification of selective anti-anthrax agents was also optioned by Echelon.
- The discovery in 2002 of a natural ligand for the nuclear protein target of the \$3 B/yr diabetes drug rosiglitazone emerged from collaboration by Dr's. McIntyre, Prestwich, and Zimmerman.

*UU*  
*Funded 1997-2002*

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**Spin Out Companies**

- [Echelon Biosciences, Inc.](#)
- Salus Therapeutics - acquired by [Genta Inc.](#)

**Benefiting Companies**

- [ComGenex](#)
- Molecular Probes, Inc. - acquired by [Invitrogen, Inc.](#)

<b>Center for CHEMICAL TECHNOLOGY</b>	
<p>This center functioned as an innovative resource to the business community by conducting applied research in a variety of chemistry related areas leading directly to new or enhanced products.</p>	<p style="text-align: center;"><i>Weber State</i> <i>Funded 1990-1995</i></p>
<p>The center facilitated the collaboration of Utah companies with diversified chemical interests to form alliances that benefited the company and the state.</p>	<p>Edward Walker, Ph.D. (801) 626-6162 <a href="mailto:ewalker@scinet.weber.edu">ewalker@scinet.weber.edu</a></p>
<ul style="list-style-type: none"> <li>• The Center has been awarded four patents</li> <li>• License agreements with three companies</li> <li>• Major contracts have been signed with TRW and AORC to study environmental fate of azide impacted landfills</li> <li>• Corporate partner, Nutraceutical, Inc., has acquired two other companies and moved its manufacturing and marketing to Utah</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Linco Technology (now First Scientific)</a></li> <li>• <a href="#">ZymeQuest, Inc.</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Nutraceutical</a></li> <li>• <a href="#">Eastman Chemical</a></li> </ul>

<b>Center for CONTROLLED CHEMICAL DELIVERY</b>	
<p>The Center for Controlled Chemical Delivery (CCCD) was established at the University of Utah in 1986, consisting of faculty from the Department of Pharmaceutics and Pharmaceutical Science. As an extension of these departments, the CCCD maintains a strong graduate training program and has attained a leading position in worldwide pharmaceutical, polymer, and biomedical research. Ongoing research projects at CCCD include:</p>	<p style="text-align: center;"><i>UU</i> <i>Funded 1988-1993</i></p>
<ul style="list-style-type: none"> <li>• POLYMERIC MATERIALS</li> <li>• NONTHROMBOGENIC SURFACES</li> <li>• SELF-REGULATED INSULIN DELIVERY SYSTEMS</li> <li>• TARGETABLE DRUG DELIVERY</li> <li>• ORAL DELIVERY</li> </ul>	<p>Sung Wan Kim (801) 581-6801 <a href="mailto:rburns@pharm.utah.edu">rburns@pharm.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Insutech/TTI</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Research Medical, Inc.</li> <li>• <a href="#">MacroMed</a></li> <li>• TheraTech, Inc. - <a href="#">Watson Labs</a></li> </ul>

**Center for DAIRY FOODS TECHNOLOGY**

<p>The focus of the center is to develop new technologies to improve and develop products for the dairy foods industry.</p>	<p align="center"><i>USU</i> <i>Funded 1991-1996</i></p>
<p>The center uses membrane technologies (reverse osmosis and ultrafiltration) to concentrate fluid milk at low temperatures so as not to impart any off flavors to milk concentrates.</p>	<p align="center">Paul A. Savello <a href="mailto:psavello@cc.usu.edu">psavello@cc.usu.edu</a></p>
<p>Another technology uses ultra-high temperature heat processing to commercially sterilize milk and milk concentrates yielding new products that do not require refrigeration and can be stored for up to 12 months. The concentrated and ultra high temperature process milk can be used in reconstituted fluid milk, yogurt, ice cream and cheeses.</p>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Dairy Research Consulting of Utah</a></li> <li>• <a href="#">Food Research &amp; Dev Group</a></li> <li>• <a href="#">Utah Milk Technology</a></li> </ul>
<ul style="list-style-type: none"> <li>• The center has an agreement with Utah Milk Technologies to commercialize membrane concentrated, sterile milk for export.</li> <li>• A patent for the center's "Creamier Skim Milk" was issued in November 1994.</li> <li>• Gossner Foods, Inc. Logan, holds the contract for the production and packaging of new products researched and developed by national food companies with the assistance of the center.</li> <li>• Heart-to-Heart Foods, Inc., Richmond, which produces yogurt and ice cream products and new lines of cream cheese, has used center equipment and expertise to research and develop new product lines.</li> <li>• International Dairy Foods Association has shown interest in "Creamier Skim Milk" to increase consumer acceptability of skim milk.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Gossner Foods, Inc</a></li> <li>• <a href="#">Nichols Research</a></li> <li>• <a href="#">NutriScience, Inc</a></li> <li>• R-Con International</li> </ul>

**Center for DAIRY TECHNOLOGY COMMERCIALIZATION**

<p>The Center for Dairy Technology Commercialization was established to commercialize technologies developed at the Western Dairy Center, whose research is funded by a consortium of dairy food companies, for a variety of applications in the dairy industry.</p>	<p align="center"><i>USU</i> <i>Funded 1998-2001</i></p>
<p>The Center is currently pursuing commercialization of the following inventions: utilization of bacterial cultures that produce polysaccharides externally to increase cheese yield; production of flavored cheese using high pressure injection technology, using textured whey protein both as a meat extender and as a high protein snack food.</p>	<p align="center">Carl Brotherson (435) 797-3466 <a href="mailto:wcdprt@cc.usu.edu">wcdprt@cc.usu.edu</a></p>
<ul style="list-style-type: none"> <li>• Cheese trials have begun using the exopolysaccharide gene to determine commercial interest among cheese producers.</li> <li>• One company intends to modify the cheese flavor and the other company will use the technology as a method of creating new and novel cheeses for children.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Shepherds Goat and Sheep Dairy Products, LLC - acquired by Fire Ridge Ranch LLC, Shepherds Dairy.</li> </ul>

**Center for DESIGN OF MOLECULAR FUNCTION (formerly BIOCATALYSIS)**

With funding of approximately \$1.8 M from the NIH Biomedical Research Technology Program, the Center for Biocatalysis Science and Technology has expanded to become the National Center for the Design of Molecular Function. The goals are to:

1. Establish the underlying bases for the design of molecular function which includes the development of real-time time-resolved spectroscopic technology
2. Apply this basic knowledge and technology to biomedical and environmental applications and monitoring
3. Provide this information and specialized tools of its utilization to the scientific and engineering community

- Two patents have been issued, two are allowed, and several are pending
- The capture surface identification technology selectively bind bacterial cells, spores, toxins, and viruses [many from the CDC select agent list] using molecular engineering methods.
- DARPA is currently funding a team effort on self decontamination surfaces.
- The optical reader technology was demonstrated for the detection of microbial contamination in public water supplies for the Department of Public Health of Utah, the EPA and the Office of Public Health of the State of Louisiana in the aftermath of hurricane Katrina.

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Funded 1988-1994*

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**Spin Out Companies**

- [Envirol](#)
- [Whetstone](#)
- [MicroBioSystems, LP](#)

**Benefiting Companies**

- CSA of Provo, Utah

**Center for DEVELOPMENTAL AND MOLECULAR BIOLOGY**

Technologies are being developed for the high efficiency production of valuable proteins, not normally found in animal milk, by producing transgenic animals. A specific gene (DNA sequence) that codes for a specific protein is placed under the genetic control of a promoter that is expressed in mammary cells during lactation. The "genetically engineered DNA" is introduced into the embryo of selected animal species which, when successful, express the desired protein in the milk producing cells. The expression of the foreign protein in the milk in relatively high quantities provides a cost-effective method of producing the valuable proteins.

- Genes for specific proteins have been sequenced and prepared for injection into animal embryos.
- Transgenic nature of newborn animals confirmed
- Expression of a valuable protein has been confirmed in these animals' milk

*USU*

*Funded 1992-1998*

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**Spin Out Companies**

- [Pangemics, Inc.](#)

**Center for ENVIRONMENTAL TECHNOLOGIES**

<p>Established to support Utah's environmental technologies industry through focused research and development in monitoring and sensing technologies, waste-stream reduction technologies, pollutant destruction and remediation, technology transfer, and advanced technical training. The center focused on the following:</p> <ul style="list-style-type: none"> <li>• Knowledge-based expert system for Waste-fed Cement Kilns.</li> <li>• Environmental applications of Time-of-Flight Mass Spectrometry</li> <li>• Environmental applications of the Air-Sparged Hydrocyclone (radionuclide separations, oil-water separations, VOC stripping).</li> <li>• HydroPur industrial wastewater recycling system.</li> </ul>	<p align="center"><i>USU</i> <i>Funded 1992-1995</i></p>
	<p align="center">Russ Price (435) 797-8305 <a href="mailto:russ.price@usu.edu">russ.price@usu.edu</a></p>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Thiokol</a></li> <li>• <a href="#">Dugway Proving Ground</a></li> </ul>
<ul style="list-style-type: none"> <li>• A subcontract was signed with Thiokol Corp. For development of an electrolytic process to recycle industrial wastestreams. A pilot plant is in place at Thiokol.</li> <li>• The Center has formed strategic partnerships with twelve companies and federal installations.</li> </ul>	

**Center for GENETIC IMPROVEMENT OF LIVESTOCK**

<p>Established to identify genetic markers for economically important traits of livestock. The first trait for which genetic markers were identified, was for callipyge gene in sheep, responsible for heavy muscling. Sheep carrying the callipyge gene have 8% more muscle, 8% less fat and 2% less bone, when compared to sheep that do not express the gene. The center also identified a genetic marker for Spider Lamb Syndrome (SLS), which results in severe bone deformities of the legs and back.</p>	<p align="center"><i>USU</i> <i>Funded 1993-1997</i></p>
	<p align="center">Noelle Cockett (435) 797-2201 <a href="mailto:noelle.cockett@usu.edu">noelle.cockett@usu.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Livestock Molecular Research and Development, Inc.</a></li> </ul>
<ul style="list-style-type: none"> <li>• The center determined that the callipyge gene provides an additional 10.3% to the value of each marketed sheep.</li> <li>• Developed a test that is 97% accurate in identifying the callipyge gene and 100% accurate in identifying the SLS gene.</li> </ul>	

<b>Center for GENOME TECHNOLOGIES</b>	
<p>The Center's main focus was on developing and refining technologies for large scale sequencing and genotyping of DNA, the genetic material involved in inheritance of every organism. The Center was also developing technology for gridded DNA array detection.</p> <p>The Center developed novel technologies in three areas:</p> <ul style="list-style-type: none"> <li>• Molecular reagents and techniques</li> <li>• Automated sequencing devices</li> <li>• Computer software.</li> </ul>	<i>UU</i> <i>Funded 1996-1998</i>
	Robert Weiss (801) 585-3435 <a href="mailto:bobweiss@genetics.utah.edu">bobweiss@genetics.utah.edu</a>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Cimarron Software Inc.</a></li> </ul>

<b>Center for HOMOGENEOUS DNA ANALYSIS</b>	
<p>This new center was formed to commercialize a novel suite of fast, user-friendly and inexpensive DNA sequence analysis tools that could be fielded in a doctor's office rather than requiring the services of an expensive reference laboratory, and which will reach markets including cancer testing, the diagnosis of inherited diseases, and rapid bioterrorism detection.</p> <p>The central innovation involves a new, high-resolution twist on a very old technique for DNA sequence analysis: thermal denaturation profiles. A fluorescent dye, added before amplification via polymerase chain reaction (PCR), allows the melting transition of the PCR product to be continuously monitored without ever moving it from the same tube. Data processing allows even minute sequence changes to be readily identified through their effect on the melting profile.</p> <ul style="list-style-type: none"> <li>• The Center's first product has been licensed to a Utah firm, Idaho Technologies, Inc., which has commenced commercial sales.</li> </ul>	<i>UU</i> <i>Funded 2003-</i>
	Carl Wittwer (801) 581-4737 <a href="mailto:carl.wittwer@path.utah.edu">carl.wittwer@path.utah.edu</a>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Idaho Technologies, Inc.</a></li> </ul>

<b>Center for IN SITU OZONATOR</b>	
<p>The powerful oxidizing power of ozone is harnessed in a safe, effective mechanism wherein sediments are processed and redeposited in a minimally invasive manner – immediately arresting contaminant release into the water, capping deeper contaminated layers, and promoting the onset of natural biodegradation.</p>	<p><i>UU</i> <i>Funded 2003-2004</i></p>
<ul style="list-style-type: none"> <li>• Center has already completed laboratory treatment tests on PCBs and DDT</li> <li>• International patent pending</li> <li>• Funding from both government and industry partners</li> </ul>	<p>P.K. Andy Hong (801) 581-7232 <a href="mailto:hong@civil.utah.edu">hong@civil.utah.edu</a></p>

<b>Center for LASER INSTITUTE</b>	
<p>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.</p>	<p><i>UU</i> <i>Funded 1988-1989</i></p>
<ul style="list-style-type: none"> <li>• Fiber optic lasers</li> <li>• Light activated drugs</li> <li>• Metal vapor laser applications</li> <li>• Laser angioplasty</li> <li>• Cardiac surgical laser devices</li> <li>• Fluorescence sensors</li> </ul>	<p>Richard C. Straight</p> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Benefiting Co</li> <li>• HGM Corp.</li> </ul>
<ul style="list-style-type: none"> <li>• Six patent applications</li> </ul>	

<b><u>Center for MEAT PROCESSING TECHNOLOGY</u></b>	
<p>The center focused on the development of new meat products and processing technologies, including:</p> <ul style="list-style-type: none"> <li>• Ultra-High Temperature (UHT) pasteurization of meat surfaces.</li> <li>• Low-fat lamb chops, beef steaks, pork chops, and bacon.</li> <li>• Processing technology to reduce fat content of raw meat.</li> <li>• Processing technology to bond meat to bone.</li> <li>• Combining UHT with electron beam radiation technology to produce sterile meat products.</li> <li>• UHT pasteurization combined with High-Temperature Aging (HTA) to produce tender steaks and roasts from the cheaper, less tender primal cuts of beef carcasses.</li> </ul>	<p><i>USU</i> <i>Funded 1991-1996</i></p>
	<p>Von T. Mendenhall, Ph.D.</p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Mountain Lamb Co-op</a></li> <li>• <a href="#">Timpanagos Meats</a></li> <li>• <a href="#">Canyon Rayas</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• B.V. Holland</li> <li>• Agri-Products, Inc.</li> <li>• <a href="#">ConAgra</a></li> <li>• E.A. Miller &amp; Sons</li> <li>• <a href="#">NUTEK, Corp.</a></li> <li>• Stone Meats</li> </ul>
<ul style="list-style-type: none"> <li>• Four patents issued</li> <li>• Two license agreements: B.V. Holland and Agri-Products Inc.</li> </ul>	

<b><u>Center for MICROARRAY TECHNOLOGY</u></b>	
<p>Developing a superior microarray platform for the molecular diagnostics and research markets with improved sensitivity, specificity and throughput.</p>	<p><i>UU</i> <i>Funded 2005-</i></p>
	<p>Steve Blair (801) 585-6157 <a href="mailto:blair@ece.utah.edu">blair@ece.utah.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Sigma Technology Holding Company</a></li> </ul>
<ul style="list-style-type: none"> <li>• Six patent applications in process for molecular diagnostics technologies</li> </ul>	

**Center for NEURAL INTERFACES**

It is only by recording the activity patterns of large groups of neurons that we can begin to understand how sight, hearing, touch and volitional information are encoded and processed by the brain. The center for Neural Interface has created a tool that makes this investigation possible.

The center is focused on the development of technologies that will permit bi-directional (i.e. stimulation and recording) communication with large numbers of neurons in the central and peripheral nervous systems. The center has developed silicon-based arrays of microelectrodes that can either listen in on or talk directly to hundreds of neurons simultaneously. The center has also developed the surgical tools and techniques that allow these high-density arrays to be implanted in central and/or peripheral nervous systems.

The long range goal is to use these neural interfaces as therapies for disorders of the nervous system e.g. limited, but functional sensory restoration in individuals with blindness or deafness, and enhanced motor function to individuals with high spinal cord injuries.

*UU*

*Funded 1995-2000*

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**Spin Out Companies**

- [Bionic Technologies](#)

**Benefiting Companies**

- [Cyberkinetics](#)

<u>Center for NUCLEAR, MEDICAL &amp; ENVIRONMENTAL TECHNOLOGIES</u>	
<p>The commercial strategy of the Center for Nuclear, Medical, and Environmental Technology (CNMET) is to acquire selected spin off facilities and consolidate existing niche markets into a single, well-managed and licensed entity that can provide a convenient source for a full range of nuclear services. Large companies are currently downsizing, outsourcing, and eliminating risky and costly nuclear research and development (R&amp;D) capabilities, and are teaming with universities with established nuclear engineering programs and research facilities to perform key services. An additional market trend is for companies to off-load ownership and operation of their nuclear testing, diagnostic, and irradiation facilities, and to contract with new owners for specific access and services. Others are simply decommissioning their nuclear facilities without replacement. The result is a decrease in availability of licensed facilities. That, in combination with an increasing demand for services from the private sector, provides the basis for a solid commercial opportunity. E-Cubed and Nuclear Labyrinth will assume commercial production to reduce costs, implement uninterrupted production cycles, and achieve economies of scale. Appropriate R&amp;D functions then will be merged and contracted to universities with nuclear facilities, such as the University of Utah’s TRIGA reactor, to promote innovation, train co-operatively, and supply a steady stream of knowledgeable and seasoned potential employees to the workforce.</p>	<p><i>UU</i> <i>Funded 2001-2003</i></p>
	<p>David M. Slaughter (801) 585-0759 <a href="mailto:slaughter@nuclear.utah.edu">slaughter@nuclear.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Nuclear Labyrinth is a newly formed company under CNMET that will engage in commercial nuclear services beginning in 2006.</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Nuclear Labyrinth</a></li> </ul>

**Center for RAPID MICROBE DETECTION**

The focus of this center is the development of technologies which lead to the real-time detection of pathogenic micro-organisms. This involves the development of novel pathogen capture molecules, platform development, prototype development, and commercialization. Industries where this technology is useful include pharmaceuticals, biomedicine, biotechnology, veterinary, production agriculture, food processing, public health, defense, and water and sewage treatment. To date, four technologies have been developed:

- ImmunoFlow
- ImmunoDNA
- GlycoBind
- TissueTag

- The Center has licensed the ImmunoFlow technology to Stellar Technologies.
- 5 international patents issued, several more pending
- Seeking commercialization partners

*USU  
Funded 1998-2003*

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**Spin Out Companies**

- [Bio Matrix Solutions](#)
- [Finite Technologies](#)

**Benefiting Companies**

- Stellar Technologies

<u>Center for SIGNAL PROCESSING</u>	
<p>Rarely is a technology developed that is still valid 15+ years after it was first introduced. The Center for Digital Signal Processing was the first to create a way to accurately simulate digital imaging and digital sound.</p> <p>The technology is comprised of three elements. Digital signal processing is the first. It has been marketed primarily to the military for use in creating accurate simulations for pilot training or military treasure hunts.</p> <p>Digital signal hearing is the second. It has been used to create a better hearing aid.</p> <p>The third, multi-spectral imaging is the technology being used to read ancient damaged scrolls. Script reading is just one of the applications for multi-spectral imaging.</p>	<p><i>BYU</i> <i>Funded 1988-1990</i></p>
	<p>Richard W. Christiansen (801) 422-6317 <a href="mailto:richard_christiansen@byu.edu">richard_christiansen@byu.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Deseret Digital Design</li> <li>• <a href="#">Sonic Innovations</a></li> <li>• <a href="#">Vector Technology</a></li> <li>• <a href="#">ASTECH</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Eyring Research Institute</li> <li>• Softsolutions</li> <li>• <a href="#">Space Dynamics Laboratory</a></li> <li>• <a href="#">Unisys Corp.</a></li> </ul>

<u>Center for THERAPEUTIC BIOMATERIALS</u>	
<p>The Center for Therapeutic Biomaterials (CTB) prepares and uses new biomaterials for reparative medicine for the 3-D culture of human cells. The Center Develops applications of biopolymers and hydrogels for clinical use in wound repair, prevention of surgical adhesions, and extending the life of donated organs as well as permitting evaluation of cell response to various compounds. The compounds also have application in a variety of non-medical applications, such as cosmetics.</p>	<p><i>UU</i> <i>Funded 2004-</i></p>
	<p>Glenn Prestwich (801) 585-9051 <a href="mailto:gprestwich@pharm.utah.edu">gprestwich@pharm.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Sentrx Surgical</a></li> <li>• <a href="#">Sentrx Animal Care</a></li> <li>• <a href="#">Glycosan Biosystems</a></li> </ul>

<b>Center for VALUE ADDED SEED TECHNOLOGY</b>	
<p>The center was established to produce value-added crops:</p> <ul style="list-style-type: none"> <li>• Drought resistant turf grasses for roadways, lawns, golf courses (require 30-40% less water)</li> <li>• Forage grasses with superior yield under arid land conditions</li> <li>• Hybrid vigor in wheat using molecular biology.</li> </ul>	<p><i>USU</i> <i>Funded 1991-1997</i></p>
<ul style="list-style-type: none"> <li>• A new forage grass, crested wheatgrass variety CD-2, has been released and licensed to 6 companies.</li> <li>• The DNA based genetic markers for apomixis (asexual seed formation) genes are being used to tag apomictic Australian wheat grasses.</li> <li>• Proprietary tissue culture media and procedures are being refined and show promise for use in the mass cloning and genetic engineering of agronomic, horticultural, and forestry plants.</li> </ul>	<p>H. Grant Vest <a href="mailto:grant@usu.edu">grant@usu.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">F1 Technologies</a></li> </ul>

<b>Center for VASCULAR BIOTHERAPEUTICS</b>	
<p>The Center for Vascular Biotherapeutics is focused on commercializing medical strategies and devices that target blood vessel formation for the treatment of cancer and obstructive vascular diseases such as atherosclerosis. This Center capitalizes on a robust scientific program aimed at deciphering the molecular blueprint for vessel regeneration using human genetics and transgenic mice technologies; these technologies were pioneered at the University of Utah. The "Functional Vascular Genetics" program established at the University of Utah is identifying genes that are essential for vascular development.</p>	<p><i>UU</i> <i>Funded 2001-</i></p>
<ul style="list-style-type: none"> <li>• Negotiations for a licensee are in progress and we have designed and tested a first generation elastin sheath-stent and showed it to be effective in preventing restenosis in a porcine model.</li> </ul>	<p>Dean Y. Li (801) 585-5505 <a href="mailto:dean.li@hmbg.utah.edu">dean.li@hmbg.utah.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Hydra Biosciences</a></li> </ul>

<u>Center for VENTRICULAR ASSIST DEVICE</u>	
<p>The goals of the center are to develop a magnetically suspended centrifugal blood pump to be used as continuous-flow ventricular assist device for nearly all sizes of human patients.</p> <p>A prototype continuous flow ventricular assist device (CVAD2), which has all-electromagnetic bearings has been designed and developed. The centrifugal blood pump is gentle to the blood and is suspended in magnetic bearings. The pump output (rotor speed) is readily controlled to meet the physiologic needs of the patient. This device can pump blood over a wide range of cardiac output from 1 to 10 liters/min, effectively satisfying the physiological needs and excellent blood flow dynamics.</p>	<p><i>UU</i> <i>Funded 1995-1996</i></p>
	<p>Donald Olsen, Ph.D. (801) 581-6991 <a href="mailto:don.b.olsen@m.cc.utah.edu">don.b.olsen@m.cc.utah.edu</a></p>
<ul style="list-style-type: none"> <li>The center received the Sezai Innovative Research Award at the International Society for Rotary Blood Pumps in 1995.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">MedQuest</a></li> </ul>

<u>Center for X-RAY IMAGING</u>	
<p>This center has successfully commercialized x-ray research by carving a product niche among the biggest manufacturers in the analytic instrument business. The ability to reflect and focus x-rays permit scientists to achieve remarkably high resolution when measuring minute objects. Experiments should begin soon on the compact x-ray laser, an instrument necessary for the success of the Strategic Defense Initiative. In addition to defense applications, advanced x-ray technology is used to detect trace materials in substances and would provide simpler, safer medical testing. Applications include:</p>	<p><i>BYU</i> <i>Funded 1988-1992</i></p>
	<p>Larry Knight <a href="mailto:larry_knight@byu.edu">larry_knight@byu.edu</a></p>
<ul style="list-style-type: none"> <li>Atomic Layer Epitaxy (ALE)</li> <li>MultiLayer X-ray Optics</li> <li>Leading edge technology in X-ray imaging</li> <li>X-ray laser technology</li> <li>Thin film technology and diagnostics</li> <li>Bright x-ray sources</li> <li>Electronic x-ray detectors</li> <li>Damage resistant nano structures</li> <li>Pure silicon production</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">MOXTEK</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li><a href="#">TechniScan</a></li> </ul>

**Software Development and IT Cluster**

<b>Center for 3D COMPUTER GRAPHICS / 3D SOFTWARE</b>	
<p>In the early stages of computer graphics technology, a software library of three dimensional shapes and textures in a computer environment was created by the Center for 3-D Computer Graphics.</p> <p>Though this does not seem “amazing” in today’s world, at the time it was cutting edge technology. The center studied the practical applications of three dimensional modeling for the graphic arts industry. It created one of the first web pages in Utah.</p>	<p><i>Dixie State College</i> <i>Funded 1991-1996</i></p>
	<p>Eric Pederson (435) 652-7977 <a href="mailto:pedersen@dixie.edu">pedersen@dixie.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Illustrative Impressions</a></li> <li>• <a href="#">Infowest</a></li> <li>• <a href="#">NetEx</a></li> <li>• <a href="#">Paintbrush Productions</a></li> <li>• <a href="#">AK International</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Mira Imaging</li> <li>• <a href="#">Strata, Inc.</a></li> </ul>

<b>Center for ACCOUSTICS RESEARCH</b>	
<p>Commercializing active sound control technology with superior ability to both reduce noise in varied settings (vehicle cabins, computer fans and telecommunications, e.g.) and modify sounds for commercial benefit.</p>	<p><i>BYU</i> <i>Funded 2005-</i></p>
	<p>Scott Sommerfeldt (801) 422-2205 <a href="mailto:scott_sommerfeldt@byu.edu">scott_sommerfeldt@byu.edu</a></p>

**Center for ADVANCED COMMUNICATIONS TECHNOLOGY**

The Center for Advanced Communications Technology was formed to commercialize multi-antenna wireless communications: the main focus is using multiple antennas for robust wireless links to maneuvering air vehicles (tactical aircraft and UAV's). A secondary focus is in applying multi-antenna technology to improvement of commercial wireless communications. The Center has forged strong links with industry and with government as they've developed and refined the technology.

*BYU*  
*Funded 2004-*

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**Center for ASYNCHRONOUS CIRCUITS**

The Center for Asynchronous Circuit and Systems Design was established in 1997 to complete the development of software design tool that will allow engineers to efficiently design digital circuits that do not require a global clock in order to operate.

While most of today's digital systems use a synchronous global clock to coordinate operations within an integrated circuit, the challenge of distributing such global clock signals becomes increasingly difficult as circuit densities increase. Asynchronous circuits do not require a global clock and therefore do not require clock distribution lines as traditional synchronous circuits do. Industry has not moved to asynchronous design in large part owing to a lack of computer aided design (CAD) tools supporting this technology. Meeting this need is the direct target of this Center. This Center is working with companies such as Intel and IBM not only to help solve their future asynchronous design problems, but also their current difficulties in the analysis and verification of high-speed integrated circuits.

- Significant design verification work was completed at IBM's Austin Research Laboratory, which has resulted in a non-exclusive license agreement with IBM to evaluate the Center's analysis tool in IBM's design flow.
- The center worked in collaboration with Sonic Innovations, a spin-out of another Center, designing digital hearing aids. The Center is designing an asynchronous version of their hearing aid that will significantly reduce circuit size and power consumption.

*UU*  
*Funded 1997-2000*

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<b>Center for BASE EDUCATION TECHNOLOGIES</b>	
The center focused on creating new base education technologies.	<i>UU</i> <i>Funded 1987-1988</i>
	Carol Weller
<ul style="list-style-type: none"> <li>Two companies were formed out of this center, one focused on assessments, the other on developing software</li> </ul>	<b>Spin Out Companies</b> <ul style="list-style-type: none"> <li>Assessment Co.</li> <li>Software Co.</li> </ul>

<b>Center for COMMUNICATIONS RESEARCH</b>	
The Center focused on the following technologies: <ul style="list-style-type: none"> <li>Multiple access communications</li> <li>Coded modulation systems</li> <li>High performance medical imaging</li> <li>Vector quantization</li> <li>Adaptive digital filters</li> <li>Neural networks</li> </ul>	<i>UU</i> <i>Funded 1987-1990</i>
	Craig Rushforth <a href="mailto:ckrush1@msn.com">ckrush1@msn.com</a>
<ul style="list-style-type: none"> <li>2 patents granted on decoding algorithms</li> <li>Unisys using products for expansion of Utah operations</li> <li>Spin-out Techniscan awarded Phase II SBIR for \$500K</li> </ul>	<b>Spin Out Companies</b> <ul style="list-style-type: none"> <li><a href="#">Techniscan</a></li> </ul>
	<b>Benefiting Companies</b> <ul style="list-style-type: none"> <li><a href="#">Unisys</a></li> </ul>

<b>Center for COMPUTER BASED EDUCATION</b>	
Established as a center in 1987. State-of-the-art computer-based systems have been designed to improve foreign language and computer science instruction. These programs, currently being adopted by industry and education, are training those from kindergarten through adult education. Improved tools for the design, development and delivery of computer instruction systems are revolutionizing teaching and learning methodology.	<i>BYU</i> <i>Funded 1987-1991</i>
	Jerry Larson (801) 422-6529 <a href="mailto:jerry_larson@byu.edu">jerry_larson@byu.edu</a>
	<b>Spin Out Companies</b> <ul style="list-style-type: none"> <li><a href="#">Cali, Inc. - Now Ellis</a></li> </ul>
	<b>Benefiting Companies</b> <ul style="list-style-type: none"> <li><a href="#">LinguaTech</a></li> </ul>

<b>Center for COMPUTER GRAPHICS AND SCIENTIFIC VISUALIZATION</b>	
<p>Established in 1991 to develop integrated computer aided solutions to problems in computer graphics, scientific visualization, computer aided geometric design and computer-aided manufacturing for industrial applications.</p> <p>Computer design, modeling, graphics, and manufacturing technology for automating the whole "art-to-part" process, scalable from a small job shop to a large advanced industrial shop, national televideo infrastructure and learning via the national information highway.</p>	<p style="text-align: center;"><i>UU</i> <i>Funded 1990-1996</i></p> <p>Risenfeld and Cohen, Ph.D.'s (801) 581-8235 <a href="mailto:cohen@cs.utah.edu">cohen@cs.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• Spin-out Engineering Geometry Systems (EGS)</li> <li>• EGS has created and delivered a custom product to Hill Air Force Base to increase its manufacturing productivity</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Engineering Geometry Systems</a></li> </ul>

<b>Center for COMPUTER INTEGRATED MANUFACTURING</b>	
<p>The focus of the center is on the 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.</p>	<p style="text-align: center;"><i>BYU</i> <i>Funded 1987-1989</i></p> <p style="text-align: center;">Dr. Dell K. Allen</p>
<ul style="list-style-type: none"> <li>• IBM donated money to assist with research applications</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• CIM Training Center</li> <li>• EDGE Foundation</li> <li>• EDGE Inc.</li> <li>• Ozone Saver Industries</li> <li>• Smartware</li> <li>• Utah PODS Manufacturing Co-op</li> <li>• CAM Software</li> </ul>

<b>Center for COMPUTER NETWORKS</b>	
<p>The main focus of the Center was to develop computer assisted methods for the design analysis, and simulation of large computer information networks.</p> <ul style="list-style-type: none"> <li>• Computer assisted methods for design analysis</li> <li>• Research for local area &amp; large computer networks including network optimization software, network traffic models and verification software</li> </ul>	<p><i>USU</i> <i>Funded 1987-1989</i></p>
	<p>Dr. Bruce R. Peterson</p>
<ul style="list-style-type: none"> <li>• Assisted in creating ICOMP</li> <li>• Strong relationship with Novell</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• ICOMP</li> <li>• <a href="#">Novell</a></li> </ul>

<b>Center for DESIGN SYSTEMS</b>	
<p>The Center focuses on researching, designing, developing and commercializing software that brokers information in a time critical way for manufacturing, distribution and design companies.</p>	<p><i>UU</i> <i>Funded 1995-1996</i></p>
	<p>Don R. Brown, Ph.D. <a href="mailto:dbrown@part.net">dbrown@part.net</a></p>
<ul style="list-style-type: none"> <li>• Provision patent application in August 2006</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">ErgoWeb</a></li> <li>• <a href="#">PartNet</a></li> </ul>

**Center for ELECTRONIC MEDICAL EDUCATION**

The objective of the Center for Electronic Medical Education was to develop software technology for use by physicians and scientists who require images as the primary means of communication and consultation.

Initially the software consisted of tools to help medical professionals make diagnoses in real time using a database of images as a reference. The center extended development into three markets: 1) consultation, 2) medical and scientific imaging and 3) telehealth. The goal was to improve the process of delivering healthcare and scientific discoveries for the purposes of consistent communication and collaboration and by linking visual annotations and clinical notes to images without altering the images. By maintaining a consultation record, two physicians could have a consultation about the same patient in geographically distant locations. Both physicians could review clinical information (images and text) at the same time, discuss aspects of the clinical review and maintain an auditable record of the consultation.

*UU*

*Funded 1999-2004*

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**Spin Out Companies**

- [Amirsys](#)
- [VisualShare](#)
- [Globalmatics](#)

<b><u>Center for ELECTRONIC SYSTEMS TECHNOLOGY</u></b>	
<p>The Center for Electronic Systems and Technology combined the expertise, resources, and capability of three universities--the University of Utah, BYU, and Utah State University--to serve the industrial community in electronic systems technology. The goal of the Center is to ensure that Utah industry can compete more effectively in the global market and to enhance the opportunities for Utah researchers to develop and commercialize their technologies</p> <p>Electronic systems technologies include microelectronics, digital electronics, RF, microwave, millimeter wave electronics, as well as optoelectronics. The Center provides research, design, evaluation, and prototyping services to Utah businesses that need specialized help in developing new products or enhancing market strengths. Services provided to industry include access to test equipment, laboratory testing, fundamental research and technology development, market analysis, personnel, information, and strategic planning.</p>	<p><i>UU</i> <i>Funded 1995-1999</i></p> <p>R. Jennifer Hwu, Ph.D. and Benjamin V. Cox, Ph.D.</p>
<ul style="list-style-type: none"> <li>• Research contracts with a large number of technology-based companies were executed</li> <li>• The Center also provided a stream of new commercializable technologies that were patented and offered for licensing to Utah companies</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Bonneville Technologies</li> <li>• HDG</li> </ul>

<b><u>Center for GLOBAL KNOWLEDGE MANAGEMENT</u></b>	
<p>This Center was formed to effect the commercialization of software tools representing the next generation of data mining technology, with the potential to leapfrog competing approaches by enabling customers to both quickly and inexpensively discover useful knowledge from databases and efficiently manage that knowledge over time as the underlying data or conditions of use change.</p>	<p><i>UU</i> <i>Funded 2003-2006</i></p> <p>Olivia Sheng (801)-585-9071 <a href="mailto:olivia.sheng@business.utah.edu">olivia.sheng@business.utah.edu</a></p>
<ul style="list-style-type: none"> <li>• New Software Acculink in validation process</li> </ul>	

**Center for HIGH SPEED INFORMATION PROCESSING**

The Center for High Speed Information Processing, focuses on miniaturizing digital devices by using faster algorithms (multiplier free technology), which allows the manufacturing of smaller, faster and cheaper chips.

Echo cancellation technology is the first application. It eliminates the echo that is created on a speaker phone or cell phone when two people talk at the same time. Two patents for this technology have been issued. This same technology can also make it possible for a person with hearing aids to hear someone (s)he is talking to when there is background noise. For hearing impaired people, this is revolutionary. With current hearing aids, when there is background noise, voices are canceled out, producing empty static.

Another area is building encoders and decoders for error correction that are compliant with emerging standards for low density parity check codes. This technology is in a commercialization phase.

- First spin out company, SP Communications was formed.
- Smaller, faster, cheaper chips are being developed by this center.
- A large Utah based company currently has licensing with the University for the technology connected to hearing-aid feedback

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**Spin Out Companies**

- [SP Communications](#)

**Center for INDUSTRIAL IMAGING**

The Center was established to commercialize image analysis, data analysis, and artificial intelligence technologies developed in the geosciences. Research at the University on fluid flow through porous media (i.e., aquifers, petroleum reservoirs) has resulted in generally useful image processing, image analysis, data analysis, and artificial intelligence techniques with commercial applications in geosciences and engineering.

Center technologies include Petrographic Image Analysis (PIA), which comprises four components: image acquisition, image processing, pattern recognition/data analysis, and linking to physical models. Each component involves specialized hardware, software, and expertise. The pattern recognition procedure within PIA has also proven useful in chemical fingerprinting in a variety of geoscience/environmental applications. The Center has begun to explore areas outside geoscience applications, including the application of PIA to medical imaging, and especially to automated screening of prostate biopsies. The Center also has been granted ownership of Integrated Paleontological System (IPS) software for further research, development, and commercialization. The Technical Alliance for Computational Stratigraphy (TACS), a consortium of nine petroleum companies, has been established to fund a three year commercialization and development initiative.

- GeoChem Metrix, Inc. was spun-off in September 1998. The company specializes in analysis of chemical data in the context of environmental and toxic tort litigation support.
- Two new software license agreements were signed with BP-Amoco Upstream Technology and Elf Exploration Production for the TACS consortium.

*UU*  
*Funded 1995-1999*

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**Spin Out Companies**

- [GeoChem Metrix, Inc.](#)

**Benefiting Companies**

- [BP-Amoco Upstream Technology](#)
- [Elf Exploration Production](#)

**Center for INFORMATION TECHNOLOGY - HANDICAPPED EDUCATION**

<p>The Center for Information Technology—Handicapped Education was funded with two purposes in mind: first, to meet a federal requirement that government and education offices provide closed captioning for training videos, and second, to promote information technology in public schools. K-SAR captioning software was developed, as well as reading and other software for educators.</p>	<p align="center"><i>USU</i> <i>Funded 1989-1991</i></p>
	<p align="center">Alan Hofmeister <a href="mailto:hofa@cc.usu.edu">hofa@cc.usu.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Effective Instructional Tech</a></li> </ul>

**Center for INTELLIGENT COMPUTER TOOLS**

<p>The Center focuses on interactive image segmentation, composition and digital image editing, automated creation/browsing of digital (microfilm) libraries, semiautomated creation of virtual environments, especially with Virtual Venues for the 2002 Winter Olympics.</p>	<p align="center"><i>BYU</i> <i>Funded 1996-2001</i></p>
	<p align="center">William A. Barrett (801) 378-7430 <a href="mailto:barrett@cs.byu.edu">barrett@cs.byu.edu</a></p>
<ul style="list-style-type: none"> <li>• The Center teamed up with a CA company to produce media for the 2002 Olympics which was featured on big screens along with individual event media.</li> </ul>	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• Virtual Venues</li> <li>• Adobe Systems</li> <li>• Park City Entertainment.</li> </ul>

**Center for INTERACTIVE RAY TRACING & PHOTOREALISTIC VISUALIZATION**

<p>Producing a commercial form of two programs that can process 3-D graphics based on large data sets found in CAD, film animation and scientific models, which existing GPUs cannot handle</p>	<p align="center"><i>UU</i> <i>Funded 2005-</i></p>
	<p align="center">Steven Parker (801) 585-1504 <a href="mailto:sparker@cs.utah.edu">sparker@cs.utah.edu</a></p>

<b>Center for INVERSE PROBLEMS, IMAGING &amp; TOMOGRAPHY</b>	
<p>The Center for Inverse Problem, Imaging and Tomography (CIPIT) is the result of research efforts conducted at the University of Utah's Advanced Imaging Methods Laboratory (AIM lab). The AIM lab was developed to study medical ultrasound imaging. Further research was then introduced in advanced sonar and geographical/environmental imaging methods based on common mathematics. In 1990, the AIM lab submitted a proposal for independent support as the CIPIT and initial funding was received in February of 1991. Some of CIPIT's technical accomplishments are in the areas of:</p> <ul style="list-style-type: none"> <li>• MEDICAL ULTRASOUND</li> <li>• HAZARDOUS SITE IMAGING</li> <li>• 3-D MICROSCOPE</li> </ul>	<p><i>UU</i> <i>Funded 1989-1993</i></p>
	<p>Steven A. Johnson <a href="mailto:johnson@ee.utah.edu">johnson@ee.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Monolithic Tech</li> <li>• <a href="#">Techniscan Medical Systems</a></li> </ul>

<b>Center for MAGNETISM IN INFORMATION TECHNOLOGY</b>	
<p>The center was established in 1995 to produce superior magnetic materials including permanent magnets and magneto-resistive materials, which would have applications in numerous markets including products such as motors, sensors, magnetic storage media, and electromagnetic circuitry.</p> <ul style="list-style-type: none"> <li>• An agreement has been signed between the center and a Utah company, for the company to manufacture high corrosion resistance rare-earth materials using center technology.</li> <li>• The center is collaborating with the Idaho National Engineering Laboratory (MEL) to develop efficient processing for permanent magnetic materials.</li> <li>• The center is also working with a Utah company to manufacture flexible magnetic materials.</li> <li>• The center is working with a Utah company to develop a new type of sensor for applications in the automotive industry.</li> </ul>	<p><i>USU</i> <i>Funded 1995-1996</i></p>
	<p>C.Y. Pan</p>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Starsys</a></li> </ul>

**Center for MTV FLAT PANEL DISPLAY TECHNOLOGY**

Established in 1995 to study new technologies in producing flat panel displays for the information (e.g. computer monitors) and entertainment (e.g. television sets) markets. The main focus is to conduct proof-of-principle research on new and emerging potential flat panel display technologies and to evaluate new and existing flat panel display technologies. An additional focus is to create and support applications needed by flat panel display manufacturers especially those located in the State of Utah.

- Developed a new, enhanced flat panel display for which a patent application has been submitted.
- Established a close working relationship with a local company involved in flat panel display development. A new company has been established with an option to license the flat panel display technology.
- Received Department of Energy funding to investigate another spin-off technology for micro-energy converters under a collaborative development effort with Sandia National Laboratories.

*UU*  
*Funded 1995-1997*

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<b>Center for MULTI-DIMENSIONAL INFORMATION - CROMDI</b>	
<p>The Center for Multi Dimensional Information—CROMDI was established to commercialize audio-visualization technology that facilitates the rapid and accurate analysis of large quantities of quickly changing data. By visually displaying multiple variables using various objects and colors, a wide range of information is clearly presented. IntuInfo, the patented technology, enables the processing of events significantly faster and more accurately, while requiring less training from those who use the software. The areas of application are broad: finance programs, homeland security systems, DOE contacts, medicine, and entertainment. The most successful application at this time is in finance and networking.</p>	<p><i>UU</i> <i>Funded 2000-2004</i></p>
	<p>Stefano Foresti (801) 581-3176 <a href="mailto:stefano@chpc.utah.edu">stefano@chpc.utah.edu</a></p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Applied Medical Visualization, Inc</a></li> </ul> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">GE Medical Systems</a></li> <li>• <a href="#">Draeger Medical</a></li> </ul>
<ul style="list-style-type: none"> <li>• Licensing agreements with several existing companies have been negotiated.</li> <li>• This center can quickly process large amounts of data and generate easy-to-interpret results.</li> </ul>	

<b>Center for MULTIMEDIA EDUCATION AND TECHNOLOGY</b>	
<p>Established in 1993 to develop state-of-the-art, interactive multimedia technology and also to author and produce with industrial partners a wide range of commercial training and education applications.</p> <p>Interactive multimedia computer-based authoring systems. Some authoring technologies will be copyrighted, held, and owned by WSC and the Center while others will be developed with external corporate partners.</p>	<p><i>UVSC</i> <i>Funded 1992-1995</i></p>
	<p>Gary L. Phelps</p>
	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• Cela Solutions Inc.</li> <li>• MC2</li> <li>• Memory Lane Productions</li> <li>• <a href="#">Utah Valley On-Line</a></li> </ul>

**Center for MULTIMEDIA EDUCATION AND TECHNOLOGY**

<p>Established in 1993 for the development of interactive multimedia software modules for science, mathematics, and engineering education.</p>	<p align="center"><i>UU</i> <i>Funded 1993-1997</i></p>
<p>Software and hardware interactive multimedia products for education including simulation software, virtual laboratories, software and hardware for data acquisition and analysis, inexpensive virtual reality applications. Production and distribution of interactive multimedia educational modules on CD-ROM.</p>	<p align="center">Richard W. Grow (801) 581-7634</p>
<ul style="list-style-type: none"> <li>• Two CD-ROM products have been developed: a multiplatform "Calculus Castle and "Engineering Electromagnetics." Another CD-ROM in genetics, "History of the Human Gene," is also completed. The Center is actively pursuing commercialization of these products.</li> <li>• The center manages the Conceptual Learning of Science (CoLoS), USA project, which is a consortium of eleven universities and is sponsored by Hewlett-Packard Company.</li> <li>• In collaboration with John Wiley &amp; Sons, the center continues to publish the award-winning journal, "Computer Applications in Engineering Education."</li> <li>• The center hosted an international conference "1996 Frontiers in Education" in Salt Lake, which had 617 attendees from 14 countries.</li> </ul>	

**Center for ORGANIC ELECTRONICS**

<p>Development of new polymers for the creation of OLEDs (Organic Light Emitting Diodes) resulting in the commercialization of organic semiconductors with superior luminescence efficiency and color spread, for multicolor displays and white light illumination.</p>	<p align="center"><i>UU</i> <i>Funded 2006-</i></p>
	<p align="center">Valy Vardeny (801) 581-8372 <a href="mailto:val@physics.utah.edu">val@physics.utah.edu</a></p>

<b>Center for PARALLEL SUPERCOMPUTING</b>	
<p>The Center was focused on Phase I Beta Testing including training, software porting, performance and development. There was potential for the center to become unique nationally in comparing supercomputer architectures.</p>	<p><i>UU</i> <i>Funded 1988-1989</i></p>
<ul style="list-style-type: none"> <li>• IBM provided a 3090 (\$11.7MM)</li> <li>• Convex donated upgrading components for a C-120 and a C-220 to supercomputer status with a \$100K donation</li> <li>• CSA donated a 16 processor system systolic processor for supercomputer at smaller workstations</li> </ul>	<p>Dr. Douglas Chabries</p>

<b>Center for SCIENTIFIC COMPUTING AND IMAGING</b>	
<p>The Center for Scientific Computing Imaging, SCI, developed the SCIRun technology, which provides scientists and engineers with a new model for scientific computing. The model uses graphic interfaces and 3D graphics to provide a visual program for solving complex problems. Previously three separate programs had to be used. SCIRun incorporated the programs into one</p>	<p><i>UU</i> <i>Funded 1996-2000</i></p>
<ul style="list-style-type: none"> <li>• The SCI Center has become the SCI Institute, which has a huge impact on Utah's economy.</li> </ul>	<p style="text-align: center;">Chris Johnson (801) 581-7705 <a href="mailto:crj@cs.utah.edu">crj@cs.utah.edu</a></p> <p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Visual Influence, Inc.</a></li> </ul>

**Center for SOFTWARE SCIENCE**

The Center for Software Science created a complete integration capability to enable a Unix based program to be run in a Windows Operating System. The product allowed for compatibility between PC and Unix workstations throughout the country, running approximately 150 functions.

This was an especially useful software during the transition from Unix to a Windows based environment. At that time the center was well funded. However once Windows became the standard, the need for this technology almost completely disappeared.

- This technology was critical during the transition from Unix to Windows Operating Systems.
- While funded this center had a 17 to 1 match in funding.
- The technology enabled Unix based programs to be run in Windows Operating Systems.

*UU*  
*Funded 1989-1994*

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**Spin Out Companies**

- [Hippo Software](#)

**Center for SUPERCOMPUTING**

<p>The mission of the Center was to establish a High Performance Computing Center to serve as a computational resource for Utah companies and universities. This partnership among industry and education was a unique resource for solving scientific and engineering problems that required unusually large memory and visualization requirements.</p> <p>The Center for Parallel Supercomputing, now the Center for High Performance Computing provides large scale computer sources to facilitate advances in the field of computational science.</p> <p>The projects supported by CHPC come from a wide array of disciplines requiring large capacity computing resources, both for calculating the solutions of large-scale, two and three dimensional problems and for graphical visualization of the results.</p> <p>The published results of research supported by CHPC facilities are maintained in the <a href="#">CHPC Bibliography (PDF)</a>.</p>	<p align="center"><i>UU</i> <i>Funded 1988-1992</i></p>
<ul style="list-style-type: none"> <li>• IBM contracted for \$13M in matching funds</li> <li>• Signed a new 3 year agreement with IBM regarding visualization</li> </ul>	<p align="center">Julio Facelli (801) 556-2426 <a href="mailto:julio.facelli@utah.edu">julio.facelli@utah.edu</a></p> <p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">3M Health Systems</a></li> <li>• <a href="#">Eden Solutions</a></li> <li>• Hercules</li> <li>• <a href="#">IBM</a></li> <li>• <a href="#">Kennecott</a></li> <li>• Relational Technology Products</li> <li>• <a href="#">SyncSort</a></li> <li>• <a href="#">Thiokol</a></li> <li>• <a href="#">WordPerfect</a></li> </ul>

<b>Center for VLSI DESIGN</b>	
<p>The Center was established to explore a new technology called Path Programmable Logic (PPL), an innovative design approach for compact integrated circuits. This technology has been developed in response to an identified market niche for a less expensive, more user-friendly design program. The ability to interface PPL with other commercial software packages makes this design program attractive to smaller engineering firms needing custom integrated circuits.</p>	<p><i>UU</i> <i>Funded 1990-1992</i></p>
	<p style="text-align: center;">Kent F. Smith <a href="mailto:kjsthree@gmail.com">kjsthree@gmail.com</a></p>
<ul style="list-style-type: none"> <li>• Joint venture was formed with a European company to sell center products in Europe</li> </ul>	<p><b>Spin Out Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Bonneville Microelectronics</a></li> </ul>
	<p><b>Benefiting Companies</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Cirque Corp.</a></li> <li>• <a href="#">IOMEGA Co.</a></li> <li>• Phoenix</li> <li>• Softeze</li> </ul>

## Appendix B – Benefiting Companies (by center)

CENTER	COMPANY
3D Computer Graphics	Mira Imaging Strata, Inc Ford, Bacon, Davis Geneva Steel Hercules IOMED
ACERC	Pacific Corp. Questar Sarcos Research Corp Sarcos, Inc Thiokol UP&L AeroTrans American Polymer Ashton Aerospace Automated Process Control B&M Enterprises Beckwith Technology Group Bemsco BGA Blue Cow, Inc. Bradley Instruments ClayTech Controlled Composite Technology CRP/Springlite Curecrete DAH, Inc. Delta Fiberglass Dimensional Research DMS DPE EDO
Advanced Composites	Evolution Skis Fiber Tek Futura Propulsion Systems H K Corporation Haelan Medical Hexatron Ideas to Products INCO VaporFab International Biokenetics LCC Fabrications Legends Technologies MATCO Medilight Mountain High Engineering Mountain Land Support Performance Composites Potter Management Pro Design Corporation Red Hawk, Inc. Rotomolding of Utah

	Sound Composites
	Terra Tek
	TRA
Advanced Composites	Ultralite of America
	UP International
	Utah Rocketry
	Van Patten Corporation
	Wasatch Engineering
Advanced Imaging LADAR	Wasatch Technology Group
	RapidMapper
	Bonneville Microelectronics
	Ceramatec
	Concoyle Oilfield Tools, Inc
	Evans & Sutherland
Advanced Materials & Microelectronics	Fisher Company
	Hercules
	Nova Tech
	Space Systems Engineering
	Thiokol
	Westcot Co.
	Intraspace Inc.
Aerospace Technology	R & D Inc.
	Wasatch Research & Engineering
Biocatalysis	Computer Systems Architects
	Hyclone Labs
	Becton Dickinson Critical Care
	Monitoring
Biopolymers	Cardiopulmonics, Inc
	Hyclone Labs
	Research Industries
Bioremediation	Silicon Graphics
	Non-invasive Geotracking
	AgriDyne Technologies
Biotechnology	EarthFax
	Thiokol
	UP&L
	AgriDyne Technologies
	Albion Technologies
	Arrow Dynamics
	Artistic Precision Enterprises
	Bel Viso Labs
	Buena Ventura
	Bureau of Mines
	C.T. Film Inc.
	Cache Valley Cheese
	Chromalox
CAEDM	Del Med, Inc
	Evans & Sutherland
	Great Basin Brine Shrimp
	Great Salt Lake Mineral
	Hercules
	Hewlett-Packard
	Hill AFB
	Industrial Research
	IOMEGA Co.
	KEMGAS
	Miller Labs

	Monarch Labs
	Morton Automotive
	Reily Wendover
	Schreiber Foods, Inc
	Solaray
CAEDM	Susumu Construction
	Thiokol
	Trysan
	VALTEK
	Viewpoint Animation
	Western Zirconium
	Williams International
	EIMCO
Chemical Reactors	Kennecott
	ASARCO
	Cascade Refining
	DataChem
Chemical Separations	GalTech Semiconductor
	Johnson Matthey
	Parish Chemical
	Tronac, Inc.
Coal Research	Advanced Processing Technology
	ATL (Springville)
	Flowserve (Springville)
Compliant Mechanisms	Grandway USA (Salt Lake City)
	ICON (Logan)
	MityLite (Orem)
	Recreation Systems (Kaysville)
Computer Based Education	LinguaTech
	MacroMed
Controlled Chemical Delivery	Research Medical Inc
	TheraTech Inc. (Watson Labs)
	Gossner Foods, Inc
Dairy Foods Technology	Nichols Research
	NutriScience, Inc
	R-Con International
Design of Molecular Function	CSA
Engineering Design	Sarcos Research Corp
Homogeneous DNA Analysis	Idaho Technologies
	Digitran
Information Technology (Handicapped)	SkiHi
	Systems Inpact Inc.
	Alta Technologies
	Computer Systems Architects
Inverse Imaging & Tomography	Evans & Sutherland
	MOXTEK
	TechniScan
	Unisys Defense Systems
	HGM Corp.
	Innovative Imaging Services
Laser Institute	MetaLaser Corp.
	Primemed
	QLT, Inc.
	ConAgra
Meat Processing Technology	E.A. Miller & Sons
	NUTEK Corp.
	Stone Meats

Novel TiB Surface Hardening	Ortho Development Corporation, Draper, UT
Pyrometallurgical	Kennecott
Quality and Integrity Design	Technology Mgt. Associates, Inc.
Rapid Microbe Detection	Stellar Technologies
	Accuserve
	American International
	Bolick Co.
Rapid Product Realization	CellTek, International
	GWH
	Hatch Biomedical
	Tile Roof Associates
	Youth Reclamation Inc.
	Eyring Research Institute
Signal Processing	Softsolutions
	Space Dynamics Laboratory
	Unisys Corp.
Space Engineering	Hercules
	Thiokol
	3M Health Systems
	Eden Solutions
	Hercules
	IBM
Supercomputer	Kennecott
	Relational Technology Products
	SyncSort
	Thiokol
	WordPerfect
	Cirque Corp.
VLSI Design	IOMEGA Co.
	Phonix
	Softeze
X-RAY Imaging	TechniScan
	Process Engineering Resources
Supercritical Fluid	Dionex
Solid Oxide Fuel Cells	FuelCell Energy (FCE) of Danbury, CT
Profitable Uses of Agricultural Byproducts	Agrimass – Cali – licensing
	Inrepid – ITR Idaho
Green Hill Recycling	Advanced Construction Materials
Soil Stabilization Inc.	Advanced Construction Materials
uniAMS	Advanced Construction Materials
	ACI Technology
Advanced Composites	Behavioral Technology Inc.
	Ridgeway & Fautz
	Springlite
	Beta Power Inc.
Advanced Materials & Microelectronics	Edo Western
Advanced Structural Composites	Patterned Fiber Composites, Inc.
Biotechnology	Natural Product Sciences
	EDO Fiber Science
	Hydrotech
Composites in Construction	Monroc, Inc. (Eagle Precast Co.)
	Sika
	Thiokol
	Waterpoint
Engineering Design	Animate Systems
	MicroJect, Inc.

Harsh Environment Electronics (formerly MTV Flat Panel)

Profitable Uses of Agricultural Byproducts

Rapid Product Realization

Scientific Computing & Imaging

Self Organizing Intelligent Systems

Solid Oxide Fuel Cells

Innosys

HHE

UniFoods

Manufacturing Extension Partnership

Visual Influence Inc.

Kuchera Defense Systems

Fuel Cell Energy

Versa Power Systems