The Technology Transfer Office 2004-05 Annual Report

the Process of Transforming Knowledge into Technology

University of Colorado System

Knowledge • Innovation • Technology

Technology Transfer Key Performance Indicators			
Item/metric	**Targets 03/04**	**Accomplishments**	**Targets 04/05 (mostly 15% increases)**
Inventions reported to TTO	**142**	**147**	**169**
Patent applications (US Filings)	**71**	**100**	**115**
Licensing transactions (options and licenses)	**38**	**41**	**47**
Ratio of legal fee reimbursements to legal expenditures	**32%**	**39%**	**42%**
Royalty revenue	**$3.9M**	**$5.8M**	**$5.2M**
Start-up companies	**9**	**9**	**12**
IP induced sponsored research	**$1.4M** (1)	**$3.9M**	**$4.48M**
Executed Service Agreements	**380**	**495** (2)	**569**

(1) Revised according to AUTM survey definition.
(2) Expanded service measure now includes not only Materials Transfer Agreements, but also Confidential Disclosure, Faculty Consulting, Software Evaluation, Interinstitutional and Service Agreements.

For FY 2003-04, TTO received $5.8 million in gross revenue, which includes all royalties, payments, equity liquidations, and patent cost reimbursements. TTO's share of the Wyeth settlement (see page 4) is not included in the gross revenue total. The $5.8 million gross revenue figure exceeded expected revenue mainly due to stock liquidations. Such liquidation events are virtually impossible to predict and the four that occurred happened earlier than expected according to our financial modeling.

Expected gross revenues for FY 2004-05 are $5.2 million. Only one stock liquidation is factored into the revenue projection for this fiscal year.

TTO Portfolio Snapshot as of July 1, 2004

U.S. Patents in Force = 229
U.S. Patents in Prosecution = 119
Active Licenses/Options = 170
Operational Start-ups = 34

A Note About Campus Names

This annual report covers FY 2003-04 when the University of Colorado was comprised of four separate campuses: Boulder, Colorado Springs, Denver, and Health Sciences Center. In July 2004, the Denver and Health Sciences Center campuses merged to become the University of Colorado at Denver and Health Sciences Center. Therefore, events occurring during or prior to the period covered by this report refer to Denver and Health Sciences Center as separate campuses. Discussions about TTO's future refer to CU's three campuses.

Vision Statement

By 2010 the University of Colorado Technology Transfer Office will be recognized as the best among public universities.

Mission Statement

The mission of the CU Technology Transfer Office is to aggressively pursue, protect, package, and license to business the intellectual property generated from the research enterprise and to serve faculty, staff, and students seeking to create such intellectual property.

Executive Summary

Over the past two and a half years, technology transfer at the University of Colorado (CU) has undergone significant transformation. Technology transfer is the system of support and service based on policies, people, and processes that build bridges between the university's research enterprise and innovative adopters of commercial technology. The transformation of technology transfer at CU is evident in this annual Technology Transfer Office (TTO) report covering the past fiscal year—July 1, 2003 to June 30, 2004. TTO achieved or exceeded its primary performance objectives for FY 2003-04. This report chronicles TTO's performance, the inventive achievements of CU research investigators, and the innovative companies that are developing and commercializing intellectual property (IP) created at CU.

Today, CU is one of the nation's top research oriented public universities. Even in a fiscal environment where state government funding has decreased for CU by 31 percent over the past three years and future prospects to reverse this trend are uncertain, federally funded research expenditures increased 77 percent from 1996 to 2002. This represents the third highest among all U.S. universities during the five-year period for which comparative data are available. In 2003, CU's research expenditures were nearly $437 million, with 86.5 percent from federal government sources.

CU research investigators are driven by intellectual curiosity, the desire to advance and disseminate new scientific and technological findings, and their students' zeal for acquiring and applying knowledge. However, top-notch university research by itself does not organically translate into beneficial societal outcomes such as products, jobs, and wealth without bridges between the university and commercial adopters of technology.

CU's TTO helps build and maintain these bridges between the often-diverse cultures and objectives of the university and technology intensive companies. For the past few years, TTO has been operating under a strategic plan that has successfully guided the technology transfer operation. Except for an increased emphasis on collaborative team projects, no major changes to the basic strategic orientations are anticipated for the future because the basic elements and conditions for long-term success are firmly in place. The fundamental challenge TTO faces in the near term is to provide expanded and high quality services to the CU research community while accelerating the reduction in university financial assistance to TTO. This challenge will be met through continued skillful management by TTO staff and the leverage created by participation from interested faculty, students, entrepreneurs, business services, financial providers, and innovative companies.

The grand vision of CU's TTO being recognized by 2010 as the best among public universities is more achievable than ever. The journey to achieving this vision will be difficult, but the anticipated benefits for the university, the state of Colorado, and the nation will help motivate and focus the quest.

What Is Technology Transfer?

Technology transfer is the process of pursuing, protecting, packaging, and licensing to business intellectual property (IP) generated from research, while serving faculty, staff, and students who seek to create such IP. All U.S. research universities pursue technology transfer. Technology transfer performance is not difficult to assess; the metrics are objective and easily accessible, indeed, relevant indicators are chronicled in this report. The overall model is one of a transactions pipeline, i.e., input, intermediate, output, and outcome variables. The common performance measures are invention disclosures, patent applications, patents issued, licenses granted, royalties earned, and the number of new companies formed based on university IP.

In the university context, a license is a legal agreement conveying IP rights owned by the university to a company that develops and commercializes a product or service protected by the IP. In exchange for the grant of IP rights, the company licensee agrees to certain terms and conditions specified in the license agreement. Usually the licensed IP is in the form of one or more patents, but it can also be expertise or copyrighted materials, or a combination of all of these. Financial consideration for the grant of IP rights typically includes fees due at license execution, payments made upon achieving certain mutually determined development and commercial performance objectives, and royalties that are periodic payments based on a percentage of the product's sales. If the licensee defaults on the terms and conditions defined in the license, the agreement may be terminated by the university and the university would be free to license the invention to another company. Licensees may terminate the agreement at their discretion. The range and application of university inventions lend themselves to different risk levels and commercial pathways. Licenses may be exclusive (to one company) or nonexclusive (more than one company receives rights). Given company capabilities, the license could be broad or limited to specific fields or geographic territories. Successful license relationships are based on mutual understanding of the risks and commitment to the creation, development, and commercialization of university technology.

CU's TTO is shifting its approach to how technology transfer is accomplished. The conventional university model is essentially a TTO licensing associate working with the inventor to understand the IP and identify a potential licensee. Collaborative project teams represent the new, emerging CU model. TTO licensing associates are teaming up with CU students, inventors, technology domain professionals, serial entrepreneurs, venture capitalists, and IP attorneys to evaluate invention disclosures, conduct licensing feasibility studies, and write business plans. Licensing associates and inventors working with students and technology business professionals subject the invention to an iterative technical and licensing commercial analysis, a process that both accelerates and strengthens the invention during the initial exposure to prospective technology adopters.

Capital Markets and Acquiring Corporations Respond to CU Technologies

Dharmacon, Inc. acquired by Fisher Scientific. In April 2004, Dharmacon, Inc., a global leader in developing and commercializing synthetic ribonucleic acid (RNA) and related technologies, was acquired by Fisher Scientific International, Inc. for $80 million. Dharmacon, based in Lafayette, Colorado, was formed based on a licensed technology for nucleic acid synthesis, patented as 2'-ACE(r) chemistry, and developed at CU-Boulder by Stephen Scaringe, PhD, and Marvin Caruthers, PhD. **www.dharmacon.com**

Eyetech IPO nets $142.9M. In February 2004, Eyetech netted $142.9 million upon completion of its initial public offering. Macugen™, a compound of the class of affinity-selected nucleic acids called "aptamers," was identified through a CU-patented process invented in Boulder's molecular, cellular, and developmental biology department in the 1980s. The two inventors were Professor Larry Gold and graduate assistant Craig Tuerk. The process generates a vast array of short strands of RNA, from which aptamers can be selected and designed for enhanced binding to molecular sites, potentially enabling more specific therapeutic effects. **www.eyetech.com**

Knowledge Analysis Technologies acquired by Pearson Education. Knowledge Analysis Technologies, a Boulder-based company developing and commercializing proprietary and patented machine-learning technology for text understanding, was acquired in June 2004 by Pearson Education, the world's largest education company. Much of the core intellectual property, including its essay grading technology, was developed at CU-Boulder. Knowledge Analysis Technologies' flagship product, the Intelligent Essay Assessor, is designed to automatically analyze and score standardized writing assessments. **www.knowledge-technologies.com**

Myogen's IPO raises $70M. In an October 2003 IPO, Myogen raised $70M, selling 5 million shares at $14/share. Myogen is a biopharmaceutical company based in Westminster, Colorado, focused on the discovery, development, and commercialization of small molecule therapeutics for the treatment of cardiovascular disorders. Myogen currently markets one product in Europe and has three product candidates in late-stage clinical development. The company also conducts a target and drug discovery research program focused on the development of disease-modifying drugs for the treatment of chronic heart failure and related cardiovascular disorders. **www.myogen.com**

Colorado Technology Commercialization Partnership

In the summer of 2003, TTO launched the Colorado Technology Commercialization Partnership (CTCP) program funded in part by the Robert H. and Beverly A. Deming Center for Entrepreneurship at CU-Boulder and the Colorado Institute of Technology (CIT). The program's purpose is to expedite the process of technology commercialization by forming teams to examine CU inventions. The teams are composed of student interns, TTO staff, and volunteer advisors from the Front Range professional business community. These advisors include prominent IP attorneys, venture capitalists, seasoned business professionals, and technology domain experts.

In the summer of 2004, hiring a more diverse population of students with broader backgrounds further expanded the program. CIT and the Deming Center again augmented TTO financial resources. The result was an even more collaborative approach to university technology commercialization. In all, 10 students from each of the three CU campuses examined nearly 50 cases, solicited a dozen new disclosures, and wrote 20 business assessments. During the two summers, CTCP recruited more than 75 professional volunteers to provide advice on commercialization strategies. This orientation of working with the business community goes beyond these summer programs and has been ingrained as a major focus for TTO.

Courts Uphold CU Intellectual Property Rights in Two Significant Rulings

In September 2003, the United States Court of Appeals affirmed a judgment of $54.1 million, plus post-judgment interest, for the University of Colorado Foundation, Inc., the University of Colorado, the CU Board of Regents, and two CU researchers, resulting from global pharmaceutical company Wyeth Corporation's American Cyanamid subsidiary's misappropriation of an idea developed by the researchers. The judgment represents the culmination of a legal dispute spanning more than 10 years. Inventors Dr. Robert Allen and Dr. Paul Seligman, their research laboratories, their department, and the CU System each received 25 percent of the proceeds, after legal and related costs. Most of the proceeds distributed to the university are directed to funding endowed chairs and professorships, and to further enhance technology transfer operations at CU.

In June 2004, the United States Court of Appeals issued a ruling favorable to two CU inventors, upholding an earlier jury verdict and a Colorado District Court decision. The appeals court found Laboratory Corporation of America (LabCorp) liable for willful infringement of patent rights to a widely used medical diagnostic test. LabCorp is expected to pay a $2.1 million judgment and $4.5 million in damages and interest to the University of Colorado and Columbia University, and Competitive Technologies, Inc., its clients, and its licensee Metabolite Laboratories, Inc. The ruling affirms the validity of a patent derived from discoveries made by Dr. Robert Allen and Dr. Sally Stabler, professors at CU-Health Sciences Center in collaboration with a Columbia University researcher.

A Sampling of CU Inventions and Licenses from the Past Year

• **Rose Biomedical Development Corporation** signed an exclusive license with CU in 2004 to develop and commercialize a patent-pending CPR device for patients suffering from pulseless electrical activity during cardiac arrest.

• **CU investigators Drs. Jeff Stansbury, Marianela Trujillo, and Xingzhe Ding** have devised a novel technology for the precise and controlled fabrication of nanogel particles with useful cross-linking properties that affect macrogelation dynamics, expansion, shear strength, solubility, hydrophobicity, and rigidity/flexibility. The technology has applications in dental restoratives, tissue scaffolding, drug delivery, adhesives, and a variety of other materials sciences.

• **Drs. Jean Hertzberg and Robin Shandas,** professors in CU-Boulder's Department of Mechanical Engineering, with their students H.B. Kim and O. Mukdadi have disclosed a technology involving a high speed scanning ultrasound transducer. The ultrasonic flow measurement innovation will provide accurate in vivo blood flow measurement to facilitate the diagnosis of cardiovascular disease.

• **CU-Colorado Springs physics faculty Drs. Zbignew Celinski and Robert Camley** disclosed an invention based on high frequency tunable band pass filters on magnetic thin films. The inventors are leading researchers in the domain of high-frequency devices and represent the synergy of theoretical and experimental physics.

• **CU-Boulder chemical engineering professors Dr. Rich Noble and Dr. John Falconer** have disclosed an invention of zeolite membranes that possess orders of magnitude higher selectivity than any membrane reported in the literature. Called SAPO-34 zeolite, the inorganic membranes demonstrate good erosion resistance; high-pressure stability; and superior thermal, mechanical, and chemical stability compared to conventional polymeric membranes. Many natural gas wells contain high concentrations of CO2 (as high as 70 percent), and most of this CO2 must be removed before the natural gas is shipped. SAPO-34 membranes may prove to be superior to conventional polymeric membranes for CO2 removal from natural gas.

• **CU-Boulder professors Dr. Dave Walba of the Department of Chemistry and Biochemistry and Dr. Noel Clark in the Department of Physics** have disclosed an invention in chirality detection. Measurement of enantiomeric excess of chiral organic compounds is an important analytical problem. Utilizing ferroelectric liquid crystals, Drs. Walba and Clark have developed a new method for detection of molecular chirality, which can be both extremely sensitive and very precise. In addition, the method can be accomplished very rapidly on a very large number of samples in parallel.

• **CU-Boulder physics professor Dr. Dana Z. Anderson** and his team have demonstrated Bose-Einstein condensation in a compact vacuum system. The size reduction and simplification achieved were largely due to the techniques that allow all cooling steps to take place in a single small chamber and due to the chip-based electrical feed throughs, which greatly facilitate external connections. The experiments succeeded in realizing a "plug-in" concept where the atom chip vacuum cell can be "plugged into" an existing optical and electronic system. Through this concept, atom chip development and experiments may proceed more rapidly.

• **Professor Norm Pace from Boulder's molecular, cellular, and developmental biology department** has disclosed an invention in mycobacterial detection. Tuberculosis-causing mycobacteria are notoriously hard to culture and render diagnosis of the disease difficult. Pace and his team have developed mycobacteria molecular probes sensitive and specific enough to be used directly on tissue samples. Applied in the clinic, these probes have the potential to greatly facilitate diagnosis of tuberculosis.

• **Health Sciences Center Dr. David Vansickle of neurosurgery and Dr. Kenneth Winston of The Children's Hospital** designed an improved intracranial EEG electrode for use in mapping epileptic foci in patients suffering from intractable seizures prior to surgical removal of the foci.

• **Dr. Kazuyoshi Gamada,** a postdoctoral fellow in orthopedics, designed a novel knee brace to treat osteoarthritis, a disease afflicting over 20 million people in the United States. A prolific inventor, Dr. Gamada has also designed exercise equipment to rehabilitate people with osteoarthritis and knee implants.

• **James Garnett,** a graduate student in CU-Boulder's computer science department has disclosed a technology for modeling normal resource allocation in computer systems. It can be used to respond to abnormal resource requests, such as "distributed denial of service" (DDoS) attacks on computer networks.

• **Dr. Terrance Boult,** of CU-Colorado Springs' computer science department, and graduate students Gang Zheng and Chia-Jiu Wang have disclosed a touch-free, less intrusive technique of extracting personal hand geometry features for personal identification systems. Hand identification systems currently on the market can only recognize hand features in a two-dimensional plane and require hands to be placed directly on an imaging surface. Dr. Boult's technology allows hand features to be recognized from any angle and requires hands to be held up for a security camera. Hand geometry features can then be combined with facial features to increase the odds of positive recognition.

• A group of inventors from different disciplines at the Boulder and Health Sciences Center campuses developed a novel coating technology for implantable electrodes that decreases the risk of stab wound during implantation. The inventors are **Dr. Diego Restrepo, associate professor of cell and developmental biology, Dr. Andrew Sharp, a postdoctoral fellow in cell and developmental biology at CU-Health Sciences Center, and Drs. Dudley Finch and Kenneth Gall, in mechanical engineering at CU-Boulder.** Their research indicates that this technology will improve the effectiveness of electrodes by decreasing signal interference caused by local inflammation and tissue damage. The group—which now also includes Dr. Regan Zane, assistant professor of electrical and computer engineering, and Dr. Zoya Popovic, professor of electrical and computer engineering, both of CU-Boulder—is working to develop additional aspects of the technology.

• **Dr. Jaime Modiano,** associate professor of immunology at CU-Health Sciences Center, has designed an assay for the early detection of hemangiosarcoma in dogs. In the United States, approximately 1.5 million dogs suffer from hemangiosarcoma. The disease has very high morbidity and mortality, primarily due to late detection. Dr. Modiano's assay will identify dogs at an early stage of the disease, allowing surgical removal of the cancerous lesions before they have metastasized.

Service Agreements

This year, CU entered into agreements to provide intellectual property and licensing services to The Children's Hospital in Denver as well as Denver Health hospital. Both institutions have enjoyed a long affiliation with CU-Health Sciences Center, and the service contract is an extension of that relationship. The agreements call for CU's TTO to provide nearly the same IP and licensing services that it provides to the three CU campuses.

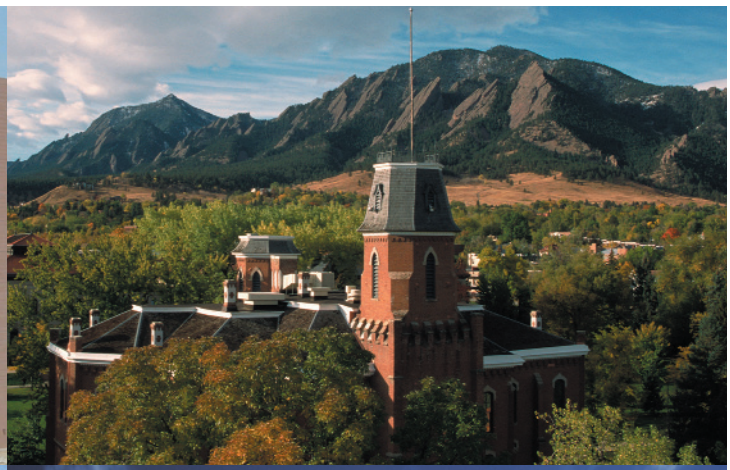
TTO's Service Mission

The Technology Transfer Office is increasingly engaged in IP activity that precedes invention disclosures and licensing. This involves preparation, review, negotiation, and execution of confidential disclosure agreements (CDAs), material transfer agreements (MTAs), consulting agreements, and IP plans for grant submissions, particularly grant applications that involve industrial collaborators. This past fiscal year, TTO has reviewed and signed more than 400 such service agreements.

Careful IP review at the research planning stage is important so that IP rights are not lost before a discovery is even made. At the planning phase, multiple parties are often involved, including government, industry, and other academic institutions. Patent rights, patent cost sharing, commercialization rights, research use, and publication rights have to be carefully assessed early on so that decisions can be made on key issues such as disposition, timing, disclosure, and cost.

Efforts to provide research related IP services will be rewarded downstream because key IP and licensing issues will be understood from the beginning of the research process. Furthermore, providing research related IP services allows TTO to help investigators develop IP strategy during their research, resulting in inventions more closely related to commercial drivers.

Clockwise from top left: *Two new research towers at the Health Sciences Center on the Fitzsimmons campus, Old Main on the Boulder campus, the El Pomar building on the Colorado Springs campus, and the Dravo building on the Denver campus.*



University License Equity Holdings, Inc.

Mission

University License Equity Holdings, Inc. (ULEHI) is a 501(c)(3) nonprofit company that assists research investigators at the University of Colorado working with the entrepreneurial business community to build successful businesses from CU research discoveries. ULEHI is also the statutory authorized legal entity created by the university to manage the private equity received from start-up companies as partial consideration for a license to intellectual property. ULEHI facilitates interaction between start-ups and constituencies at CU, and in the business and finance communities to surround promising opportunities with the expertise and capital needed to build world-class companies.

ULEHI's primary role is the promotion of entrepreneurial activity at CU through research investigator advice, new company formation, business plan assistance, management recruitment, and capital acquisition. ULEHI works closely with the Technology Transfer Office to help identify promising platform technology that could form the basis of a start-up and then leverage the resources of the university and commercial partners to provide the support to launch profitable enterprises. Additionally, ULEHI fills an important role within the state of Colorado by acting as a liaison for business professionals interested in working with early stage university research, either as entrepreneurs seeking to license IP or as technical and strategic advisors. A summary of ULEHI activities follows.

Advice, Instruction, and Coaching

ULEHI works with TTO case managers and entrepreneurially oriented investigators to assess inventions, develop commercial strategies, and understand what is needed to draft commercially feasible operating plans for outside financing. To accomplish this, ULEHI serves as the primary interface between new ventures and MBA and law students throughout the CU System, including CU's two entrepreneurship centers, the Robert H. and Beverly A. Deming Center for Entrepreneurship and the Bard Center for Entrepreneurship, which conduct research, write business plans, and help incorporate new ventures. ULEHI's director also serves as an assistant instructor for the graduate level business plan preparation course at the Leeds School of Business.

Company Formation

The Entrepreneurial Law Clinic at CU conducts educational, research, and service activities on legal matters relevant to entrepreneurs, venture capitalists, and companies. Administered by the law firm of Hogan & Hartson, the clinic's mission is to connect law students with the Colorado entrepreneurial community. ULEHI acts as a bridge between start-ups seeking assistance with company formation and legal issues and the clinic to provide low-cost/no-cost legal services in a company's formative stages.

Business Plans

ULEHI interns and business volunteers are recruited to research markets, craft commercial strategies, and write business plans for presentation to financial investors.

Management Recruitment

Eight of the nine CU start-ups launched last year were led by businesspeople recruited from the community. The skills and experience professional managers bring to start-ups are an invaluable component of the process. Entrepreneurial management helps ensure new companies target the right markets with the right strategy, stay commercially focused, and are able to raise capital to achieve critical milestones.

Financial Assistance

One of the most difficult challenges facing faculty and entrepreneurs is access to capital during the proof of concept and commercial feasibility phases of their research. This scarcity of funds between basic and applied research constitutes a developmental gap where studies needed to transition technology to commercial applications languish. ULEHI works with start-up teams to identify sources of capital (public and private), provide introductions to business angel (private equity) networks, institutional venture capitalists, and corporate strategic partners.

Starting in FY 2004-05, ULEHI initiated a Proof of Concept (POC) program. The purpose of the program is to provide funds to accelerate market-driven research and obtain important information that establishes technical and commercial viability.

The POC program makes seed investments ranging from $50,000–$100,000 in promising technologies that could become the basis for company development. ULEHI administers the program and has teamed with volunteers from the venture capital community to help select the most promising investments across a broad range of applicants.

Board of Directors

ULEHI operates under the guidance of a board of directors composed of university personnel and seasoned business volunteers. We would like to thank the following people from the business community for their valuable time and expertise as well as their dedication to the success of CU ventures:

R.C. "Merc" Mercure, Chair
Barbara Mowry, Board Member
Kyle Lefkoff, Board Member
Jerry Donahue, Board Member

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Emerging Work with CU Software Developers

In 2004, the CU Technology Transfer Office received 27 invention disclosures and worked to execute 15 royalty-based license agreements for software technologies, a previously underserved segment of the technology transfer realm. Currently, software groups work across a broad spectrum of CU departments, including biochemistry, aerospace engineering, civil engineering, psychology, physics, medicine, and computer science.

It is an established part of academic culture to share software informally among a trusted group of collaborators. TTO helps developers set up more formal permission statements for sharing source code among a wider group while still maintaining control over the integrity of the software and clarifying ownership and use. The goal is to encourage contributions from the software development community that will turn an isolated component into a new software platform.

As always, TTO seeks to get involved early, to help research groups set up software projects with their goals in mind. TTO provides the following license agreements to accommodate the life cycle of academic software:

- simple permission statements for collaborators to freely download early code,
- nonexclusive site licenses to innovative companies for use of source code, and
- commercial licenses to distributors who will create and market commercial grade products.

Software can take years to mature, but commercialization has a better chance of success if all collaborators are accounted for along the way and software is distributed under the appropriate agreements. For more information, see www.cu.edu/techtransfer/software.

New TTO Personnel

TTO hired two new licensing associates this past year: Jennifer Eby at CU-Health Sciences Center and Liza Eschbach at CU-Boulder's College of Engineering and Applied Science. Eby and Eschbach are working with their respective campus inventors on new disclosures, as well as directing patent prosecution, marketing technologies, and negotiating licenses.

Jennifer Eby earned an MS in molecular and cell biology from the University of California, Berkeley, and an MBA in finance and entrepreneurship from the University of Colorado at Boulder's Leeds School of Business. Prior to her MBA study, Eby worked for Boulder-based Baxter Hemoglobin Therapeutics as an operations associate. While still an MBA student, she founded PharmOut Manufacturing, Inc., a contract manufacturing company for the biopharmaceutical industry.

Liza Eschbach earned an MS in mechanical engineering from Washington State University and is a registered patent agent. Liza's experience includes contract research at the Pacific Northwest National Laboratory, one of nine U.S. Department of Energy multi-program national laboratories. Her background also includes academic research experience, most recently at Colorado State University, as well as work in thermal-fluid sciences, bioengineering, and medical science.

CU Technology Licensee Updates

Aktiv-Dry LLC—This Boulder company has won two SBIR Phase I grants, one from NIH and the other from USDA; work on both began on July 1, 2004. The NIH grant addresses inhalation immunotherapy against influenza. The USDA grant addresses stabilizing nutriceutical supplements. Work was undertaken on industrial contracts addressing the use of specially purified sugars for protein, DNA and measles vaccine stabilization, and coating microparticles. Additionally, proposals to develop new approaches to delivering vaccines are under review by major funding sources. Dr. Robert Sievers of the CU-Boulder chemistry department is the primary inventor with contributions by Drs. John Carpenter and Ted Randolph of Health Sciences Center pharmacy and Boulder chemical and biological engineering departments, respectively. Drs. Steve Cape and Brian Quinn are the lead scientist-engineers at Aktiv-Dry, with assistance from Jessica Burger.

ALD Nanosolutions, Inc.—This company's technology was selected by *R&D Magazine* as one of the 100 most technologically significant products introduced into the world marketplace over the past year. ALD NanoSolutions, Inc. was founded in 2001 by P. Michael Masterson, Dr. Karen Buechler, and CU-Boulder professors Dr. Steven George and Dr. Alan Weimer. The company's technology is based on atomic layer deposition (ALD) coating chemistry and processing methods for depositing ultra-thin films on particulate surfaces. The company is focused on commercializing its nano-coating processes, called Particle-ALD™ and Polymer-ALD™, on particles and polymers, and is targeting collaborative research agreements with partners for the discovery and validation of composite materials in selected industries. **www.ALDNanoSolutions.com**

AlphaSniffer, LLC—This company executed a license to develop a family of sensitive and selective sensors for detection of chemical/biological warfare agents and industrial toxic chemicals. The technology, based on novel holographic interferometry, was invented by CU-Boulder professors Dr. Dana Z. Anderson (Department of Physics and JILA), and Dr. Victor Bright (Department of Mechanical Engineering), and their graduate students Hongke Ye and Oyvind Nelson. The Boulder, Colorado-based company was formed by serial entrepreneur Dr. Misha Plam, who raised $1.4 million from private investors.

Archemix Corporation—A Boston-based licensee of the aptamer technology (also known as SELEX technology) developed by CU inventors Dr. Larry Gold and Dr. Craig Tuerk, Archemix is working to discover and develop therapeutic aptamers for the treatment of cancer, inflammation, and cardiovascular diseases. In August 2004, Archemix began a Phase I study of their lead program, ARC183, as an anticoagulant for use in coronary artery bypass graft (CABG) surgery. **www.archemix.com**

Avigen, Inc.—In collaboration with Dr. Linda Watkins, professor of psychology and director of neuroscience at CU-Boulder, Avigen is investigating plasmid delivery of the anti-inflammatory cytokine IL-10 in preclinical studies as a novel therapy for neuropathic pain. Based in Alameda, California, Avigen is committed to developing innovative therapeutics to treat serious neurological disorders. **www.avigen.com**

BaroFold, Inc. — This company is achieving its corporate goals with the signing of multiple research licenses and contracts with major biotechnology and pharmaceutical companies over the last year. The Colorado-based company was awarded an NSF-STTR grant for the application of high pressure technology on IVIg, a parmaceutical product. BaroFold is working to expand the use of the technology in the protein therapeutic market though increased yields and improved product safety.

Cardiac Access LLC—In the past year, Cardiac Access secured rights from CU covering the application of an artificial neural network to the challenge of accurately screening for and diagnosing heart murmurs. In addition, the company secured an exclusive license to pediatric patient data sets from The Children's Hospital (TCH). In 2003, the company received a Phase I SBIR grant for the project and submitted an application for additional Phase II funding. Cardiac Access' scientific founders are Drs. Roop Mahajan and Robin Shandas from CU, and Drs. Curt DeGroff and Lilliam Valdes-Cruz from TCH.

CDM Optics, Inc.—Founded in 1996, this Boulder, Colorado, company enjoyed several notable accomplishments during the past year. Working with Ball Aerospace, CDM completed a study program that demonstrated its Wavefront Coding™ technology's usefulness in earth imaging telescopes. The technology allows the design of telescopes that are much lighter than those in use today. The company also successfully completed its first application in the area of infrared cameras. **www.cdm-optics.com**

ColorLink, Inc.—In July 2004, JVC began shipping its new line of LCOS microdisplay rear-projection televisions that incorporate Boulder-based ColorLink's color management technology. Founded in 1995, ColorLink employs 100 people worldwide and has operations in the U.S. and Japan. The company's technology is currently under evaluation for new markets, including sunglasses, photography, and fluorescence spectroscopy among others. ColorLink has also begun shipment of optical isolators used in consumer CD/DVD players. **www.colorlink.com**

Confi-Dental Products Co.—This Louisville, Colorado company is developing a product based on dental material technology developed by Dr. Jeff Stansbury (dentistry, Health Sciences Center) and Dr. Chris Bowman (chemical and biological engineering, CU-Boulder). Confi-Dental Products is the Colorado subsidiary of Septodont, Inc., a world leader in dental supplies with extensive distribution relationships to dentists worldwide. **www.confi-dental.com**

GlobeImmune, Inc.—This early stage biopharmaceutical company is pioneering development of potent, targeted molecular immunotherapies for treating cancer and infectious diseases. The company filed an investigational new drug application (IND) in 2004; its first products for treatment of lung and GI cancers are currently in Phase 1 clinical trials.

Kapteyn-Murnane Laboratories Inc.—Boulder-based KM Labs leads the field in ultrafast laser technology research and development. The company, founded in 1999 by CU-Boulder inventors Dr. Henry Kapteyn and Dr. Margaret Murnane, recently launched its first product, The Dragon™, the highest average power, shortest pulse, ultrafast ti:sapphire laser system on the market. **www.kmlabs.com**

Keystone Biomedical, Inc.— In the past year, this Broomfield, Colorado company has put together a senior management team and is working to raise the funds necessary to commercialize the company's two main drug platforms, one of which was invented by Health Sciences Center inventor Lawrence Horwitz, M.D. **www.keystonebio.com**

Lohocla, Inc.—During the past year, Lohocla received a Fast Track SBIR award for $1.6 million to use proteomic techniques for discovery of additional diagnostic markers for alcoholism. The company also secured an SBIR contract from the National Institutes of Health (NIH) to map the transcriptome and proteome of a panel of recombinant inbred mice. Lohocla's scientific founder is Dr. Boris Tabakoff of pharmacology at CU-Health Sciences Center.

Metabolite Laboratories, Inc.—Metabolite, a Colorado manufacturer of homocysteine diagnostic tests, is at its highest income level this year thanks in large part to the company's victory in its lawsuit with Laboratory Corporation of America (see page 4).

Newellink, USA—Based in Los Angeles and Colorado Springs, Newellink executed license agreements with CU and the University of Vermont in early 2004. Newellink has identified three candidate cancer drugs termed NUI-100, NUI-200, and NUI-300. Proof-of-concept studies have been performed under a sponsored research agreement between Newellink and scientific founder Dr. Karen Newell's laboratory at CU-Colorado Springs. In vivo data obtained thus far support the use of NUI-100, NUI-200, and NUI-300 alone and in combination with existing chemotherapies to treat melanoma, leiomyosarcoma, and pancreatic, brain, and lung cancer. The company is working with Health Sciences Center faculty to design a clinical trial for NUI-100 and NUI-200 in melanoma. Newellink is seeking financing to hire key personnel, to support preclinical research and development, and to carry out phase one human clinical trials.

Paradigm—This Houston, Texas-based company is a provider of advanced petroleum geoscience and drilling technology to the oil and gas exploration and production industry. It executed a license in 2004 to commercialize state-of-the-art automatic fault extraction (AFE) technology developed at CU-Boulder's BP Center for Visualization. AFE both automates and enhances the process of identifying, extracting, and modeling geologic discontinuities (e.g., faults) from subsurface seismic volumes, thus providing a major improvement in the efficiency, accuracy, and consistency of fault interpretation and modeling. **www.paradigmgeo.com**

Phiar Corporation—Boulder-based Phiar Corporation continued development of its ultra-high speed metal-insulator electronic device technology. Two additional U.S. patents on Phiar technology were issued in conjunction with CU, and several new patent applications were filed. Phiar designed and built detectors operating at 200 GHz, tested at Harvard-Smithsonian laboratories, and 1 THz, tested at the University of California, Santa Barbara. Phiar has received two contracts from the Defense Advanced Research Projects Agency (DARPA) to further its technology and supplement its venture capital funding. **www.phiar.com**

PhosphoSolutions Inc.—This is a company specifically focused on phospho-specific antibodies; it has experienced over 20 percent annual growth over the past three years. These antibodies are a key enabling technology used by biotech companies for both discovery and validation of new drugs. PhosphoSolutions manufactures these antibodies in-house and also licenses some from research universities. **www.phosphosolutions.com**

PowerSicel, Inc. (pronounced "power-cycle")—This Boulder-based emerging growth company is commercializing a new silicon carbide power transistor based on device concepts developed at the University of Colorado. PowerSicel's transistors will provide significant enhancements in power, efficiency, size, robustness, and affordability over both conventional and future transistor technologies. The company is initially focusing on RF power applications such as military/commercial radar markets and the wireless base station market as well as high power and high temperature electronics industries. In the past year, PowerSicel closed $2.5 million in venture capital financing and won a $2 million NIST/ATP award. **www.powersicel.com**

Replidyne, Inc.—This privately held Colorado-based biopharmaceutical company in 2004 closed its largest financing, a $40 million second round of venture capital financing. Replidyne also obtained exclusive rights to "faropenem daloxate," a late stage clinical compound for the treatment of bacterial infections, from Daiichi Suntory Pharma. Work in conjunction with an international licensing partner for rights discovered in the laboratory of CU-Health Sciences Center researcher Dr. Charles McHenry continues toward commercialization. **www.replidyne.com**

RiverWare™—This reservoir and river modeling software was developed at the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at CU-Boulder. It is used by water management agencies to improve water resources planning and decision making. By the end of 2004, 36 water management agencies, stakeholders, consultants, and research institutes had active RiverWare licenses. By making RiverWare available as a product, CADSWES has built a community of users and enhanced its position as a hub of water systems research. **www.cadwes.colorado.edu/riverware**

Sentry Biosciences, LLC—In November 2003, CU executed a license with Colorado-based Sentry Biosciences, LLC that grants the use of specific DNA degradation enzymes (nucleases) in the search for compounds that regulate the process of programmed cell death (apoptosis). Apoptosis has been implicated in 50 percent of human diseases, including cancer, neurodegenerative disease, and autoimmune disease. The association of this collection of DNA degradation enzymes with apoptosis was originally discovered in the laboratory of Dr. Ding Xue, a CU-Boulder associate professor of molecular, cellular, and developmental biology.

SomaLogic, Inc.—During the past year, SomaLogic has continued the development of its photoaptamer array technology. Photoaptamer arrays, based on discoveries originally made in the CU laboratory of Dr. Larry Gold (and further developed at NeXstar Pharmaceuticals), allow for the simultaneous quantitative measurement of large numbers of proteins in medical samples such as blood and urine. SomaLogic is using the technology to identify protein signatures of disease that will improve the quality of care and outcomes across the medical spectrum. The company's initial studies in a variety of cancers and inflammatory diseases have yielded encouraging results. SomaLogic's most recent investors, Mitsui & Co., Ltd. and Sumitomo Bakelite, are also strategic partners who contribute market and technical expertise to the company's ongoing development. **www.somalogic.com**

Trasona Pharma, Inc.—In December 2003, TTO executed an exclusive option with Boulder, Colorado-based Trasona Pharma for two technologies from Health Sciences Center inventor Dr. Paul Wischmeyer, assistant professor of anesthesiology. The option agreement covered patent-pending technologies for the activation and manipulation of heat shock proteins (HSPs).

XenoPur Systems, Inc.—An earlier iteration of this company won first place at the graduate level of last fall's business plan competition run by the Robert H. and Beverly A. Deming Center for Entrepreneurship at CU-Boulder. The core technology, developed by Dr. Mark Hernandez in Boulder's civil, environmental and architectural engineering department, produces a process designed to remove heavy metals from industrial wastewater at significantly less cost than current systems.

Looking Forward

The University of Colorado is a large, diverse organization, spanning three campuses (the Denver and Health Sciences Center campuses merged in 2004). It is composed of more than 38,000 undergraduates and approximately 14,000 graduate-level students. The staff and faculty number more than 8,500, with approximately 80 percent of the 3,600 instructional faculty tenured or on tenure track appointments. In order to address such a large university with useful information about technology transfer, TTO employs a wide array of communication tools and approaches.

In the past year, TTO's staff has begun the transformation from reactivity, i.e., waiting for investigators to send invention disclosures, to a proactive approach. For example, staff members personally contact investigators after reviewing proposals that led to awarded grants, participate with teams of investigators in their early discussions with industrial collaborators, and initiate discussions with investigators about IP by reviewing confidentiality agreements, materials transfer agreements, industrial sponsored research agreements, and personal consulting agreements. Personal contacts are augmented by broader scale information dissemination such as broadcast e-mails and more than 50 seminars and presentations to university and business communities. A high level of personal and large-group stakeholder engagements and communications will be undertaken in the coming year.

This year a variety of new communication approaches will be pursued to disseminate news and information to TTO's diverse stakeholders. July 2004 marked the beginning of the TTO electronic newsletter, which will be distributed 10 times a year. TTO will complete a printed piece addressing the invention process from the perspectives of top CU inventors. Attention will also be directed to completing an "inventor's handbook." Development and dissemination of additional information bulletins will also be pursued.

Recognizing Achievement

TTO hosted its Second Annual Technology Transfer Awards in November 2003, recognizing contributions to the technology transfer process at the University of Colorado. Highlights included an introductory address by retired admiral and venture capitalist Bobby Inman; CU President Betsy Hoffman and Vice President Jack Burns presented the awards.

Award winners included Dharmacon, Inc. as the Life Sciences Company of the Year, and Drs. Richard Duke, Alex Fanzusoff, and Donald Bellgrau as joint winners of the Outstanding Life Sciences Faculty Inventors. Winners from the physical sciences included Outstanding Inventor, Dr. Christopher Bowman, and Company of the Year PowerSicel, Inc. Two new awards were presented this year: First Time Inventor Awards went to Drs. Ding Xue and Paul Wischmeyer, and Business Advisor of the Year went to Dr. Michael Artinger. In the spring, TTO also honored exemplary achievements by administrators and students on the Boulder campus in an awards luncheon. The Third Annual Technology Transfer Awards will be held November 8, 2004.

Executing the Growth Plan

During spring 2004, TTO completed The Plan for Sustainable Growth of Technology Transfer at the University of Colorado and presented the plan for review and concurrence to the university and business communities. Having built credibility and achieved initial milestones as guided by the 2002 strategic plan, it was necessary to ensure long-term financial sustainability and orderly growth. Strategic monitoring of financial targets and the use of decision rules to make determinations about the size, pace, and sequencing of initiatives will enable technology transfer at CU to reach its ambitious long-term objectives.

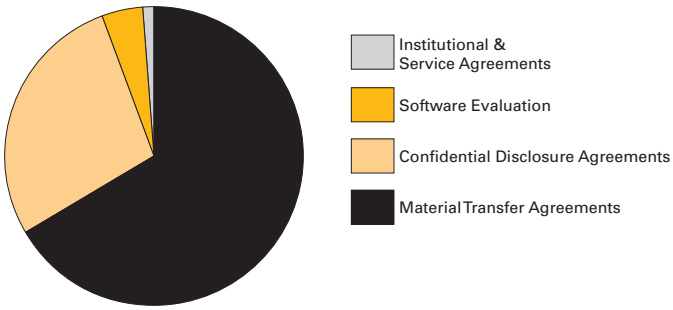
The plan, which is available at the TTO web site, focuses on reducing reliance on university financial contributions and the creation of financial security measures to ensure small reserve cushions should revenue growth be stalled for a short period. More importantly, two new research programs are also proposed. The first research initiative is the Proof of Concept program discussed in the ULEHI section of this report. The second faculty research priority, funded contingent on achieving royalty revenues characteristic of an optimistic scenario, is the creation and management of a competitive research program to advance the Vision 2010 research agenda.

Achieving and sustaining self-sufficiency for TTO over the long run is an ambitious objective. Sustainability is, however, entirely possible given the commercial potential inherent in CU's IP and license portfolio. While sustaining self-sufficiency for TTO is important for its own sake, it is also important in helping CU realize significant academic and economic benefits that are critically important to a top research university.

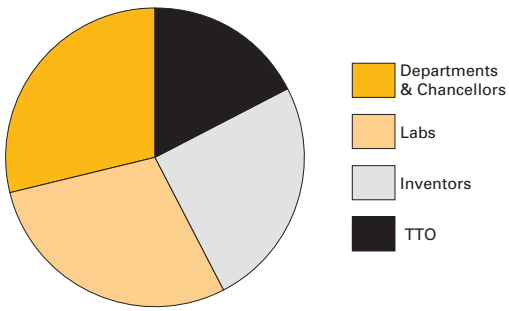
2003-04 TTO Financial Forecast

REVENUES (in $ thousands)	
Total Royalties	$5,220
TTO Portion	$1,465
President's Office Support	$550
Campus Support	$330
Patent Cost Reimbursements	$180
Interest	$354
Gifts, Grants, Contracts	$133
Carry Forward	$266
TOTAL REVENUES	$3,278
EXPENSES (in $ thousands)	
Salary & Benefits	$1,522
Administrative Expenses	$973
Speculative Patent Costs	$515
Proof of Concept	$268
TOTAL EXPENSES	$3,278

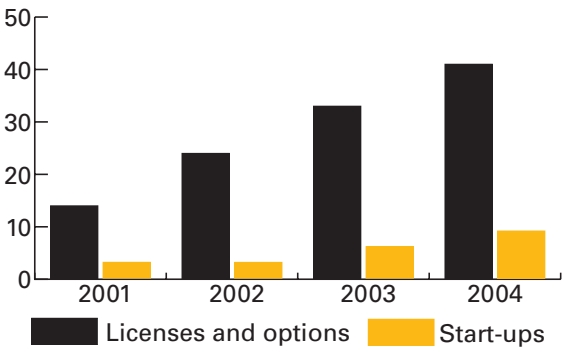
Service Agreements Executed FY 2003-2004



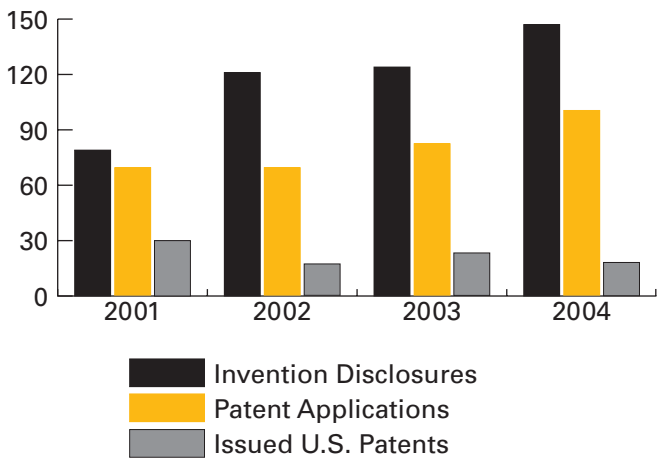
Distribution of FY 2003-2004 Royalty Income



New Licenses, Options, & Start-ups



Invention Disclosures, Patent Applications, Issued U.S. Patents



Student Interns

The Technology Transfer Office is pleased to support student internships, which form living laboratories for technology transfer. Many summer interns continue throughout the academic year. The office employs graduate and undergraduate students with a variety of academic backgrounds. The following students worked with TTO during 2003-04.

Colorado Technology Commercialization Partnership (CTCP) Interns—Summer 2004
Somer Aly—MBA/MS International Business, Denver
Michael Drapkin—JD/MS ECS/EE, Boulder
Robin Elliott—EE undergraduate, Boulder
Alex Furman—BSEE, JD/MBA, Boulder
Andrew Gano—MBA/BA Chemical/Environmental Studies, Boulder
Pamela Garl—MS Microbiology/MBA, Health Sciences Center
Joel Gratz—MS CIRES/MBA, Boulder
Eric Kreider—MS Biology/Biochemistry, MBA, Boulder
Ruperto MacQuhae—MBA/Systems Engineering, Boulder
Susana Read—DVM/MBA, NRSA Research Fellow, Health Sciences Center

CTCP Interns—Summer 2003
Justin Briggs—ChemE/MBA '04
Dale Cassidy—Biology/MBA '04
Tom Chau—MD/MBA '05
Peter Loftsgordon—EE/MBA '04
Peter Swirsky—-Biology/MBA*

Legal Interns
Jared Z. Crain, JD '04
Todd Hoy, JD '06
Andrew D. Johnson, JD '05
Tim Newlin, JD '05
Jennifer L. Owens, JD '05

Administrative Interns
Gwen Butcher-Marketing/Spanish, Boulder, BS '05
Kimberly Merryman-English/Classics, Boulder, BA '06
Natacha Pires-MBA-Health Administration, Denver '05
Elizabeth Towner-Psychology, Boulder, BA '04

* *In Memoriam:* Peter Swirsky was an MBA intern during the summer of 2003 and passed away unexpectedly in the fall. Peter brought enthusiasm, intelligence, and great dedication to his work with TTO. He will be remembered by his classmates and colleagues for his kindness, generosity, and gentle nature.

Committee on University Discoveries

The Committee on University Discoveries is composed of nine members chosen from University Governance and Administration according to Section 6 of the "Administrative Policy Statement on Intellectual Property Policy on Discoveries and Patents for Their Protection and Commercialization." The committee's two primary responsibilities are to review IP policies and procedures to implement them, and to serve as a board to hear appeals brought by university inventors concerning TTO actions. To date, no appeals have been brought to the committee.

Tom Altman, Professor, Computer Science and Engineering, Denver/Health Sciences Center
Terry Boult, El Pomar Chair of Computer Communication and Networks, Colorado Springs
John Carpenter, Associate Professor, Pharmaceutical Sciences, Denver/Health Sciences Center
Tom Chau, MD/MBA Student
Dan Dandapani, Chair, Electrical and Computer Engineering, Colorado Springs
Joe Juhasz, Professor, College of Architecture and Planning, Denver/Health Sciences Center
Tad Koch, Professor, Chemistry and Biochemistry, Boulder
James Sikela, Associate Professor, Pharmacology, Denver/Health Sciences Center
Phil Weiser, Director, School of Law, Boulder, Committee Chair

Business Advisory Board

Business Community Representatives
David Begley, Director, Ball Aerospace and Technologies Corp.
Chad Brownstein, Partner, ITU Ventures
Michael Byram, President, CU Foundation, Inc.
Greg Carlisle, Partner, Gefinor Ventures
Curtis Castleman, Chief Patent Counsel, Tomkins PLC/The Gates Corporation
Chris Christoffersen, Partner, Morgenthaler Ventures
Ken Collins, President, Replidyne Inc.
Tim Conner, Partner, Sequel Ventures
Lu Cordova, President, CTEK Venture Centers
Midge Cozzens, President & CEO, Colorado Institute of Technology
Jerry Donahue, Business Advisor, University License Equity Holdings, Inc.
Larry Gold, Chairman, Chief Science Officer, SomaLogic Inc.
Chris Hazlitt, Partner, Faegre & Benson
Gregory Johnson, Partner, Patton Boggs
Jim Linfield, Managing Partner, Cooley Godward
Mark Lupa, Partner, Tango, Inc.
Dallas Martin, VP and IP Counsel, Level (3) Communications, Inc.
Catherine Merigold, Managing Partner, Vista Ventures
Bill Mooz, Senior Director, Utility Computing, Sun Microsystems
Juan Rodriquez, Co-founder of StorageTek and Exabyte

CU Faculty and Administration Representatives
David Allen, Associate VP for Technology Transfer, CU System
Alexander (Sandy) Bracken, Director, Bard Center for Entrepreneurship, Denver/Health Sciences Center
Mike Bristow, Professor, Division of Cardiology, Denver/Health Sciences Center
Jack Burns, Vice President for Academic Affairs and Research, CU System
Robert Garcea, Professor, Pediatrics, Denver/Health Sciences Center
Leslie Leinwand, Chair/Professor, MCD Biology, Boulder
Stein Sture, Associate Dean/Professor, College of Engineering and Applied Science, Boulder

CU Technology Transfer Office Staff

Top row (left to right)
David Allen, Kathe Zaslow, Liza Eschbach, Kimberly Merryman, Ken Porter, Vivian Dullien

Bottom row (left to right)
Adam Brown, Jill Jones, Kate Tallman, Donna Sichko, Annalissa Philbin, Lynn Pae, Jennifer Eby, David Drake of ULEHI

Not present: Rick Silva

TECHNOLOGY TRANSFER
UNIVERSITY OF COLORADO

Knowledge • Innovation • Technology

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fax: 303-735-3831

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