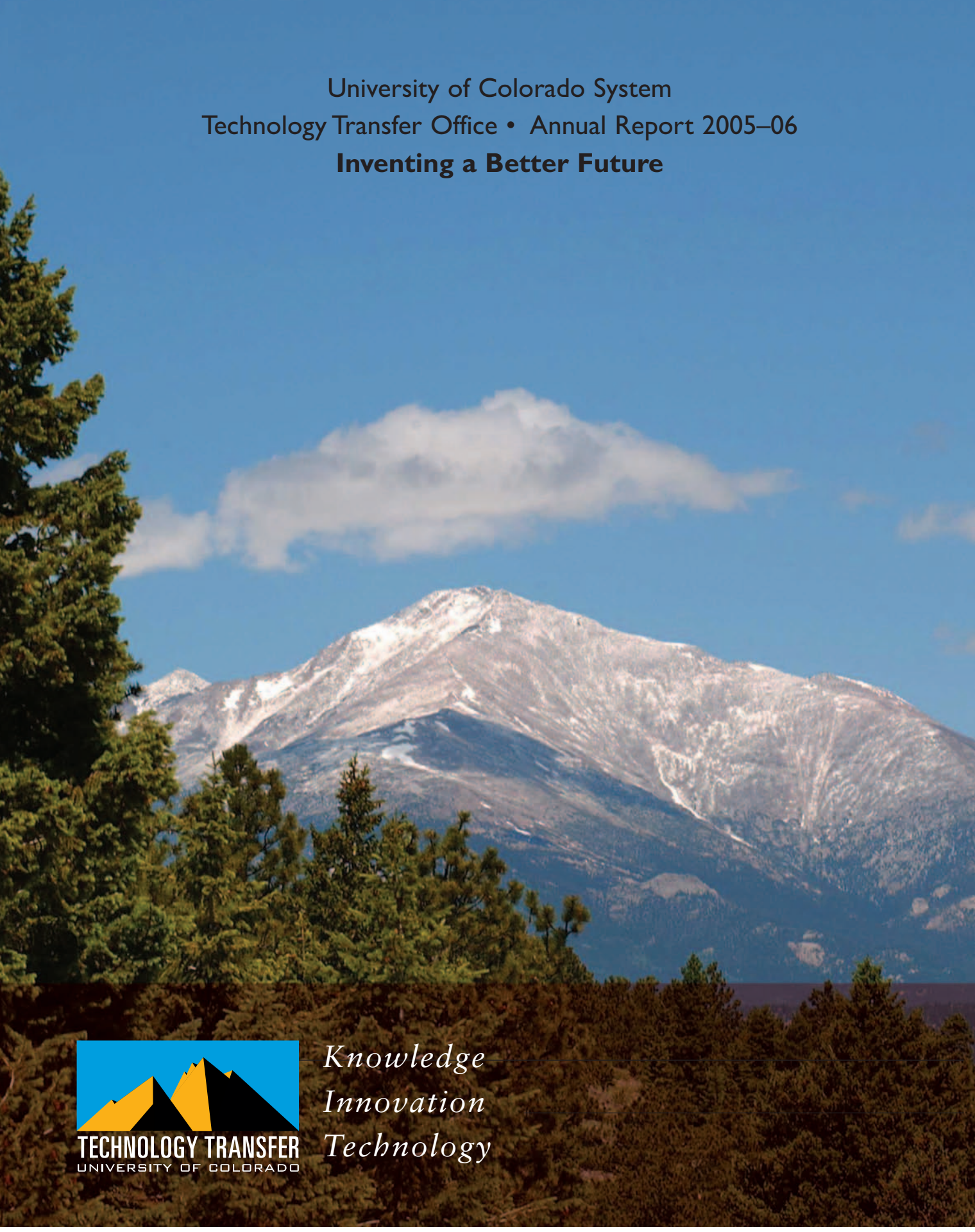
University of Colorado System

Technology Transfer Office • Annual Report 2005–06

Inventing a Better Future



TECHNOLOGY TRANSFER
UNIVERSITY OF COLORADO

Knowledge
Innovation
Technology

Message from the President

CU technology transfer has achieved national prominence at a remarkable rate. In 2002, the university developed a strategic plan, hired new leadership, and made a significant financial investment in a revitalized and reorganized Technology Transfer Office (TTO). The expectation at the time was that the financial contributions of the president's office and the chancellors would slowly diminish as technology transfer performance improved during the later part of this decade. Today, as seen in the data provided in this report, it is clear that the desired improvement in overall performance has occurred. In fact, the reorganized TTO has achieved financial self-sufficiency in just two years, with a sustainable financial condition for the near future and good prospects for long-term financial health given the pipeline of maturing technologies in the CU portfolio.

CU technology transfer benefits both the university and the people of Colorado. More than half of the income derived from technology licensing goes directly back into the CU research enterprise to promote the next cycle of discovery. Companies that license CU intellectual property develop new products and processes based on CU intellectual assets, which ultimately lead to tangible benefits for society. This report describes many of the benefits derived from CU inventions during the past year. We believe these benefits will continue to grow in the coming years.

The performance of CU technology transfer in recent years demonstrates research investigator excellence, successful collaboration with the business community, and sound stewardship. By transforming CU research into tangible benefits, the university is helping to invent a better future for Colorado, the nation, and the world.

Best regards,

Hank Brown

Hank Brown
President

Inside this report...

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.

TTO Portfolio Snapshot as of July 1, 2005

U.S. Patents in Force = 225
U.S. Patents in Prosecution = 138
Active Licenses/Options = 219
Operational Start-ups = 45

Technology Transfer Key Performance Indicators

Item/metric	Targets 04/05	Accomplishments	Targets 05/06
Inventions reported to TTO	169	177	15% increase
Patent applications (US Filings)	115	139	15% increase
Licensing transactions (options and licenses)	47	59	15% increase
Ratio of legal fee reimbursements to legal expenditures	42%	42%	48%
Royalty revenue[1]	$5.2M	$21.7M	15% increase
Start-up companies	12	9	10
IP induced sponsored research	$4.5M [2]	$4.7M	$5M
Executed Service Agreements	569	574 [3]	15% increase

(1) Does not include revenue derived from legal settlements that in Fiscal Year 2004 amounted to $28.1M and in Fiscal Year 2005 amounted to $6.7M.
(2) Conforms to the Association of University Technology Managers (AUTM) definition
(3) Service measure includes material transfer agreements, confidential disclosure, faculty consulting, software evaluation, and interinstitutional and IP agreements.

Founded in 1876 with a campus in Boulder, the University of Colorado includes three unique campuses offering more than 300 degree programs. The combined fall 2004 enrollment of the Boulder, Colorado Springs, and Denver and Health Sciences Center campuses was 52,448 (38,535 undergraduate and 13,913 graduate), including 41,470 (79%) resident students.

Nomenclature used throughout this report refers to the fact that, as of July 2004, the previous two campuses in Denver and Health Sciences Center administratively merged into one.

Technology Transfer and the Virtuous Research Cycle at CU

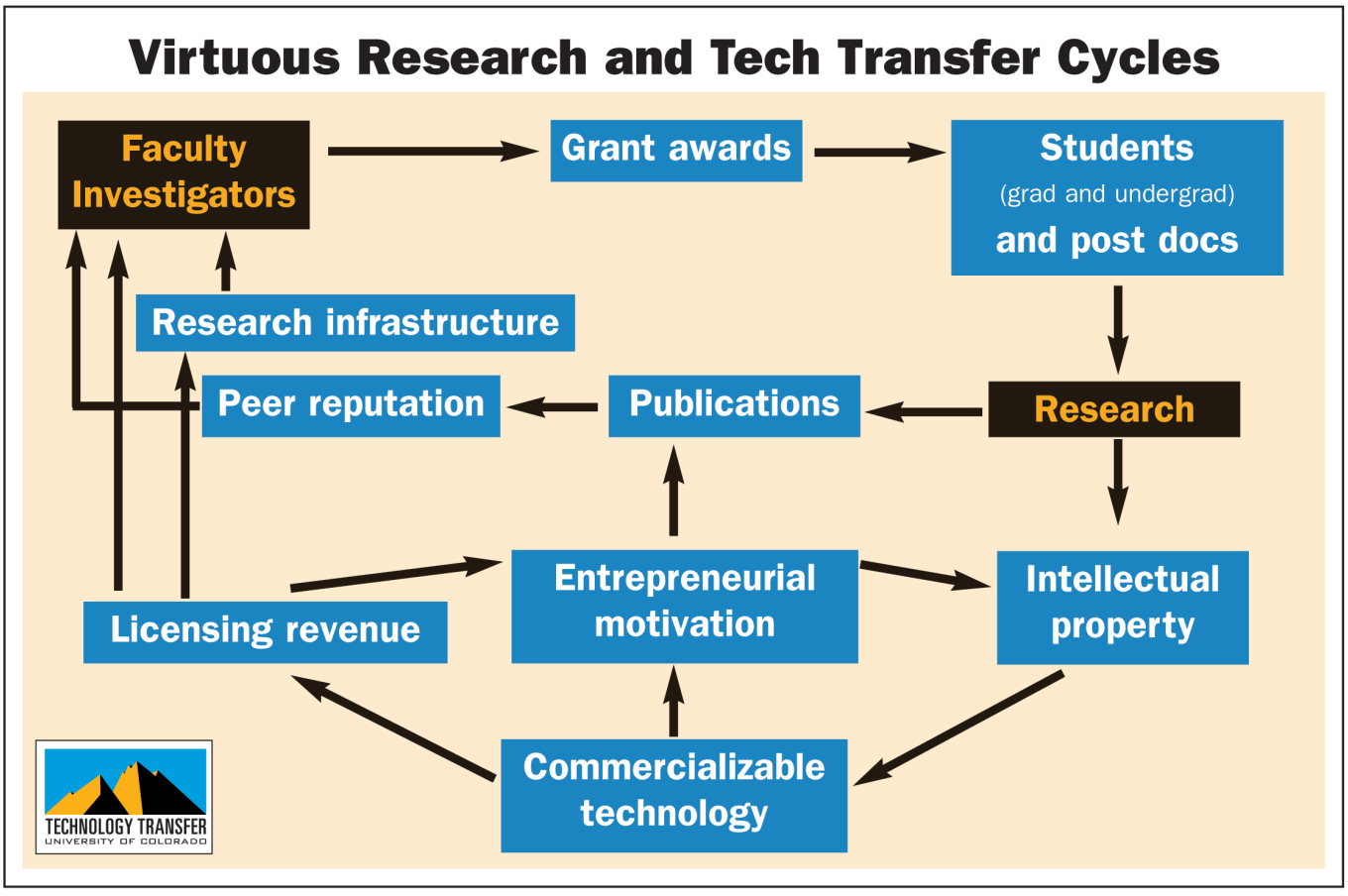
The University of Colorado has ranked sixth in recent years among the nation's leading public research universities, based on federal research expenditures. Approximately 85 percent of CU research comes from federal agency support. Because most federally supported research is discovery-oriented—pushing the frontiers of science, medicine, and technology—our research has led to greater possibilities for the university to create core intellectual property, engage in technology transfer, and foster the growth of what is often referred to as a virtuous research cycle.

Top universities strive to build their research enterprise by way of a positive feedback loop of investigators, grant awards, students, research, publications, peer reputation, and recruitment. At CU, world-class research investigators submit applications for federal grant awards. These grants provide funds for students (mainly graduate assistants and postdoctoral fellows) and support the research infrastructure (facilities, equipment, and administrative and professional research assistant support). Papers describing the process and results of CU research are submitted to peer-reviewed publications, resulting in a boost to the reputation of the research investigators and the university based on the quality of the publication. As the quality of the university's reputation improves, the prospects for additional grant funding and faculty and student recruitment also improve, which in turn elevates the quality of university research and enables placement of results in the most prestigious journals—hence the positive feedback. The fact that CU today is a leading research university is evidence that we have built a sustainable virtuous research cycle.

Technology transfer is a by-product of a virtuous research cycle that includes the creation of intellectual property during the conduct of research, the entrepreneurial motivation to develop that property into commercializable technology, and the generation of resulting licensee revenue that is then fed back into the research enterprise. In the case of CU, we have just begun to see the emergence of a robust technology transfer cycle.

Neither research nor technology transfer cycles happen by chance; both are the result of strategic thinking, effective policies, skillful execution, and wise investing. In a small number of universities across the nation (such as MIT and Stanford) a strong virtuous research cycle has led to the creation and growth of a robust technology transfer cycle. Generally, higher quality research leads to higher quality inventions, which in turn increase the prospects for licensing and commercialization.

Commercialization and licensing generate revenue and affect society through products, companies, jobs, health benefits, and improvements to quality of life. At CU, we are well on our way to building a robust technology transfer cycle that will accelerate the university's virtuous research cycle, enhance our reputation and financial resources, and provide tangible benefits to the world.



Major CU Technology Stories, July 2004 to June 30, 2005

New License Fees from Homocysteine Assay to Identify Vitamin B12 Deficiency. Following a 2004 favorable Court of Appeals ruling and a multi-million dollar award, a medical diagnostic method developed at CU-Denver and Health Sciences Center this year earned CU $5.95 million in additional settlements and new license fees. The homocysteine assay—a 1986 discovery by Robert Allen and Sally Stabler, professors of medicine, Division of Hematology, in collaboration with a Columbia University researcher—is managed for CU by Competitive Technologies, Inc. (CTT). CTT provides technology commercialization services to universities, companies, and individual inventors. The discovery is a method for identifying vitamin B12 or folate deficiency by measuring homocysteine levels. The deficiency is linked to cardiovascular and cognitive disorders and is common in seniors. Five new royalty-bearing licenses are in place with companies providing the majority of homocysteine tests, including Bayer, Abbott, and Diagnostics Products Corp. CTT estimates that 20 million of the assays are performed each year, and the number is growing.
www.competitivetech.net


Larry Gold

Macugen® Approved for AMD Treatment by the FDA. EyeTech Pharmaceuticals, Inc., headquartered in New York City, received FDA marketing approval in December 2004 for its first therapeutic product, Macugen. Macugen (pegaptanib sodium injection) treats neovascular (wet) age-related macular degeneration (AMD), a disease that can progress to severe vision loss. The drug, an anti-VEGF aptamer, was identified through a patented process invented at CU-Boulder in the 1980s by Professor Larry Gold and then-graduate student Craig Tuerk. The Gold and Tuerk SELEX process generates RNA aptamers that are selected for enhanced binding to molecular sites. The process is designed to enable more specific therapeutic effects. EyeTech announced FDA approval for wet AMD and began shipping Macugen in the first quarter of 2005. EyeTech reported second quarter 2005 gross product revenue of $49.7 million from Macugen. CU sold part of its Macugen royalty stream to a private company specializing in cash-flow securitizations. Revenue reported for fiscal year 2004–05 includes the receipt of funds under this transaction.
www.eyetech.com

Note: EyeTech was acquired by OSI Pharmaceuticals, Inc. in a definitive merger agreement on August 21, 2005.

OmniVision Acquires CDM Optics for $30 Million. Founded by R.C. "Merc" Mercure, Thomas Cathey, and Edward Dowski, Boulder-based CDM Optics was acquired in March 2005 by OmniVision Technologies, Inc. Cathey and Dowski invented the company's core technology, Wavefront Coding™, at CU. Wavefront Coding involves capturing a modified optical image through a lens, then processing the data to produce an image with extended depth of field and reduced optical aberration. CDM's processing technology allows high-quality images to be produced from simple optics, such as the systems used in camera phones. Omnivision will incorporate Wavefront Coding into optical systems that exhibit enhanced zoom and auto-focus functionality while utilizing entry-level, mass-produced optics. CDM Optics will continue to operate in Boulder as a wholly owned subsidiary of OmniVision, and all employees are expected to remain with the company. **www.cdm-optics.com**

University License Equity Holdings, Inc. (ULEHI) Makes Five Proof of Concept Program Investments. ULEHI made five investments in new companies emerging from CU research through the new Proof of Concept (POC) program. In all cases the POC program convertible debt investments were the first capitalization events for the companies. The companies are using the funds to validate the technology that is the asset base of their businesses. ULEHI is a statutorily empowered non-profit corporation that holds and manages equity in companies that license CU intellectual property. It exists solely for the benefit of CU.

Colorado Vaccine Research Receives $24 Million from the Foundation for the National Institutes of Health Awards. The Foundation for the National Institutes of Health awarded three Colorado groups $24 million for research on vaccines under the international "Grand Challenges in Global Health" initiative to treat and prevent common diseases. More than 1,500 proposals from 70 countries were submitted.

- AKTIV-DRY, LLC, a CU licensee company, received $19.5 million to work on a dry-powder version of a measles vaccine that can be inhaled through a disposable plastic device. Measles kills almost one million people annually, mostly children in developing countries. The project involves collaboration with several partners, including the University of Colorado.
- RxKinetix, Inc., a CU licensee company, received $789,000 to explore ways to make vaccines stable in a wide variety of temperatures. Most vaccines must be refrigerated, which is difficult and expensive in developing countries. RxKinetix will use inexpensive polymers already used in the formulation of many drugs. Initial work will focus on the measles and hepatitis B vaccines.
- Dr. Robert L. Garcea of CU-Denver and Health Sciences Center received $3.5 million to develop an inexpensive therapeutic vaccine designed to work in people already infected by human papillomavirus (HPV). HPV infection causes nearly 500,000 cases of cervical cancer in women each year, the majority in developing countries.


Robert Garcea

CU Endowments Funded by Technology Transfer

Technology transfer revenue has funded numerous CU endowments over the years, either from partial funds used as donor challenge matches, funds from the inventor, or laboratory and/or departmental shares of royalty or legal settlements. Approximately $32 million of technology transfer-generated funds contributed to the research endowments listed alphabetically in the table below.

Robert H. Allen, MD, Hematology Endowment	Department of Hematology, CU-Denver and Health Sciences Center School of Medicine
Robert H. & Nancy C. Allen Endowed Chair in Hematology Research	Department of Hematology, CU-Denver and Health Sciences Center School of Medicine
Charles Boettcher II Endowed Chair in Atherosclerosis Research	To support research in the atherosclerosis programs, including lipid disorders and obesity, at CU-Denver and Health Sciences Center
Henry N. Claman, MD, Endowed Chair for Clinical Immunology Research	Division of Allergy and Clinical Immunology, CU-Denver and Health Sciences Center School of Medicine
Larry Gold Molecular Biotechnology Quasi-Endowment	To support the Colorado Molecular Biotechnology Initiative
Frederic C. Hamilton Endowed Chair in Endocrinology	Department of Endocrinology, CU-Denver and Health Sciences Center School of Medicine
Cleo Meador and George Ryland Scott Professorship of Medicine in Hematology	Department of Hematology, CU-Denver and Health Sciences Center School of Medicine
UCDHSC Department of Medicine Royalty Endowment	CU-Denver and Health Sciences Center School of Medicine
Roger S. Mitchell Endowed Chair in Lung and Critical Care Research	To support research designed to conquer death and disability caused by lung diseases, including asthma, emphysema, lung cancer, and cystic fibrosis at the CU-Denver and Health Sciences Center School of Medicine
UCB Molecular, Cellular, and Developmental Biology (MCDB) Research and Educational Quasi-Endowment	To further the research and educational missions of MCDB
UCB Optoelectronic Computing Systems Center (OCSC) Graduate Fellowship Quasi-Endowment	To establish and support the OCSC Graduate Fellowship Program
Thomas L. Petty Chair for Pulmonary Research	Division of Pulmonary Sciences and Critical Care Medicine, UCDHSC School of Medicine
Bobby Rifkin Endowed Chair in Prostate Cancer Research	To advance prostate cancer research at CU-Denver and Health Sciences Center
Paul A. Seligman Endowment	Department of Hematology, CU-Denver and Health Sciences Center School of Medicine
Technology Transfer Longer-Term Investment Account	To fund the annual Proof of Concept program

Update on the 2002 Strategic Plan

The CU Technology Transfer Office (TTO) developed a strategic plan in June 2002. Review of the plan's performance against its strategies and objectives during the past three years has demonstrated no need for a major change of direction. In fact, considerable overall achievement has led to some new TTO initiatives like direct engagement with business incubator programs and the Proof of Concept (POC) program.

The context for the 2002 plan was provided by a benchmarking analysis of the eight public universities that are the most similar to CU. An update of the benchmarking analysis is shown below. On four of the five major metrics of performance, CU's growth rate is outpacing its peer institutions. Overall, CU advanced from the lowest quartile to a rank above the median. CU is among the top quartile in intellectual property licensed to start-up companies. In reporting of inventions, CU has improved but is still below the median, suggesting that the university still has considerable latent intellectual property.

Benchmark Analysis Summary*

(normalized by federal research expenditures)

	2000 CU 4-year trend	2000 Peers 4-year trend	2005 CU 5-year trend	2004 Peers 4-year trend
Invention Disclosures	Steady decline	No growth	Steady growth	Slight increase
Patent Applications	Steady decline	Slight increase	Steady growth	Steady growth
Licenses & Options	Slight decline	Slight increase	Steady growth	Slight increase
Revenue	Steady decline	Steady increase	Significant increase	Steady increase
Start-up Companies	Slight decline	Steady increase	Steady increase	Slight increase

*Data derived from the Association of University Technology Managers

TTO Reorganization and Personnel

As the demand for services provided by TTO has increased for fiscal year 2005–06, existing staff members have assumed new responsibilities and new personnel have been hired. Ken Porter was promoted to Director of Licensing. Kate Tallman and Rick Silva were promoted to Assistant Directors for the CU-Boulder/CU-Colorado Springs and CU-Denver and Health Sciences Center campuses, respectively. Jill (Jones) Penafiel at CU-Denver and Health Sciences Center was promoted to Intellectual Property Manager to spend her time primarily on material transfer agreements and confidentiality agreements. Mary Tapolsky, a licensing associate who primarily serves CU-Boulder, moved from half to three-quarter time. David Drake, former University License Equity Holdings, Inc. (ULEHI) Executive Director, left to become the Director of the Fitzsimons BioBusiness Incubator. After a national search and reorganization of the business development function back to TTO from ULEHI, Tom Smerdon was hired as New Business Development Director in May 2005. Late in fiscal year 2004–05, Elizabeth Towner was hired as a temporary marketing associate.

Fiscal year 2005–06 begins with two new licensing associates at CU-Denver and Health Sciences Center—Susana Read and Andrew Gano. Andrew interned at TTO while pursuing his MBA degree. Susana earned a doctorate in Veterinary Medicine from LaPlata National University, Buenos Aires, Argentina and an MBA with an emphasis in Technology Management from the University of Phoenix. Three half-time classified administrative assistants will be hired this year, bringing the complement of TTO staff from 14.5 to 16.75 full-time equivalents.

A Sampling of CU Inventions from the Past Year

Dr. Edward Abraham, professor of medicine in the Pulmonary Sciences and Critical Care Division at CU-Denver and Health Sciences Center, has identified a possible method for treating sepsis. Specifically, he has identified the kringle domain (KD) of an activator that is an important pro-inflammatory domain. Dr. Abraham has found that blocking the KD decreases organ injury, improves survival for those afflicted with sepsis, and may hold promise in the treatment of other diseases, infections, and injuries.


Natalie Ahn

Professor Natalie Ahn and Associate Professor Katheryn Resing, both from the CU-Boulder Department of Chemistry and Biochemistry, collaborated with Professor Krzysztof Cios from the CU-Denver and Health Sciences Center Department of Computer Science and Engineering on software to simplify the process of analyzing data produced by mass spectrometry. The software is a novel set of integrated methods for processing protein databases to improve identification peptide sequences. Once available, it will save mass spectrometer users hours of tedious data analysis.

Professor Chris Bowman and his laboratory group from the CU-Boulder Department of Chemical and Biological Engineering described in *Science* a novel crosslinked polymer that, upon exposure to light, exhibits dramatic stress and/or strain relaxation without any concomitant change in material properties. Potential applications include introducing stress gradients in cross-linked materials, allowing shape-change or actuation phenomena, eliminating shrinkage stress in dental materials and reinforced composites, alleviating unwanted birefringence in optical materials, and permitting the formation of arbitrary shapes after cure (i.e., molding).

Dr. Gregory Everson, professor of medicine, Division of Gastroenterology and Hepatology, and medical student Michael Martucci have developed and validated a sensitive test to measure liver function in humans. They use clearance techniques and minimal numbers of samples of naturally occurring compounds to define metabolic and flow-related liver functions.

Former CU-Boulder Associate Professor Kenneth Gall, along with graduate students Jeffrey Tyber and Christopher Yakacki of the CU-Boulder Department of Mechanical Engineering and Reed Bartz, assistant professor in the Department of Orthopedics and Sports Medicine at CU-Denver and Health Sciences Center, developed a novel fixation device for anterior cruciate ligament replacement. This group is using state-of-the-art polymer technology to improve fixation devices in orthopedics.

Assistant Professor Ryan Gill and colleagues in the CU-Boulder Department of Chemical and Biological Engineering have developed an integrated bio-refining "toolkit." In bio-refining, biomass is used as a feed source for organisms that produce desired organic acids for subsequent conversion into valuable derivative chemicals. Because organic acids are toxic to their producing organisms, the organisms are engineered to tolerate the organic acids. The toolkit facilitates process engineering and also permits the precise identification of the gene(s) responsible for tolerance to organic acids, ultimately improving process optimization.

A CU-Boulder research team—including **Carl A. Koval and Richard D. Noble**, professors of chemistry and biochemistry and chemical and biochemical engineering, respectively, Christine E. Evans, a postdoctoral student, and Mya Norman, who recently completed her PhD—has developed a pumping and pressurization system that has no moving parts. Electrochemical reactions are used to create a charge imbalance across an ionomer membrane. The e-Pump is scalable and has generated pressures in excess of 20 atm, characteristics that are important for applications ranging from biomedical lab-on-a-chip systems to morphing mechanical structures.

While studying the muscle activation and metabolic requirements of walking, **Roger Kram,** associate professor in the CU-Boulder Department of Integrative Physiology, developed a system that prevents falls and enables active facilitation of the leg swing needed to walk. Two evening CU-Boulder Leeds School of Business MBA students, Geoff Synder and Jeanine Lee, will be working with Professor Kram to evaluate the business aspects of this system during their upcoming business plan class with Frank Moyes, instructor in the CU-Boulder Deming Center for Entrepreneurship.


Dale Lawrence

Associate Professors Dale Lawrence and Lucy Pao of the CU-Boulder Departments of Aerospace Engineering and Electrical Engineering, respectively, have designed many innovative elements in developing a prototype demonstration of a five-degrees-of-freedom, low-cost, and reduced-footprint haptic system. Commercially available haptic devices, which allow a user to interact with a computer by receiving tactile feedback, are expensive and have a relatively large (tabletop) footprint, limiting their usefulness. Reducing the size and cost of haptic interfaces—while retaining fidelity—enables a variety of potential increased uses, including training, gaming, immersive technologies, scientific/data visualization and interpretation, design, and multi-dimension rendering.

Professor Simon Levinson, CU-Denver and Health Sciences Center Departments of Physiology and Biophysics and Neuroscience, disclosed a method for creating an artificial bio-battery that converts bio-energy to a form suitable for use by modern day electronics. The device integrates a man-made support with cultured epithelial cells to generate enough voltage to support real-world devices. The recently conceived bio-battery may one day serve as a power source for prosthetics and implantable medical devices.

Associate Professor Charles Edelstein and former Associate Professor Chirag Parikh, CU-Denver and Health Sciences Center Division of Renal Disease and Hypertension, disclosed a technology for early detection of acute renal failure (ARF). They have developed and extensively tested the reliability of using a urinary biomarker for early diagnosis of ARF in humans.

Assistant Professor Leland Shapiro of the CU-Denver and Health Sciences Center Division of Infectious Disease has disclosed two technologies. One relates to the use of serine protease inhibitors to promote graft survival in islet transplantation for diabetic patients. The other is the discovery of a novel target to which alpha-1-antitrypsin (AAT) might bind and produce all of the biological effects seen with this serine protease inhibitor, such as diminishing inflammatory cell infiltration into transplanted cells.

Creating New Businesses from CU Intellectual Property

A Collaborative Process Between the University and the Community

The CU Technology Transfer Office (TTO) serves as a catalyst between inventors, entrepreneurs, business advisors, students, and service providers to support the creation and early development of start-up companies based on CU technology. In fiscal year 2004–05 nine such start-ups were formed, and they are identified below. TTO supports the start-up route for commercialization (as an alternative to licensing the CU intellectual property to an established company) for intellectual property that includes the following characteristics: a platform or core technology to be commercialized, the aspiration of the inventor, a third-party business champion, and a workable plan for managing conflicts of interest. For about two-thirds of start-up licensees, TTO works with the business community to connect the company with interested entrepreneurs and others who can potentially fill the management and services gaps confronting university-based start-up companies. In addition, TTO provides market feasibility and business planning assistance for selected CU start-up candidates through its summer internship program, student class engagements, and relationships with volunteer business advisors. Besides the involvement of business schools on all three CU campuses, two programs that provide considerable assistance to the TTO new business development process are the CU School of Law's Entrepreneurial Law Clinic and the Boulder Innovation Center's technology transfer business track.

Until recently, a CU research investigator had to invest a great deal of time, energy, and capital to create a company based on his or her invention. Today, the TTO new business development operation actively helps the investigator bring local and university resources into the business planning and launch activities of the start-up. In a few cases the inventors work independently of the TTO process to form the new company, but these types of engagements are no longer the norm.

Prior to December 2004, the new business development function was a responsibility of University License Equity Holdings, Inc. (ULEHI), a State of Colorado statutorily empowered 501(c) (3) non-profit company that exists solely to serve the University of Colorado. The university decided this year to reassign new business development responsibilities to TTO, and Tom Smerdon was hired as the director of new business development. Today, the two functions of ULEHI are: 1) to manage the portfolio of equity received from start-up licensees in consideration for the grant of rights to develop and commercialize CU intellectual property and 2) to oversee the CU Proof of Concept (POC) program. In fiscal year 2004–05, ULEHI has been involved in the liquidation of equity associated with a small number of companies, including the purchase of CDM Optics.

Starting in the fall of 2004, ULEHI initiated the POC program to provide funds to support development and validation of promising early-stage CU technologies. These funds, which are provided in the form of a $100,000 convertible loan, are awarded on a competitive basis in the fall and spring with the involvement of an outside panel of venture capitalists. In fall 2004 two CU start-ups won POC investment awards; three received investment awards in spring 2005.

Fiscal Year 2004–05 Start-up Companies

ARCA Discovery, Inc.

BioTech Cures

CLP MicroTechnologies, Inc.

Gleeco, Inc.

OncoLight, Inc.

Proteome Resources, Inc.

Securics, Inc.

Serendipity Pharmaceuticals, Inc.

Windom Peak Pharmaceuticals, Inc.

Fiscal Year 2004–05 Proof of Concept Program Investment Recipient Companies

OncoLight, Inc.

Securics, Inc.

Taligen, Inc.

WindomPeak Pharmaceuticals, Inc.

XenoPur Systems, Inc.

Notable Technology Development Collaborations


Marvin Caruthers

Caruthers Collaborates with Agilent and DARPA to Simplify DNA Synthesis. CU-Boulder Professor Marvin Caruthers invented solid phase DNA synthesis in the early 1980s. Agilent (Palo Alto, CA) and the Defense Advanced Research Projects Agency (DARPA) are investing $6.1 million to work with Professor Caruthers to improve the widely utilized process. The new two-step synthesis has been described in the *Journal of the American Chemical Society* (2003) 125, 13427 –13441. Reducing the number of steps per cycle from four to two allows DNA to be produced cheaper, faster, and with reduced production of hazardous wastes. While the technique can be used generally, Agilent expects the method to be ideal for the chip-sized miniaturization and highly parallel batch processing required to produce DNA microarrays.

Rose Biomedical and CU Awarded Two NIH Phase I Small Business Technology Transfer Research (STTR) Grants. CU-Boulder Professor Dale Lawrence invented a dexterous micromanipulator enabled by novel actuator joints. Working with Rose Biomedical Development Corporation (Denver, CO), a design has been created for a MicroFlex Scope™, which is a flexible diagnostic and surgical tool. The tool, with a 3-millimeter diameter, will contain optics for visualization, as well as channels through which to perform surgical work or to deliver therapeutic agents. The flexible design will allow navigation of small, delicate, and intricate areas in the body like the sinuses, lungs, and ears. In May, the National Institute of Allergy and Infectious Diseases awarded a $150,000 Small Business Innovation Research (SBIR) grant to Rose and CU for proof-of-concept studies to apply the MicroFlex Scope to navigation of the sinuses. In June, the National Heart, Lung, and Blood Institute awarded Rose and CU a $150,000 SBIR grant to investigate the efficacy of the MicroFlex Scope for the detection of lung cancer. **www.rosebiomed.com**

CU Cancer Center Partners with National Cancer Institute, Biopharma Businesses on AP 4 Program. The University of Colorado Cancer Center, the Rocky Mountain region's only nationally designated comprehensive cancer center, partnered with the National Cancer Institute (NCI) and several biopharma companies to form a preclinical oncology research consortium. The corporate partners include Array BioPharma, Inc. (Boulder, CO), AstraZeneca PLC (Wilmington, DE), GlobeImmune, Inc. (Aurora, CO), Eli Lilly and Company (Indianapolis, IN), OSI Pharmaceuticals, Inc. (Melville, NY), and Tapestry Pharmaceuticals, Inc. (Boulder, CO). A board composed of partner representatives will select translational research proposals that will be jointly funded by the NCI and the corporate partners and conducted and administered by the University of Colorado. **www.uccc.info**

CU Medical School Forges Strategic Alliance with Affymetrix Translational Medicine. In the interest of enhancing the University of Colorado's rich clinical trial capabilities with Affymetrix, Inc. (Santa Clara, CA) GeneChip® technology, TTO participated in the creation of the Affymetrix Translational Medicine Strategic Alliance with the University of Colorado School of Medicine. This collaboration is intended to facilitate genetic analysis of clinical tumor and blood samples for personalized medicine/patient selection, therapeutic response monitoring, and discovery and validation of biomarkers for early detection and diagnosis.

The Colorado Power Electronics Center

The increasing sophistication of electronic devices depends on efficient power management and display lighting. The Colorado Power Electronics Center (CoPEC), an industrial consortium in the CU-Boulder College of Engineering and Applied Science Department of Electrical and Computer Engineering is the source of numerous power management and display technologies with immediate commercial applications. In the past year alone, Professors Dragan Maksimovic and Regan Zane have disclosed seven CoPEC innovations that have resulted in 19 licenses to five international electronics firms. **ece.colorado.edu/~pwrelect**

Cooperative Intellectual Property and Licensing Service Agreements

In July 2004 TTO entered into agreements to provide intellectual property and technology licensing services to **The Children's Hospital (TCH) and the Denver Health and Hospital Authority (DHHA)**. These service agreements grew out of long-standing and productive affiliations between CU and the two health care and research institutions. Currently, TTO provides technology evaluation, intellectual property protection, and commercialization services to support more than a dozen inventions of clinical practitioners at these two institutions, primarily in the fields of software and data, medical devices, and diagnostics. One invention has already become the basis for a non-profit institute. TTO provides advice and assistance to research investigators and administration for protecting intellectual property arising in the course of federal agency and industry-sponsored research.
www.thechildrenshospital.org, www.denverhealth.org

At the Colorado Springs campus, TTO cooperates with the El Pomar Foundation-funded **Colorado Institute for Technology Transfer and Implementation (CITTI)** in its mission to support economic development by providing technology-centered enterprises access to capital and business information. CITTI serves as a bridge between the intellectual resources of CU-Colorado Springs and the high-tech community, focusing on technology development consulting in the areas of engineering, technology, and finance; information sharing on the topic of technology development; and support for technology transfer. TTO contributes financial support, personnel, and expertise in leveraged and accelerated technology transfer for building and

managing teams of CU and external professionals. These invention disclosure teams promote and guide development of CU-Colorado Springs inventions. In addition, TTO assists investigators and CU-Colorado Springs administrators with intellectual property contractual matters. **www.citti.uccs.edu**

Biological Materials and Other Service Agreements Related to Research and Intellectual Property at CU

TTO completed more than 500 material transfer agreements (MTAs) and other research-related service agreements during fiscal year 2004–05, further expanding its service mission to the CU research community. In addition to MTAs and confidentiality agreements (CDAs), TTO increased service in the provision of intellectual property language review in clinical trial agreements, sponsored research agreements, and consulting agreements for adherence to university intellectual property policy. Working closely with the campus Offices of Contracts and Grants, the Office of University Counsel, centers and institutes, academic administration, and research investigators, TTO facilitates research relationships with other academic institutions and industry partners.

Eliminating Barriers to Commercialization of Software and Data

Software programs and databases developed at the University of Colorado can be incorporated into a variety of commercial products. However, companies are often unwilling to incorporate untested code or data into their products. This behavior has been a barrier to the commercial adoption of University of Colorado software and data. Now software and database developers are working with TTO to break down that barrier by providing low-cost, limited access to the technology.

- Developers creating applications for people with cognitive disabilities can freely use the Memory Aiding Prompting System developed in the Center for Lifelong Learning and Design at CU-Boulder. Anyone selling those applications must work out a revenue sharing agreement with the university.
- Companies can evaluate software for six months by signing a low-cost demo license. If they choose to develop and market a commercial product, they pay for a full commercial license.
- Users can make limited queries on a genome search tool for free, but must pay for more extensive searches.
- Companies can receive a small sample of speech data for free in order to determine whether it will be compatible with their needs. If they are satisfied, a standard commercial license is available.

These mechanisms allow potential commercial partners to ease their skepticism about "research code" at a relatively low cost. Once they see the quality and value of CU software and data, they are more willing to pay for the licenses.

Center for Spoken Language Research

The Center for Spoken Language Research (CSLR) was established at CU-Boulder in 1998. The CSLR mission includes inventing the next generation of conversational systems, contributing to the basic scientific knowledge of speech processing, and creating and sharing language resources. Over the past six years CSLR has continued to distribute leading-edge technology through a variety of commercial and open source mechanisms. **cslr.colorado.edu**

- Most recently, CSLR released free demos of eight tools for natural language processing (NLP), technology that allows a computer to understand what a user is saying by assigning semantic roles to each word in the sentence.
- CSLR also developed CU Animate, technology for a 3-D animated figure with realistic lip movements that automatically correspond to prerecorded or machine-generated speech.
- CSLR also released their speech CORPUS, extensive collections of speech audio recordings taken from different parts of the United States. Some leading companies license the CORPUS collections to make their speech recognizers better at understanding all kinds of speech.
- SONIC is a large vocabulary speech recognition system used in a number of research projects at CSLR and other universities. SONIC is unique because it can accurately recognize a wide range of words and can be quickly trained to recognize speech in other languages. Three companies have licensed SONIC and put it into their commercial products for sale to end users. In 2004–05, TTO began offering distribution licenses for SONIC, which allow third-party companies to improve and sell the software with support and documentation.

Recognizing Technology Transfer Achievement

The CU Technology Transfer Office (TTO) held its third annual awards ceremony on the evening of November 8, 2004 to celebrate CU inventors, licensee companies, and advisors who have assisted TTO in the past year. Over 150 academic, business, and government notables attended. The law firm of Patton Boggs LLP sponsored the awards ceremony. The Patton Boggs LLP Technology Transfer Awards were given in eight categories. By award category the winners were:

New Inventors of the Year
Jean Hertzberg, Associate Professor of Mechanical Engineering, College of Engineering and Applied Science, CU-Boulder
Terrance Boult, Professor of Computer Science, College of Engineering and Applied Science, CU-Colorado Springs
Jeffrey Stansbury, Professor, School of Dentistry, CU-Denver and Health Sciences Center

Business Advisors of the Year Award
Chris Christoffersen, Morgenthaler Ventures
Tim Connor, Sequel Ventures
Mark Lupa, Tango Group

Life Sciences Licensee Companies of the Year
Archemix Corporation, Boston, MA
Replidyne, Inc., Louisville, CO

Physical Sciences/Engineering/Information Technology Company of the Year
Pearson Knowledge Technologies (formerly Knowledge Analysis Technologies), Boulder, CO

University of Colorado at Boulder Inventors of the Year
Steven George, Professor, Chemistry and Biochemistry and Chemical and Biological Engineering
Alan Weimer, Professor, Chemical and Biological Engineering

University of Colorado at Colorado Springs Inventor of the Year
Karen Newell Rogers, Associate Professor, Biology

University of Colorado at Denver and Health Sciences Center Inventor of the Year
V. Michael Holers, Professor, School of Medicine, Rheumatology

Pinnacles of Inventorship Inductee
Robert E. Sievers, Professor, Department of Chemistry and Biochemistry, CU-Boulder


V. Michael Holers


Robert E. Sievers


Stein Sture

On April 12, 2005, Ken Porter of TTO hosted the second annual **Boulder Campus Technology Transfer Awards.** Stein Sture received the Boulder Administrator Award for his work as Associate Dean of Research, School of Engineering and Applied Science, and for his efforts to foster collaboration between engineering researchers and TTO. The Boulder Student Award went to the Capstone Design Team "Aqualung" for their work on a dual-use visualization bronchioscope and laryngoscope. The team "Aqualung" consists of four students: Robin Elliot, Greg Newcomb, Freddie Oteromatos, and Minhaz Ali.

Updates on CU Technology Licensee and Start-up Companies

Steven George and Alan Weimer

ALD NanoSolutions, Inc. has recently entered into a relationship with a second commercial material partner. ALD NanoSolutions and NanoDynamics, Inc., of Buffalo, New York, will design five new materials under technology development and license agreements. In 2005 the company began pilot scale operations in its Broomfield, Colorado facility. ALD NanoSolutions received two new Phase I STTR grants, bringing the total amount of funding from the SBIR/STTR programs from various federal agencies to $2.4 million for seven programs since June 2003. In addition to the new grants, CU was awarded U.S. patent number 6,913,827, "Nanocoated primary particles and method for their manufacture," which was exclusively licensed to ALD NanoSolutions. ALD NanoSolutions, Inc. was founded in 2002 by P. Michael Masterson, Dr. Karen Buechler, and CU-Boulder Professors Steven George and Alan Weimer. The company's proprietary technology is based on atomic layer deposition (ALD) coating chemistry methods developed by Drs. George and Weimer for depositing ultra-thin films on particulate surfaces. **www.aldnanosolutions.com**

Allos Therapeutics, Inc., located in Westminster, Colorado, is a biopharmaceutical company focused on developing and commercializing innovative small molecule therapeutics for the treatment of cancer. In December 2004 Allos acquired an exclusive worldwide license from the University of Colorado, the University of Salford, and Cancer Research Technology to develop and commercialize a new chemotherapeutics agent known as RH1. RH1, developed by Professor David Ross, CU-Denver and Health Sciences Center, is a targeted cytotoxic prodrug that is bioactivated by the enzyme DT-diaphorase, which is over-expressed in many tumors relative to normal tissue, including lung, colon, breast, and liver tumors. The compound is currently being evaluated in patients with advanced solid tumors refractory to other chemotherapy regimens in an open label, Phase 1 dose escalation study at Cancer Research UK. **www.allos.com**

AlphaSniffer, LLC, a Boulder-based company started in 2003, recently finished a Phase I SBIR/NASA grant and submitted its proposal for Phase II with principal investigator Oyvind Nilsen, graduate of the CU-Boulder College of Engineering and Applied Science Mechanical Engineering Department. A prototype of the instrument used to measure air and water quality on space flights was tested and flown to Johnson Space Center. These tests have applications in the commercial sector.

William Arend

Amgen, Inc., headquartered in Thousand Oaks, California, manufactures three drugs at its Longmont, Colorado facilities, including Kineret®, a drug based on the work of William Arend, professor of medicine, Rheumatology Division, CU-Denver and Health Sciences Center. The first drug to specifically inhibit the inflammatory properties of interleukin-1 (IL-1), Kineret was approved for rheumatoid arthritis in 2001 and Amgen completed Phase II trials for osteoarthritis last year. Amgen originated from a research and development enterprise founded in the 1980s with a license to discoveries from Marvin Caruther's CU-Boulder lab. Now the world's largest independent biotechnology company, Amgen reported revenues of $3.2 billion in the second quarter of 2005. Currently the company sponsors research at CU and reports that it is investing millions to develop and expand its two Colorado plants, which employ 750 people in Boulder County. **www.amgen.com**

Archemix Corporation, founded in 2001 based on CU's SELEX technology and other non-CU intellectual property, has become the biopharmaceutical leader in the development of aptamers as a new class of directed therapeutics for the prevention and treatment of chronic and acute disease. Located in Cambridge, Massachusetts, the company has forged strategic alliances with three other companies formed around CU technology—EyeTech Pharmaceuticals, SomaLogic, Inc., and Sirna (formerly Ribozyme Pharmaceuticals, founded in Boulder in 1994). Archemix has several collaborations in progress, including joint research with Nuvelo for developing an anti-thrombin aptamer in Phase I clinical trials for use in coronary artery bypass surgery. **www.archemix.com**

Linda Watkins

Avigen, Inc., located in Alameda, California, has sponsored research in collaboration with Dr. Linda Watkins—professor of psychology and director of the Interdepartmental Neuroscience Program at CU-Boulder—since 2003. In association with Dr. Watkins, the company is investigating anti-inflammatory therapies for neuropathic pain and the role of glial cells in controlling chronic pain. Their work is part of an emerging realization that glial cells, in addition to neurons, may serve as effective targets for pain control. A current focus is interleukin-10 (IL-10), an anti-inflammatory protein, and related drug candidates for combating chronic pain and other central nervous system disorders. **www.avigen.com**

BaroFold, Inc., with headquarters in Boulder, Colorado and lab facilities in Lafayette, Colorado, has achieved profitability through the signing of over a dozen agreements with major biotechnology and pharmaceutical companies for the use of high hydrostatic pressure to disaggregate and refold biotherapeutic proteins. In the past year, BaroFold has demonstrated that its PreEMT™ technology is the preferred method to reduce or eliminate soluble aggregates in final product formulations for protein biotherapeutics. Soluble aggregates have been identified by the U.S. Food and Drug Administration as a serious safety concern. Lower soluble aggregate levels can provide a safer, more effective drug. BaroFold is expanding its presence in the non-commercial/academic laboratory through equipment, disposable, and reagent sales. In addition, BaroFold's intellectual property portfolio has been expanded significantly with patent filings covering a range of new applications, equipment, and disposable designs. **www.barofold.com**


Roop Mahajan

Cardiac Access, LLC, of Denver, Colorado, has continued to develop its proprietary diagnostic decision support system for quickly and accurately diagnosing suspected heart murmurs in the pediatric population. So far, the company has trained its artificial neural network (ANN), which was developed at CU-Boulder, with over 1,500 patient data sets acquired by the Cardiac Care Center at The Children's Hospital (TCH) in Denver. A majority of the funding has come from various SBIR grants awarded by the National Institutes of Health. Cardiac Access' scientific founders are Drs. Roop Mahajan and Robin Shandas from CU-Denver and Health Sciences Center, and Drs. Curt DeGroff and Lilliam Valdes-Cruz from TCH.

Confi-Dental, a division of Septodont USA located in Louisville, Colorado, has an exclusive option to dental restorative materials developed by Drs. Jeff Stansbury, CU-Denver and Health Sciences Center, and Chris Bowman, CU-Boulder. The CU technology is photopolymerizable monomers that can be combined with Confi-Dental's materials to produce dental composites. The company is now testing the fillers, and has found that the new material has excellent properties, with very high monomer conversion and low polymerization shrinkage and stress. These characteristics are important for dental composites that do not degrade over time. Confi-Dental expects to begin marketing the product in mid-2006. **www.confi-dental.com**

CLP MicroTechnologies, Inc., a 2004–05 start-up company located in Boulder, Colorado, is in the process of raising funds, mainly through SBIR/STTR proposals, to support research efforts on commercializing their microfabrication technology and developing diagnostic microfluidic devices. Brian Good, PhD, a recent graduate of the CU-Boulder Department of Chemical and Biological Engineering, has been hired to lead these efforts. Microfluidic devices have a wide range of applications from genetic analysis to cancer detection to environmental monitoring. **www.clpmt.com**

Dharmacon, Inc. became a wholly owned subsidiary of Fisher Scientific International, Inc. in March of 2004 and continues operations in Boulder, Colorado—considered by many to be the "RNA Capital of the World." Over the past year Dharmacon, which specializes in creating reagents for RNA interference (i.e., "gene silencing"), entered into collaborations for genomic-based drug discovery with Wyeth, Genentech, and Cancer Research UK. Two new siRNA libraries were introduced that cover over 20,000 genes each for the rat and the mouse genomes. A collaboration with Millennium Pharmaceuticals included delivery of over 100,000 siRNAs that target more than 21,000 human genes. The siARRAY® genome-wide library is the first complete library targeting genes across the entire human genome. **www.dharmacon.com**


Tom Cech

Geron Corporation, of Menlo Park, California, is the exclusive licensee of telomerase discoveries from Tom Cech's CU-Boulder lab. The Cech lab contributed to understanding the telomerase enzyme's key role in cell aging and proliferation. Geron this year reported promising data from clinical trials of a therapeutic vaccine for prostate cancer that uses a CU-patented human protein. Under Geron sublicenses, numerous biotechnology and pharmaceutical firms are widely researching applications for the joint CU–Geron discovery of human telomerase reverse transcriptast (hTERT). Geron and its collaborators currently target telomerase for treating cancer and diseases and injuries characterized by cell senescence and degeneration. Together with CU, Geron owns an extensive, worldwide portfolio of telomerase patents. **www.geron.com**

GlobeImmune, Inc. is a biopharmaceutical company pioneering the discovery, development, and manufacturing of potent, targeted molecular immunotherapies called Tarmogens™ for the treatment of cancer and infectious diseases. The company was founded by Drs. Donald Bellgrau, Richard Duke, and Alex Franzusoff. Tarmogens (Targeted Molecular Immunogens) are whole, heat-killed recombinant *Saccharomyces cerevisiae* yeast genetically modified to express one or more protein antigens that program the immune system to specifically target and eliminate diseased cells. Tarmogens are avidly taken up by antigen presenting cells, which mobilize cytotoxic T lymphocytes (a.k.a "killer T cells") against cells expressing the target and eliminate them. GlobeImmune's patented Tarmogen platform has a number of advantages over current approaches because Tarmogens are not neutralized by the host immune system, do not require a custom vaccine approach, and are simple to identify and manufacture. The company's lead product series, GI-4000, for the treatment of cancers of the lung and gastrointestinal tract, is in late Phase 1 clinical trials. The company initiated a Phase 1b trial for its second product, GI-5005, a Tarmogen for the treatment of chronic hepatitis C infection in July 2005. **www.globeimmune.com**


Henry Kapteyn

Kapteyn-Murnane Laboratories Inc. (KMLabs), located in Boulder, Colorado, manufactures ultrashort-pulse laser systems for research and completed its fiscal year 2004–05 with an increase in revenue of 80 percent over the year 2003–04 and a substantial increase in profit. KMLabs is a spin-off from a leading research group in laser science, CU-Boulder Professors Margaret Murnane and Henry Kapteyn. KMLabs introduced its Dragon™ high-power ultrafast laser amplifier system—based on CU-licensed technology—in 2003. The Dragon is the first commercially-available high-power laser system that uses cryogenically-cooled laser material, making it possible to obtain output powers up to an order of magnitude greater than similar previous-generation lasers. Ultrafast lasers can generate short pulses of intense light, with peak power approaching a terawatt (1012 W) in a tabletop laser. These pulses can be used for the generation of coherent x-rays, for precision machining, and for basic studies of dynamics processes. **www.kmlabs.com**

Keystone Biomedical, Inc. is an early-stage drug development company located in Westminster, Colorado, focusing on the commercialization of its primary drug program, bucillamine, in multiple disease areas with significant unmet need. A Phase II clinical trial is scheduled to begin shortly for the drug's lead application—the prevention of cardiac tissue damage following heart attack. The company has recently been awarded an STTR grant from NIH and is nearing the completion of a Series A private equity placement. **www.keystonebio.com**

Lohocla Inc., a tenant at the Fitzsimons Redevelopment Authority Bioscience Park, is continuing its research and development work on diagnostic markers for alcoholism. During the past year Lohocla completed its Phase I SBIR grant on proteomic markers for alcohol intake and was awarded a Phase II grant of $1.2 million. Lohocla also secured two SBIR grants worth $90,000 each to further its research on the genetic markers of alcoholism. An additional SBIR contract of $1 million is pending and discussions with industry partners and investors are underway. Lohocla was founded by Dr. Boris Tabakoff, professor and chair of the Department of Pharmacology at CU-Denver and Health Sciences Center. Lohocla's acting Chief Operating Officer (COO) is Dr. Vivian Dullien.

Myogen, Inc., located in Broomfield, Colorado, is a biopharmaceutical company focused on the discovery, development, and commercialization of small molecule therapeutics for the treatment of cardiovascular disorders. Myogen completed an IPO in 2003 and began a drug discovery collaboration with Novartis the same year. Myogen currently has one product in Europe and two candidates in late-stage clinical development. Highlights of the past year include the achievement of three milestones under the collaboration with Novartis, an expansion of that collaboration to include the histone deacetylase inhibitor program, the completion of enrollment of a pivotal Phase 3 clinical trial to examine ambrisentan, granted orphan drug status in Europe for the treatment of pulmonary arterial hypertension, and the completion of the enrollment of a Phase 2b clinical trial to examine darusentan in resistant systolic hypertension. **www.myogen.com**


Karen Newell Rogers

Newellink USA, Inc., an early-phase biopharmaceutical company based on the work of M. Karen Newell Rogers, CU-Colorado Springs associate professor of biology, is now exclusively based in Colorado Springs, Colorado. In November 2004 Newellink was named the "Outstanding New Technology Company" by the community-sponsored Celebrate Technology event in Colorado Springs. In June 2005 the company relocated its primary offices from Los Angeles to Colorado Springs. Newellink has identified three candidate cancer drugs termed NUI-100, NUI-200, and NUI-300. Proof-of-concept studies have been performed and 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, breast, and lung cancers. The company is working with CU-Denver and Health Sciences Center investigators 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 I human clinical trials.

Pearson Knowledge Technologies, Inc. was formed in June 2004 from the acquisition of Knowledge Analysis Technologies (KAT) by Pearson, PLC, the largest educational publishing and testing company in the world. Pearson Knowledge Technologies (PKT) remains in Boulder with the same local management. PKT supplies Pearson with innovative web-based educational services based largely on computational text understanding technology developed in CU Boulder's Institute of Cognitive Science (ICS). Prominent among its products are the Intelligent Essay Assessor®, which grades the content of student essays as accurately as subject-matter experts, and Summary Street®, a reading and writing tutorial currently under effectiveness evaluation by ICS and PKT. As of January 2005, Lynn Streeter, who was with KAT for five years, became PKT president. Founders of KAT, CU-Boulder Professors Tom Landauer and Peter Foltz, are engaged at an executive level with PKT's externally funded research operation. **www.PearsonKT.com**

Phiar Corporation, based in Boulder, Colorado, has signed a joint development agreement (JDA) with Motorola, a leader in communications technology, for the continuing development of its high frequency (THz) metal-insulator technology for next-generation electronic devices. High-speed circuits based on Phiar's technology have the potential to significantly boost data rates for wireless communications and provide higher resolution for radar and imaging applications. Additionally, Phiar has hired a new president and CEO, Bob Goodman, and closed an A-3 round of funding for $6.3 million from Menlo Ventures, a top-tier venture capital firm in northern California. Phiar has also successfully completed two contracts from the Defense Advanced Research Projects Agency (DARPA) and is in the process of reviewing a new Phase II DARPA project. **www.phiar.com**

PhosphoSolutions, LLC, a tenant at the Fitzsimons Redevelopment Authority Bioscience Park, was created to manufacture and distribute proprietary research tools, known as phospho-specific antibodies, which are at the cutting edge of proteomics. 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. These antibodies greatly accelerate drug discovery and research in diseases such as Alzheimer's and cancer. Antibody sales at PhosphoSolutions have grown more than 20 percent each year since its inception in 2001. **www.PhosphoSolutions.com**

PowerSicel, Inc., of Boulder, Colorado, was acquired in December 2004 by Advanced Power Technology, Inc. (APT) for approximately $5.4 million in cash and APT stock options. In 2002 PowerSicel entered into a license with CU, and ITU Ventures provided seed capital with additional capital provided by ITU Ventures and Digital Power Capital. PowerSicel's expertise in silicon carbide and other compound semiconductors complements APT's current portfolio of RF products, which operate at frequencies ranging from 1–4 GHz and are sold into applications such as semiconductor capital equipment, medical imaging, radar, avionics, and wireless communications. **www.advancedpower.com**

Proteome Resources, LLC, a tenant at the Fitzsimons Redevelopment Authority Bioscience Park, manufactures ultra-grade 98 percent purity enzymes and substrates and supplies these antibodies and custom protein and peptide services to the biotechnology industry. Launched in February 2005, the company's initial market focus are researchers of the ubiquitin proteasome pathway and apoptosis (programmed cell death). Proteome distributors are A.G. Scientific, Calbiochem/EMD Biosciences, Sigma-Aldrich, VWR Scientific, Gentaur (Europe), and Leehyobio (Asia). Founded on CU-licensed technology, the company has since begun adding other product technologies through relationships with Rockland Immunochemicals, University of Florida, University of North Carolina, and Cancer Research Technology Ltd., among others. **www.proteomeresources.com**

Replidyne, Inc., of Louisville, Colorado, is a pharmaceutical company focused on developing and commercializing innovative antibacterial therapeutics. Replidyne's lead product, faropenem daloxate (faropenem, or FD), is a novel oral community antibiotic with potent activity against respiratory tract infections (RTIs). Replidyne will file an NDA for faropenem in late 2005 with an expected product launch in late 2006. Replidyne is also developing a topical treatment addressing the major challenge of methicillin-resistant *Staphylococcus aureus* (MRSA), for which there are few available treatments. Replidyne's product, REP8839, has a novel mechanism of action and addresses a market for treating antibiotic-resistant skin infections and eradication of MRSA. Replidyne also has discovery programs directed to inhibition of bacterial DNA replication, which could result in therapies to treat a wide range of antibiotic-resistant bacteria. **www.replidyne.com**

Riverware™ is reservoir- and river-modeling software developed at the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES), an interdisciplinary center of CU-Boulder's School of Engineering and Applied Science. The software is used by water management agencies to improve water resources planning and decision making. By the end of 2005, 55 water management agencies, stakeholders, consultants, and research institutes had active RiverWare licenses. By making RiverWare available, CADSWES has built a community of users and enhanced its position as a hub of water systems research. **www.cadswes.colorado.edu**

RxKinetix is a specialty pharmaceutical company focused on developing new therapeutics for oncology care. By combining proven drugs with its proprietary, polymer-based drug delivery technologies, RxKinetix has accelerated development timelines while significantly reducing the risk of failure. The company currently has four products in development, including some that incorporate technology from the CU-Boulder Department of Chemical and Biological Engineering and the CU-Denver and Health Sciences Center Department of Pharmaceutical Sciences. The company's lead candidate, RK-0202, is currently in late Phase II clinical trials for oral mucositis, the primary rate-limiting side effect associated with chemotherapy and radiation therapy. Two other products, targeting proctitis and oral pain, could potentially be filed as investigational new drugs with the FDA in early 2006. In addition, the company is developing a hematopoietic growth factors formulation, HemaGel™ G-CSF, and vaccines with improved release and temperature stability characteristics. RxKinetix has received SBIR, STTR, and the Foundation for the National Institutes of Health grants, as well as a prestigious grant from the Grand Challenges in Global Health initiative funded in part by the Bill and Melinda Gates Foundation. **www.rxkinetix.com**


Terrance Boult

Securics, Inc., based in Colorado Springs, Colorado, was formed in November 2004 to commercialize the biometric security technologies developed at CU-Colorado Springs by Terrance Boult of the College of Engineering and Applied Science and some of his students. Boult holds the El Pomar Chair of Communications and Computation associated with the Colorado Institute for Technology Transfer and Implementation. Securics has an option to license Boult's inventions pertaining to secure revocable biometrics systems, biometric system performance enhancements, and hand geometry recognition. Securics has been awarded three SBIR grants; three other proposals are pending. In June 2005 Securics was awarded $100,000 of TTO Proof of Concept program funding to develop and test a real-time projective invariant hand geometry system for biometric-based identification. **www.securics.com**

SomaLogic, Inc., located in Boulder, Colorado, continues the development of its aptamer array technology as the basis for a new approach to clinical diagnostics. The company focuses on autoimmune and inflammatory diseases, cardiovascular disease, and oncology. In May 2005 SomaLogic announced a strategic collaboration with Quest Diagnostics, the country's leading provider of diagnostic testing and related services. Aptamer arrays are based on discoveries made in the CU laboratory of Dr. Larry Gold, SomaLogic's Chairman and CEO. **www.somalogic.com**.

Taligen Therapeutics, a company co-founded by Dr. V. Michael Holers and former faculty member Dr. Woodruff Emlen of CU-Denver and Health Sciences Center, is focused on developing biologic therapeutics for the treatment of serious, life-threatening inflammation. In August Taligen entered into an exclusive license agreement with CU for one issued and three pending patents to cover technologies from the laboratory of Dr. Holers. Taligen received the university's first Proof of Concept program funding in October 2004, and has been awarded three SBIR grants to date totaling over $800,000. Taligen opened a laboratory at the Fitzsimons Biomedical Research Park in March 2005 and is currently in pre-clinical development.

Texas Instruments, Inc., based in Dallas, Texas, licensed the Buffalo Switcher—a digital controller for switching power supplies—and has incorporated it into its broad line of Fusion Digital Power™ solutions. Professor Dragan Maksimovic of the CU-Boulder College of Engineering and Applied Science, Electrical and Computer Engineering Department, led a group of engineers on this invention. The Fusion Digital Power devices will support power supply systems, from AC-line to point-of-load applications, including telecommunications, uninterruptible power supplies, computer server, and data-centric systems. Later this year, Texas Instruments plans to extend its digital power coverage by introducing digitally controlled power conversion circuits that will support battery-powered products such as cell phones and notebook computers. **www.ti.com**


Michael Vasil


Robert Hodges

Windom Peak Pharmaceuticals, Inc., a Denver-based company seeking to develop novel antibiotics to treat infectious diseases, entered into an exclusive option agreement for three provisionally patented CU technologies. These technologies include a method developed by Michael Vasil, a professor in the CU-Denver and Health Sciences Center Department of Microbiology, for identifying antimicrobial agents that directly affect the function of a pathway that may abolish the ability of a variety of bacteria to cause disease. Additional research by CU-Denver and Health Sciences Center Professor of Biochemistry and Molecular Genetics Robert Hodges and his students, performed in conjunction with Dr. Vasil, led to the discovery of four novel peptides that have the potential for broad spectrum antimicrobial activity against a variety of multi-drug-resistant strains of common pathogens. To facilitate the commercialization of these early inventions, Windom Peak Pharmaceuticals was awarded $100,000 from TTO's Proof of Concept funding program.

Summary and Concluding Remarks:

A Preliminary Agenda for FY 2005–06 and Beyond

The conclusion to the 2002 TTO strategic plan began with the statement "The University of Colorado has distinguished itself as a world-class education and research institution. However, its technology transfer ambitions are largely unfulfilled, a situation that CU is positioned to change." The creation of the virtuous research cycle and robust technology transfer cycle mentioned at the beginning of this report—along with the stories about the actual and potential societal and economic impact of CU technology during the past year—provide evidence that CU has transformed its technology transfer operation and is positioned for even greater success.

In the current fiscal year, TTO has targeted continued 15 percent growth for most of the major performance metrics. As much as such a pace of growth is desirable, it is not sustainable in the long run. As we begin to approach our carrying capacity for invention reporting, licenses, and start-ups in the near future, we must strive to ensure continued quality over merely increased quantity. This year we will examine our growth expectations, and with input from the academic community and interested businesses, we will set new and sustainable targets for future performance.

The overall success of CU technology transfer can be attributed to a strategy of engaging faculty, students, and the business community in the technology transfer process. In fiscal year 2005–06, TTO will advance this strategy into new areas and expand its relationships with external entities—like the Boulder Innovation Center and the Fitzsimons BioBusiness Incubator—to provide strong linkages between budding CU technologies and the entrepreneurial business communities they serve. TTO will also build its relationships with internal entities—like the Industry/University Cooperative Project Center in the CU-Boulder Mechanical Engineering Department, where students provide design and productization assistance for CU medical device inventions as part of a capstone course, and the Colorado Institute for Technology Transfer and Implementation (CITTI) at CU-Colorado Springs, where students and local businesses coordinate to work on CU-Colorado Springs intellectual property cases.

New TTO financial resources are minimal for maturing CU intellectual property into more market-ready technology. However, one area ripe for exploitation at a relatively modest expense is the provision of small grants to inventors ($10,000 to $25,000) that are not predicated on a company start-up or expected repayment, as in the existing Proof of Concept program. Small amounts of money strategically deployed can result in increased value and better prospects for licensing intellectual property to innovative adopter companies.

CU is at the beginning of a new era for technology transfer. More research investigators than ever are learning how technology transfer complements their agenda to create impact in their profession, in their technology domains, and in society in general. We invite you to join TTO as we work with interested students, staff, faculty, and the business community to help CU's research investigators invent a better future.

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 and implement intellectual property policies and procedures 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.

Terry Boult, El Pomar Chair of Computer Communication and Networks, CU-Colorado Springs
John Carpenter, Associate Professor, Pharmaceutical Sciences, CU-Denver and Health Sciences Center
Carl Edwards, Associate Professor, Department of Dermatology, CU-Denver and Health Sciences Center
Tad Koch, Professor, Chemistry and Biochemistry, CU-Boulder
Clayton Lewis, Professor, Computer Science, CU-Boulder
Robert Melamede, Associate Professor, Biology, CU-Colorado Springs
Rafael Sanchez, Associate Professor, Mechanical Engineering, CU-Denver and Health Sciences Center
James Sikela, Associate Professor, Pharmacology, CU-Denver and Health Sciences Center
Phil Weiser, Director, School of Law, CU-Boulder, Committee Chair

Business Advisory Board

Business Community Representatives

Greg Carlisle, Senior Managing Director, Limestone Ventures
Curtis Castleman, Chief Patent Counsel/Assistant General Counsel, Tomkins PLC/The Gates Corporation
Chris Christoffersen, Partner, Morgenthaler Ventures
Doug Collier, Executive Director, Boulder Innovation Center
Tim Conner, Partner, Sequel Ventures
Midge Cozzens, President and CEO, Colorado Institute of Technology
Jerry Donahue, Board member, University License Equity Holdings, Inc.
David Drake, Director, Fitzsimons BioBusiness Incubator
Larry Gold, Chairman and Chief Science Officer, SomaLogic
Bob Goodman, President and CEO, Phiar Corporation
Chris Hazlitt, Partner, Faegre and Benson
Gregory Johnson, Partner, Patton Boggs
Jim Linfield, Managing Partner, Cooley Godward
Mark Lupa, Partner, Tango, Inc.
Dallas Martin, Vice President and Intellectual Property Counsel, Level (3) Communications, Inc.
Catharine Merigold, Managing Partner, Vista Ventures
Bill Mooz, Senior Director, Utility Computing, Sun Microsystems
Chris Ozeroff, EVP, Business Development and General Counsel, ARCA
Juan Rodriquez, Co-founder of StorageTek and Exabyte

CU Faculty and Administration

David Allen, Associate Vice President for Technology Transfer, CU System
Alexander (Sandy) Bracken, Director, Bard Center for Entrepreneurship, School of Business, CU-Denver and Health Sciences Center
Michel Dahlin, Acting Vice President, Academic Affairs and Research, CU System
Robert Garcea, Professor, Pediatrics, CU-Denver and Health Sciences Center
Paul Jerde, Executive Director, Deming Center, Leeds School of Business, CU-Boulder
Stein Sture, Associate Dean/Professor, Civil Engineering, CU-Boulder
Phil Weiser, Associate Professor, School of Law, CU-Boulder

Student Interns, Class Projects, and Guest Lecturing

Student employment and class engagement is an integral dimension of the Technology Transfer Office (TTO). TTO receives the benefit of highly trained individuals, and students receive an opportunity to apply aspects of their education to actual technology transfer cases and work situations. Most students are employed during the summer months with about one-third continuing through the academic year. Students also pursue CU technology transfer cases as part of their for-credit coursework. The most common team-based coursework examples are graduate and undergraduate business feasibility and business plan cases, the Law School Entrepreneurial Law Clinic, and engineering senior design "capstone" courses. Additionally, TTO staff members are frequent guest lecturers in law, business, engineering, science, public policy, and other courses throughout the academic year. Legal interns are supervised by Kristin Diamond, Assistant University Counsel.

TTO Summer Interns, 2004

Somer Aly—MBA/MS International Business '07, CU-Denver and Health Sciences Center
Robin Elliot—BSEE '05, CU-Boulder
Alex Furman—JD/MBA '06, CU-Boulder
Andrew Gano—MBA '05, CU-Boulder
Pamela Garl—MBA/MS Microbiology '06, CU-Denver and Health Sciences Center
Joel Gratz—MBA/MS Environmental Studies '06, CU-Boulder
Erik Kreider—MBA '05, CU-Boulder
Ruperto MacQuhae—MBA '05, CU-Boulder

Summer Legal Interns, 2004

Todd Hoy—JD '06, CU-Boulder

TTO Summer Interns, 2005

Somer Aly—MBA/MS International Business '07, CU-Denver and Health Sciences Center
Matthew Caton—MBA '06, CU-Boulder
Eric Gricus—MBA '06, CU-Boulder
Desiree Liverseidge—MD '08, CU-Denver and Health Sciences Center
Chris McReynolds—MBA '06, CU-Boulder (spring semester)
Jason Roosa—PhD Neurosciences '05, Stanford; MD '08, CU-Denver and Health Sciences Center
Stanley Sanchez—MBA '06, CU-Boulder
Blossom Tichenor—MBA '06, CU-Boulder
Michelle Stoll—MS Computer Science '05, CU-Colorado Springs

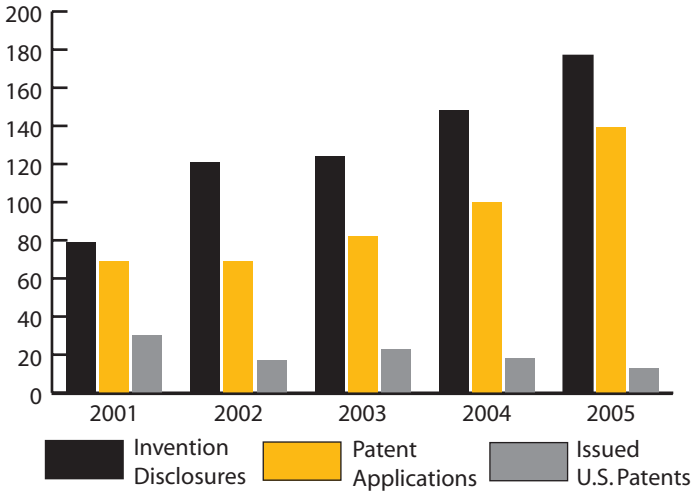
Summer Legal Interns, 2005

Patrick Haines —JD '07, CU-Boulder
Jodi Pounds—JD '06, University of Minnesota
Emily Vandenberg—JD '07, CU-Boulder
Tony Newville—BSME '05, CU-Boulder

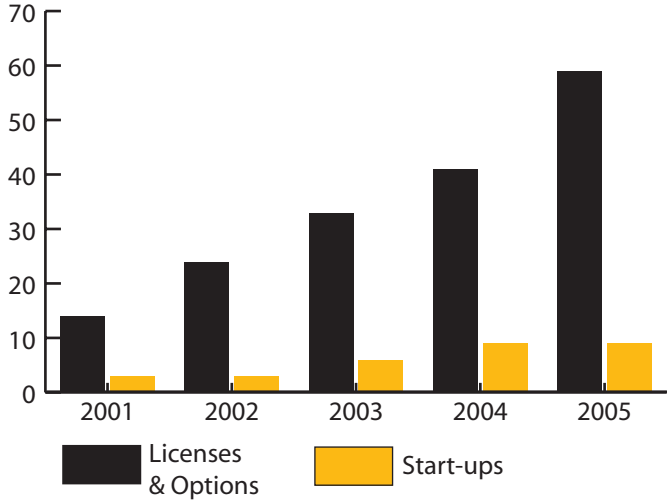
TTO Administrative Interns

Gwen Butcher—BS/BA Marketing/Spanish '05, CU-Boulder
Alexandra Lengen—BA Anthropology/Sociology '07, CU-Boulder
Kimberly Merryman—BA English/Classics '06, CU-Boulder
Natacha Pires—MBA Health Administration '05, CU-Denver and Health Sciences Center
Elizabeth Towner—BA Psychology '04, CU-Boulder
Diana Zakaryan—PhD '10 Mathematics, CU-Denver and Health Sciences Center

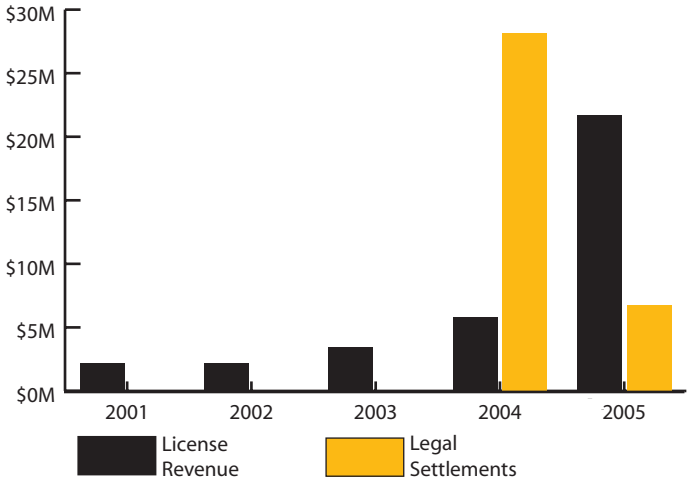
Invention Disclosures, Patent Applications, Issued U.S. Patents



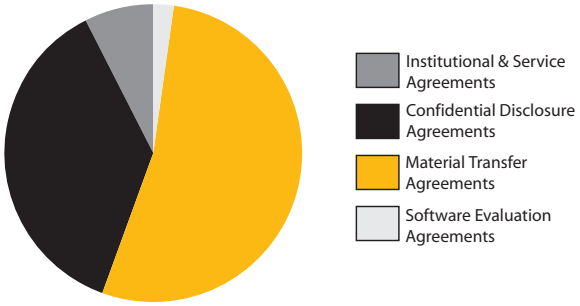
New Licenses and Options, Start-ups



TTO Revenue Earned, 2001–05



Service Agreements Executed, Fiscal Year 2004–05



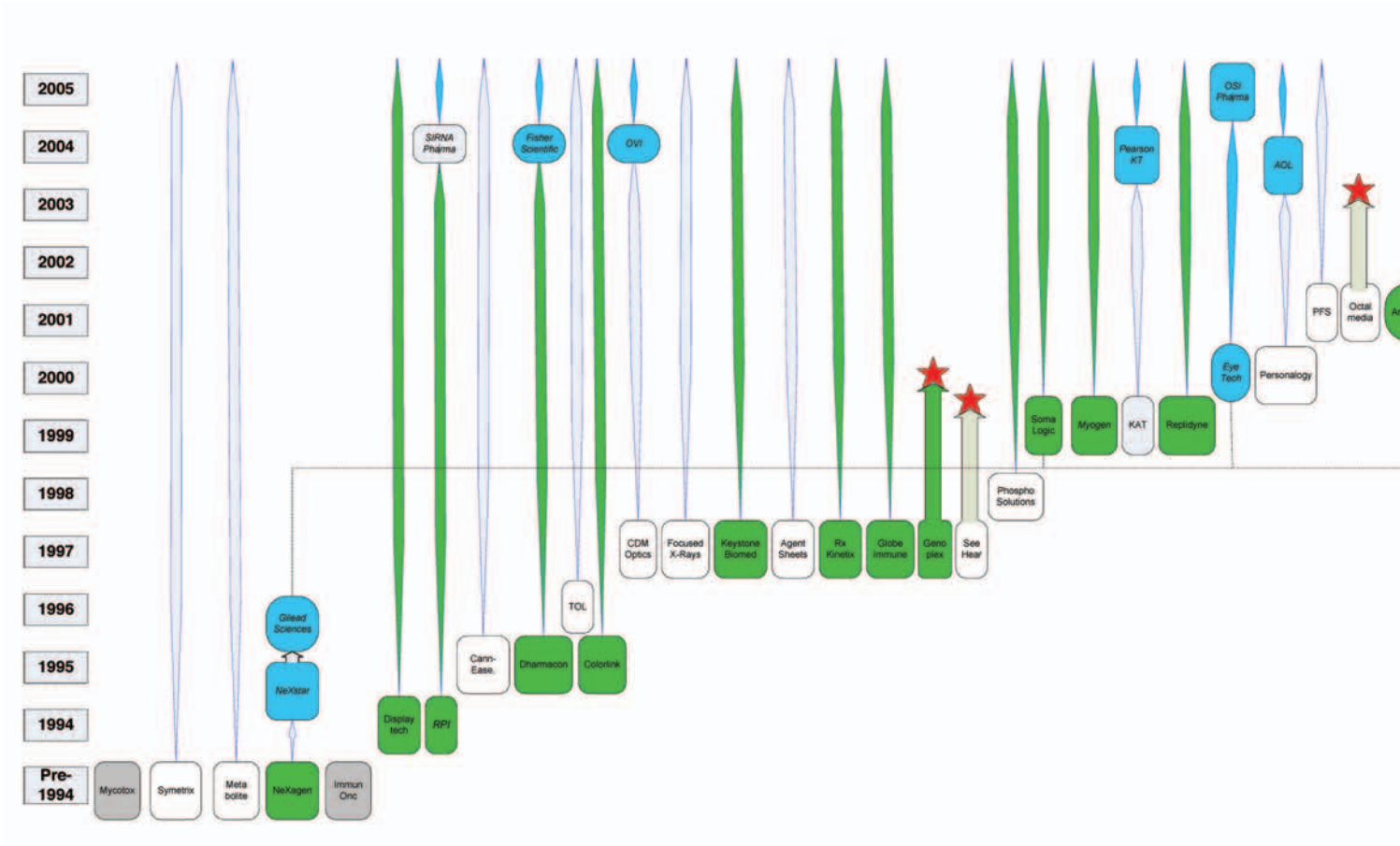
TTO Budget for Fiscal Year 2005–06
(in dollars)

Salaries and Benefits	$2,003,000
General Operating	258,000
Service Fees to System & Boulder Campus	105,000
Building Rental	195,000
Patent Costs and General Legal Expenses	796,000
Fitzsimons & Boulder Innovation Centers	75,000
Industry/University Cooperative Project	33,000
ULEHI Management Fee	54,000
Proof of Concept Program	500,000
Total All Expenses	**$4,019,000**

University of Colorado Drug Discoveries and Clinical Trials

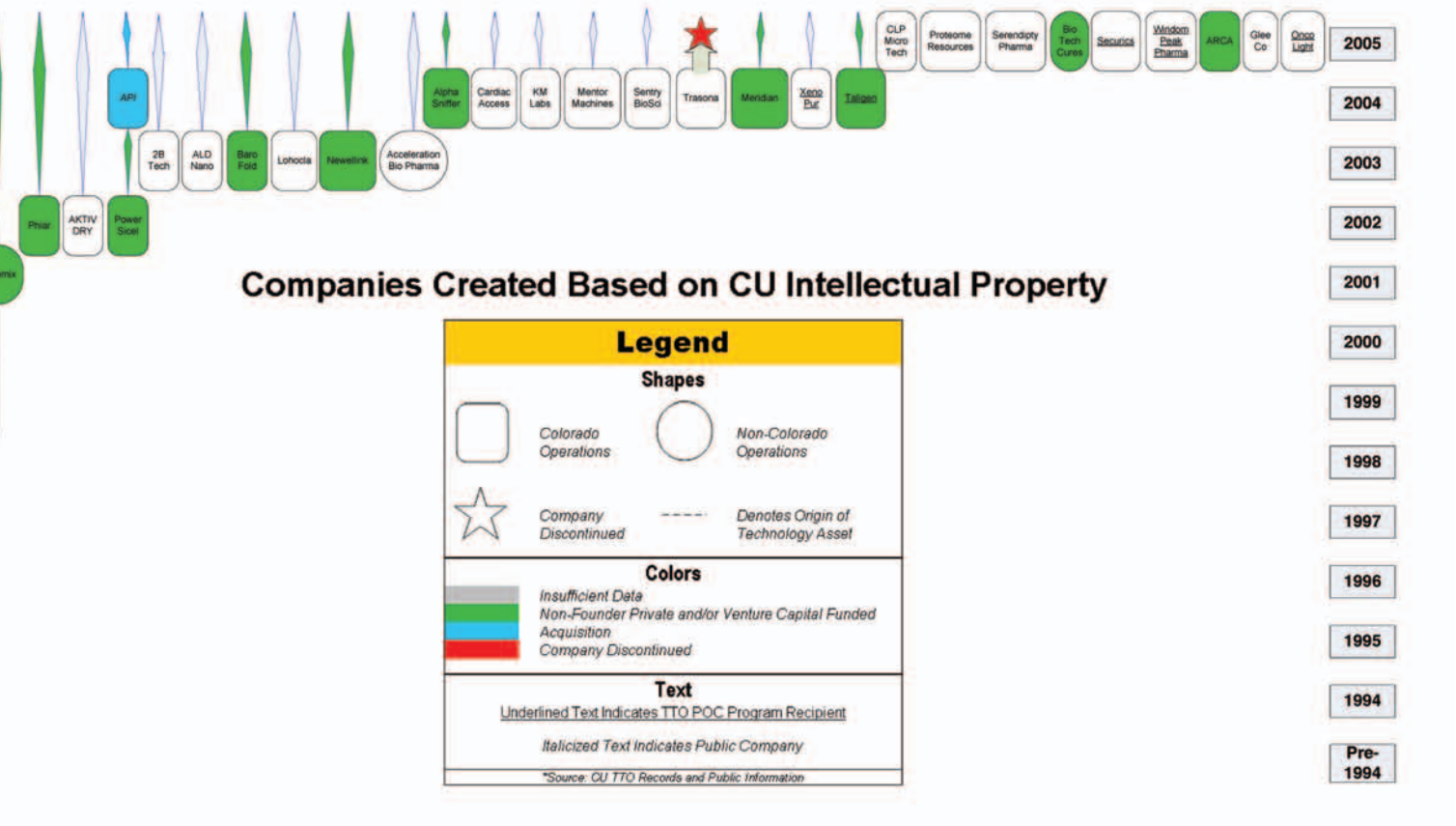
Drug	Market	Licensee	IND	Phase I	Phase II	Phase III	Approved
Kineret®	rheumatoid arthritis	Amgen					■
Macugen®	wet age-related macular degeneration	EyeTech					■
VZV Vaccine	post-herpetic neuralgia	Merck				■	▒
Botulinum Toxin	neurogenic overactive bladder	Allergan				▒	
Kineret	osteoarthritis	Amgen			■		
Kineret	arthropathy, neurogenic urticaria	Amgen			▒		
Macugen	macular edema/central retinal vein occlusion	EyeTech			▒		
Macugen	diabetic macular edema	EyeTech			▒		
RK-0202	oral mucositis	RxKinetix			▒		
TVAX Vaccine	prostate cancer	Geron		▒	▒		
Botulinum Toxin	idiopathic overactive bladder	Allergan			▒		
Bucillamine	reperfusion injury from heart attack	Keystone Biomedical		■			
Macugen	retinal angioma in VHL syndrome	EyeTech		▒			
GI-4000	immunotherapy for cancers	GlobeImmune		▒			
Bucillamine	reperfusion injury—organ transplant	Keystone Biomedical		▒			
ARC 183	CABG surgery (anti-coagulant)	Archemix/Nuvelo		▒			
AS1411	renal cancer and NSCLCs	Archemix/ Antisoma		▒			
VZV Vaccine	post-herpetic neuralgia	GSK		▒			
RH1	cancer	Allos Therapeutics		▒			
HIVAX-GS	HIV vaccine	GlobeImmune	▒				
GI-5005	chronic hepatitis (HCV) viral infection	GlobeImmune	▒				

■ Completed ▒ In Progress



CU-Denver

CU-Health Sciences Center



CU-Boulder

CU-Colorado Springs

CU Technology Transfer Office Staff

Standing (left to right): Alex Lengen, Kathe Zaslow, Liza Eschbach, David Allen, Ken Porter, Donna Sichko, Tom Smerdon, Diana Zakaryan, Rick Silva

Sitting (left to right): Adam Brown, Mary Tapolsky, Lynn Pae, Kate Tallman, Liz Towner, Kristin Diamond, Susana Read, Annalissa Philbin

Not Shown: Jill (Jones) Penafiel, Jennifer Behringer

Contact Us

For CU-Denver and Health Sciences Center inventors:
Rick Silva, rick.silva@uchsc.edu
phone: 303-724-0222
fax: 303-724-0816

For CU-Boulder and CU-Colorado Springs inventors:
Kate Tallman, kate.tallman@colorado.edu
phone: 303-492-5732
fax: 303-492-2128

For information about licensing to start-up companies:
Tom Smerdon, tom.smerdon@cu.edu
phone: 303-735-0621
fax: 303-735-3831

For general information:
Lynn Pae, lynn.pae@cu.edu
phone: 303-735-3711
Kathe Zaslow, kathe.zaslow@cu.edu
phone: 303-735-4525
David Allen, david.allen@cu.edu
Phone: 303-735-1688
fax for all three: 303-735-3831

General address for correspondence:
CU System Technology Transfer Office
4001 Discovery Drive
Suite 390C
588 SYS
Boulder, CO 80309-0588

Web site: www.cu.edu/techtransfer

Design and Production by the Office of Publications and Creative Services

Printed on recycled paper

TECHNOLOGY TRANSFER
UNIVERSITY OF COLORADO