

UNIVERSITY OF COLORADO

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*more than ever*

CU *is a* SOUND  
INVESTMENT *in*  
COLORADO

ECONOMIC INDICATORS 2005

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**Colorado higher education is the engine that drives  
the modern globally competitive wealth machine  
by providing our state with a knowledge base  
and skilled work force.**

**—Rocky Scott**

***President, The Greater Colorado Springs Economic  
Development Corp.***

## *Letter from President Hoffman*

In today's world of complex problems, unprecedented challenges, and innumerable opportunities, it is critical that we cultivate new ideas and innovative solutions. Some of the most important sources of those discoveries and solutions are teaching and research universities.

The intellectual capital shared and created in higher education classrooms and laboratories produces knowledge, which is transformed into enduring economic vitality through an educated workforce, competitive companies, useful inventions, quality healthcare, and contracts and grants for cutting-edge research.

The University of Colorado continues to cultivate its partnerships with the state, industry, and communities, making it a powerful driver of the state's economy. One of several recent CU milestones—consolidating the Denver and Health Sciences Center campuses—is enhancing the university's contributions as a public research institution with strong ties to industry and Colorado communities. With CU as an anchor, the state's economic vitality will only increase as more jobs are created, emerging industries develop, and new businesses locate to the state.

Progress relies on pushing the limits of knowledge. Strong universities are catalysts for that movement forward.

This economic impact report clearly illustrates the importance of teaching and research universities in creating vibrant economic activity. In the subsequent pages, you will find highlights and specific information that will quantify and explain the many ways the University of Colorado contributes to the state's economic progress.

You will discover how much funding CU brings into the state to pursue knowledge and make positive contributions to society. You will read how our technology transfer activities are increasing and how they improve people's lives through new pharmaceutical discoveries. You will read how industry leaders collaborate with teaching and research universities.

I am very excited about what is happening at the University of Colorado. Our students and faculty are making a positive impact by creating ideas for the next generation while serving the needs of today's generation.



A handwritten signature in black ink that reads "Elizabeth Hoffman". The signature is written in a cursive, flowing style and ends with a long horizontal flourish.

ELIZABETH HOFFMAN  
President, CU System



We cannot understate the crucial role CU plays in our local economy. CU students and alumni are a significant labor source for our businesses and likewise support the business community with their spending. Various cultural and sporting events organized in cooperation with the university attract tens of thousands of visitors.

—Susan Graf

*President, Boulder Chamber of Commerce*

As the largest private employer in Aurora, our continued growth directly relates to our ability to hire trained, skilled people from local colleges and universities. Since 1998, we have relied on 104 University of Colorado graduates to address our dynamic hiring requirements.

—Ray Kolibaba

*Vice President, Space Systems and CEO of Raytheon Colorado*

# *Economic Impact Highlights*

**CU contributes significantly to Colorado's Gross State Product (GSP).**

The demand for goods and services by CU students and visitors contributes more than \$4 billion to the Colorado economy.

**Investment in CU helps drive the Colorado economy.**

For every \$1 in unrestricted state general fund support, CU adds \$26 to the Colorado economy.

**Investment in CU is returned to the state.**

For every dollar of unrestricted state general fund support CU receives, \$1.04 is recaptured by Colorado in taxes. In addition, CU leverages its state funding; for every dollar of unrestricted state general fund support, CU spends \$2.19 on federally funded research and development.

**CU students add millions of dollars to the Colorado economy.**

CU students spent nearly \$737 million in Colorado in FY 2004. Out-of-state visitors to CU students spent an additional \$72 million during their stay.

**CU is the third largest employer in Colorado.**

After state and federal governments, CU employed the most Coloradans, more than any private employer. The CU system employs nearly 24,000 people. An additional 18,700 jobs statewide are created by the direct demand for goods and services by CU and its employees.

**CU technology builds businesses.**

CU technology has been used to start more than 40 companies since 1995, 38 of which remain operational today. Nine new companies were founded in FY 2004 alone. Nearly 200 exclusive and non-exclusive licenses are in effect for developing and marketing CU technology. Forty-three Colorado companies hold exclusive licenses. In 2004, CU completed 41 exclusive and nonexclusive licenses and option agreements.

**CU makes Colorado a vibrant and attractive economic hub.**

Research shows that the proximity of a major university is a key factor in a company's decision to choose a location for starting a company. The Corporation for Enterprise Development recently awarded Colorado an "A" for business vitality based on its entrepreneurial energy and business competitiveness. The presence of CU is key to this rating.

## *How We Measure Impact*

CU's impact on the Colorado economy is measured as the total economic activity generated by CU. To measure impact we identify not only the direct expenditures and employment created by operating an institution of higher education, but also

**Every major medical breakthrough at the Health Sciences Center provides enormous benefits to the individuals whose health may be directly improved by such discoveries.**

include certain categories of activity that are distinctive to a major university and affect the economy of the state in ways that other institutions may not. Examples of such activity include federal research grants that depend on the presence of CU's research infrastructure, and visitors from out of state who come to see students attending CU.

Further, we look at what this activity does as it moves through Colorado's economy. We know that all of the direct economic activity of the university and its affiliates and students results in indirect economic activity. By use of a standard economic model, we estimate the total activity generated.

Clearly, CU has positive effects on the Colorado economy. These can be categorized as either demand-side or supply-side effects. The demand-side effects of the university on the state's economy are based on the various goods and services that CU and its employees, students, and visitors purchase locally. These effects are easily quantifiable.

The supply-side effects are the effects that the university has on the Colorado economy based on the resources it offers to the state. These are more difficult to quantify. For example, we know the presence of research facilities and highly skilled labor attracts business activity to the state, but we can not measure exactly how much of that is attributable to the university.

There are many additional economic and social benefits provided by CU that are even more difficult, if not impossible, to measure. For example, every major medical breakthrough at the Health Sciences Center provides enormous benefits to the individuals whose health may be directly improved by such discoveries. And, by providing access to libraries, noncredit courses, and cultural and athletic events, CU enhances the quality of life for all citizens of the state. The people of Colorado can be assured that financial support for CU is a sound investment in Colorado.

## *Demand-Side Effects*

### **EXPENDITURES AND GROSS STATE PRODUCT (GSP)**

Based on all the CU-related expenditures (shown in table, top of page 5), in FY 2004 CU generated about \$26 in GSP for every dollar of the \$155.2 million in state unrestricted general fund appropriations. By comparing total GSP to collected state taxes and to the GSP generated by CU, it is estimated that for every dollar of state general fund support to CU \$1.04 is recaptured as state taxes. This estimate is conservative. It does not include some effects, such as the higher taxes collected on the higher incomes earned by CU graduates. Nor does it include any supply-side influences, such as the presence of research facilities associated with CU that attract professionals with higher incomes to the state.

## Demand-Side Effects Measured by Expenditures and Gross State Product, FY 2004

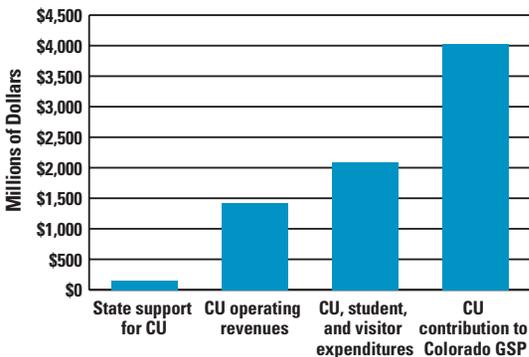
	<i>Estimated expenditures in Colorado</i>	<i>Estimated contribution to Colorado GSP</i>
<b>University Expenditures</b>		
CU <sup>1</sup>	\$1,073,715,123	\$2,087,002,810
University Physicians	\$188,831,683	\$388,993,267
CU Foundation	\$17,854,267	\$33,923,107
<b>Total Institutional In-State Expenditures</b>	<b>\$1,280,401,073</b>	<b>\$2,509,919,184</b>
<b>Student Spending <sup>2</sup></b>		
Boulder	\$370,765,944	\$704,455,294
Colorado Springs	\$100,285,763	\$183,522,946
Denver & Health Sciences Center	\$265,649,296	\$497,756,910
<b>Total Student Spending</b>	<b>\$736,701,003</b>	<b>\$1,385,735,150</b>
<b>Out-of-State Visitors to Students</b>		
Boulder	\$38,062,693	\$72,319,116
Colorado Springs	\$10,692,674	\$19,567,593
Denver & Health Sciences Center	\$23,069,074	\$43,569,507
<b>Total Out-of-State Visitor Spending</b>	<b>\$71,824,441</b>	<b>\$135,456,216</b>
<b>CU Related TOTAL</b>	<b>\$2,088,926,517</b>	<b>\$4,031,110,550</b>

1 CU's total expenditures in FY 2004 exceeded \$1.3 billion; it is estimated that 79 percent was paid in Colorado.

2 Student spending for 2004 is estimated based on a student spending survey conducted in 2002.

The University of Colorado is a major economic engine in the state. It injects more than \$4 billion into Colorado's economy each year. CU, its students, and their visitors spend more than \$2 billion in the state, and as these expenditures ripple through the economy, they create additional demand for goods and services and labor.

### CU in the Colorado Economy How the Investment Grows



By comparing total GSP to collected state taxes and to the GSP generated by CU, it is estimated that for every \$1 of state general fund support to CU \$1.04 is recaptured as state taxes.

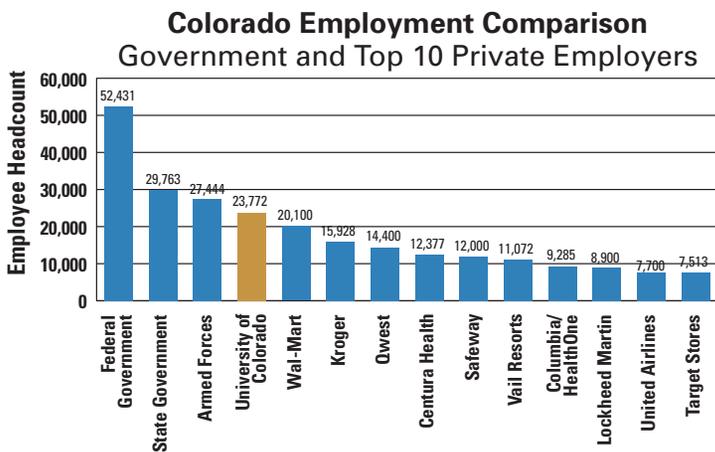
## EMPLOYMENT

Another substantial economic effect of CU is the jobs it creates. This is measured not only by its direct employment (nearly 24,000 people), but also includes the additional jobs created from the demand for goods and services generated by CU and its workforce. The figures for CU's employment impact are shown in the table below:

### Employment Impact (numbers of jobs), October 2004

<i>Campus</i>	<i>Direct employment</i>	<i>Total estimated employment impact</i>
Boulder	12,803	22,277
Colorado Springs	1,572	3,081
Denver & Health Sciences Center	8,589	15,695
UPI	302	535
CU Foundation	131	228
CU System Administration	375	653
<b>TOTAL</b>	<b>23,772</b>	<b>42,469</b>

CU's direct employment alone constitutes 1.1 percent of the jobs in Colorado, making CU the third largest employer in the state, after the state and federal governments. When the additional jobs required to meet the needs of CU and its employees are calculated, the total employment impact of CU is estimated at more than 42,000 jobs statewide. That number represents 2 percent of Colorado's employment.



NOTE: CU figures include CU Foundation and University Physicians, Inc. administrative staff. Data source for private employers: *Colorado Data Book*. Data source for government and armed forces employment: U.S. Census Bureau.

## *Supply-Side Effects*

The effect of a university on the economic prosperity of a region is significant. In a report released in October 2002 for the Small Business Administration, BJK Associates of Maplewood, New Jersey, found that there is a significant relationship between

**CU effectively leverages state financial support, spending \$2.19 on federal research and development for every dollar it receives from the state general fund.**

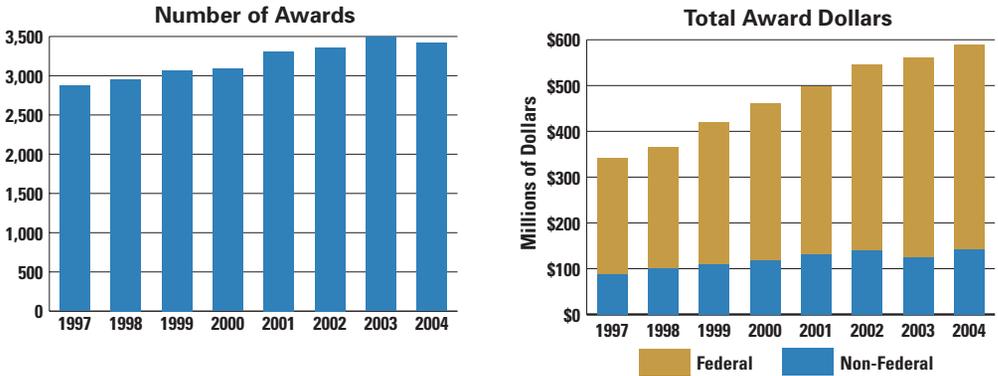
university research and development expenditures and the economic growth of surrounding communities. Specifically, the research conducted at universities was found to increase the rate at which new, innovative firms were formed. These firms, the fast growing “gazelles” of enterprise, quickly contribute to the local economy. Analyzing five years of data, the firm found that changes in research and development expenditures in year one had a significant impact on the subsequent five years of local economic development.

This effect is strong enough that Cognetics, Inc., a consulting group from Cambridge, Massachusetts, cited universities to be the most important components for economic growth in their report on the best places to start a company. This is one reason why *Inc.* magazine rated the Denver-Boulder area as the 11th best place in the country to start a business (December 2000), but the benefits are also felt across the state. A recent report issued by Seattle's Technology Alliance ranked Colorado first in the number of establishment births per 100,000 state residents (2003) and the Corporation for Enterprise Development, which annually assesses state economic conditions, awarded Colorado an “A” for Business Vitality based on its strong entrepreneurial energy and the competitiveness of its existing businesses (2004).

## RESEARCH AND DEVELOPMENT

Having top-ranked faculty who consistently attract research and development awards allows the university to conserve state funds and tuition revenue for academic and infrastructure purposes. As faculty and students engage in research activity, they generate new ideas that become seeds for further research and grant development.

### Sponsored R&D Awards



The CU faculty provides expertise in a broad range of disciplines, making it possible for the university to attract research funding from various federal and non-federal sources. The quality of CU students is also an integral part of the university's success in securing research dollars.

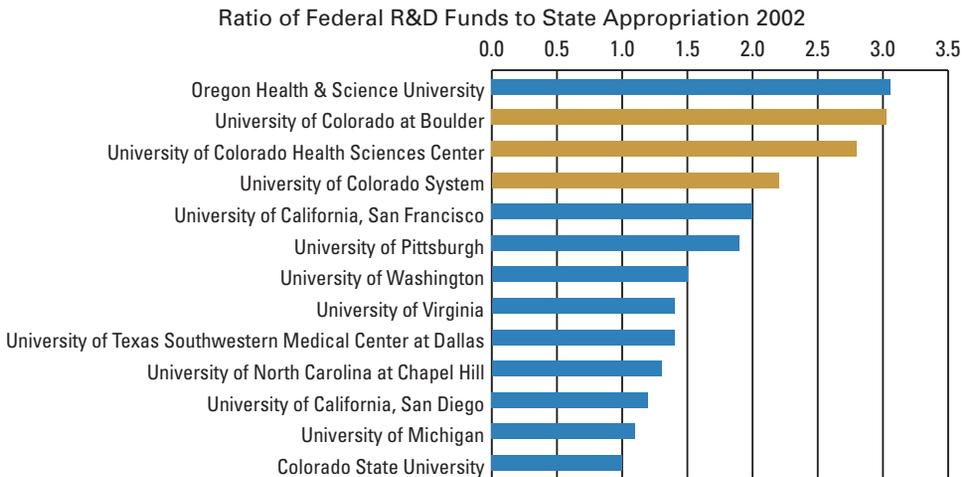
#### University of Colorado R&D Awards by Funding Agency, 2004

Source of award	(millions)
<b>Federal Agency</b>	
Commerce	\$25.4
Veterans Administration	\$2.8
Defense	\$18.3
Energy	\$6.7
Health & Human Services	\$266.3
NASA	\$47.7
Education	\$15.5
National Science Foundation	\$50.3
Other Federal	\$12.9
<b>Non-Federal</b>	<b>\$142.5</b>
<b>CU System TOTALS</b>	<b>\$588.4</b>



CU-Boulder's Carl Wieman, 2004 National Professor of the Year.

#### State Return on Investment—Federal R&D Expenditure Per Dollar of State Support



CU is particularly effective in leveraging state funding to attract federal research dollars to Colorado. In fact, CU's federal R&D expenditures totaled more than \$340 million in FY2002, ranking sixth in the nation among public universities. For each dollar in state support, CU expended \$2.19 on federally funded research. CU is one of only 11 public universities in the country to have a higher level of federal research expenditures than state support.

### TECHNOLOGY TRANSFER

CU's technology transfer operation conveys the university's rich yield of discoveries and inventions into commercial markets and public use. CU's more than 250 U.S. and foreign patents include valuable intellectual property assets licensed to industry leaders in biotechnology processes, medical diagnostics and therapeutics, software, nanotechnology, alternative energy, and environmental applications to name only a few. Since implementing a new strategic plan in 2002, the CU Technology Transfer Office (TTO) has forged innovative relations with Colorado business and industry, created valuable student internship opportunities, and more than quadrupled its licensing activity and royalty revenue.

#### Technology Transfer at CU

	2002	2003	2004	2005 Projected
Invention Disclosures	121	124	147	170
Patent Applications	69	82	100	115
Issued U.S. Patents	17	23	18	22
Licenses & Options	24	33	41	47
Business Startups	3	6	9	12



*The Center for Spoken Language Research.*

CU interacts with Colorado's biotechnology industry, licensing drug discoveries to Allos Therapeutics and Amgen as well as to Myogen and others that were created based on CU technology. Two CU-created drugs have won FDA approval and are being marketed by Amgen, Eyetech, and Pfizer. Additionally, 11 compounds are advancing through clinical trials for treating cancer, inflammation, and other significant diseases. Few public universities can claim a comparable number of promising drugs in human trials.

Because academic research produces predominantly early-stage technology, TTO seeks to sustain and prove commercial viability through start-up opportunities where CU inventors develop partnerships with some of Colorado's most experienced entrepreneurs. Between 2002 and 2004, privately-held companies based on CU inventions raised an aggregate of \$217 million in early-stage investments and employed 430 people in Colorado. Recently, TTO began a proof-of-concept program that makes seed investments in start-up companies based on promising CU technologies. Funded from interest on intellectual property revenues, the awards provide critical prototype development support for early-stage technology.

The economic contribution of CU startups is demonstrated when businesses founded in earlier years mature into notably profitable enterprises. In 2004 alone, three companies built upon CU technology were acquired by national and internationally-operated corporations that will maintain and expand operations in Colorado, employing 125 workers in-state.

## *Supporting and Diversifying the Economy*

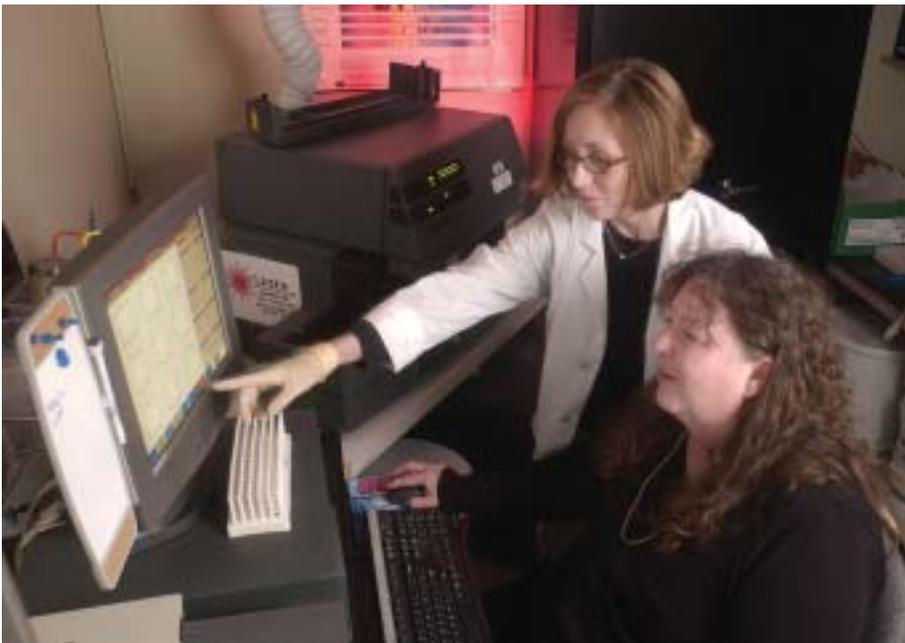
Over the last 20 years, Colorado's economy has experienced substantial diversification. While retaining significant activity in mining, gas, oil, and agriculture, the state has grown as a leader in the communications industry and a top caliber performer in information technology, especially the storage sector. CU has directly supported this high-tech growth by providing the professional employees and technical expertise that these industries require.

Looking to the future, CU is developing the Fitzsimons campus into a leading biosciences center. Bioscience is a field in which CU technology has already proven its worth, both academically and in the marketplace. From the visible human project and Nobel-prize-winning research on catalytic RNA, to drug research that has been licensed by such powerhouses as Amgen, CU has actively contributed to the development of bioscience in support of human health. By growing this important sector, CU helps buffer Colorado from the effects of economic setbacks, such as those recently experienced in telecommunications, and regularly experienced by the energy and tourism sectors. By 2010, Fitzsimons is expected directly and indirectly to support 66,800 jobs and \$3.1 billion in economic activity.

**CU supports Colorado's high-tech industries by providing research and technical expertise.**

Other fields that have grown appreciably include aerospace and astronautics. Associated enterprises support several industries in Colorado and provide a sound foundation for future growth. Recent NASA initiatives aimed at reducing the cost of going into space and producing an efficient successor to the aging space shuttle are being informed and directed by CU's aerospace and astronautics research. CU students have been involved in some of the most novel solutions being considered, which include Internet-based control schemes to reduce the cost of satellite operations. CU is acknowledged as a national leader in aerospace and astronautics research, which assures that the aerospace industry in Colorado will continue to thrive.

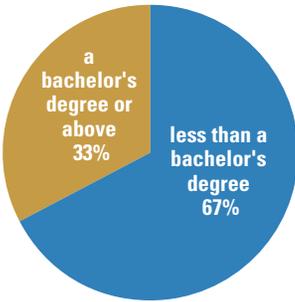
*Below: Dr. Karen Newell (seated), CU Institute of Bioenergetics, CU-Colorado Springs.*



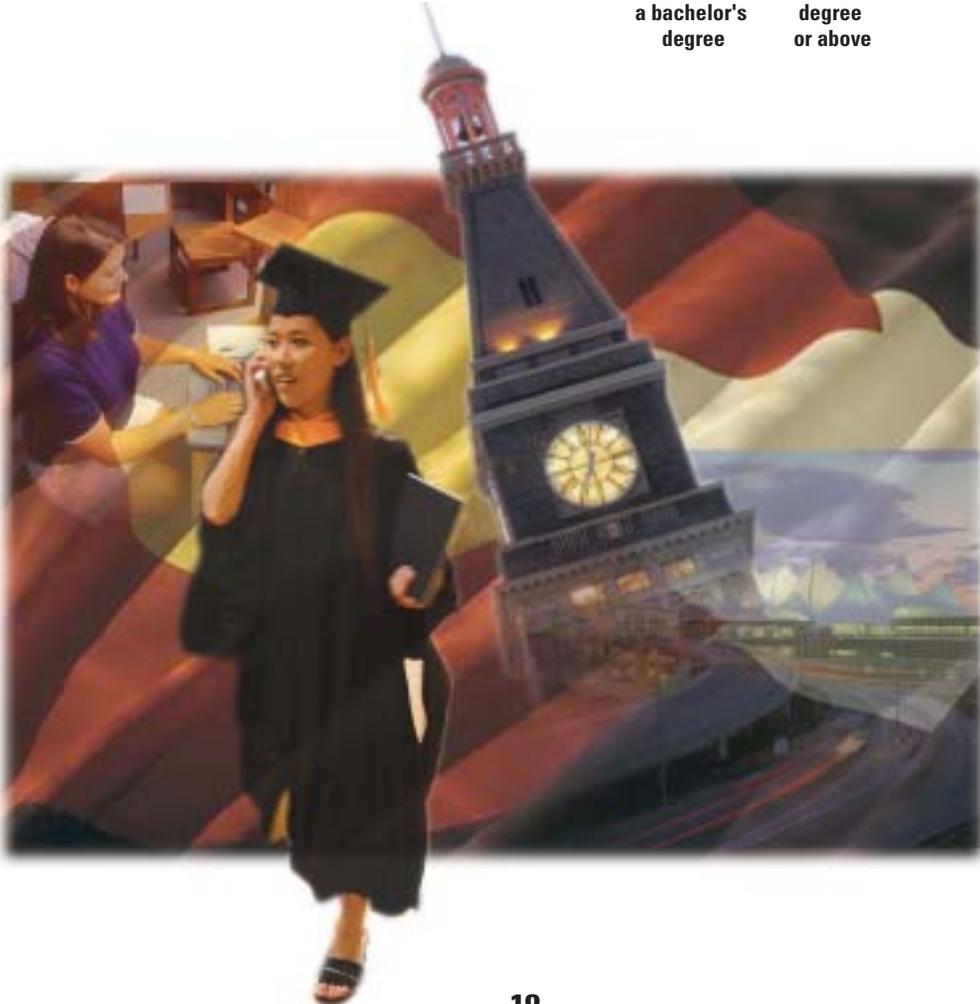
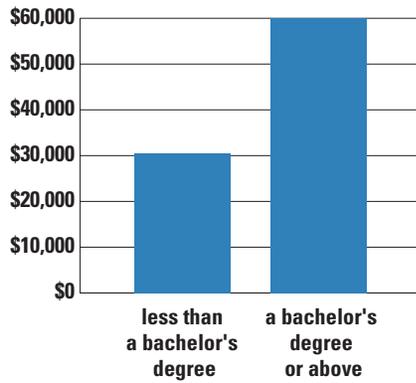
# The Value of Higher Education

Higher education is the major predictor of an individual's lifetime earning potential. The more education the individual has, the higher the lifetime earnings. In 2002–03 the University of Colorado awarded 40 percent of all bachelor's degrees, 61 percent of all master's degrees, 76 percent of all first professional degrees, and 55 percent of all doctoral degrees in the state. According to Census Bureau data, 33 percent of Colorado residents hold a bachelor's degree or above (highest in the U.S.). It is estimated that they have earnings of \$20 billion more than they would have if they were less educated, and as a result, the state collected nearly \$1 billion in additional tax revenue.

**Educational Attainment  
of Colorado Residents**



**Effect of Higher Education  
on Earnings**



## *Unmeasured Benefits*

Not all the benefits of a major university like CU are easily measurable. For example, the benefits to society of having a more highly educated population are great, but no attempt has been made to measure them in this study.

Moreover, like any major research university, CU has a number of satellite institutions and private firms in its vicinity. The presence of the university accounts in part for the location of some of these institutions and firms, which have employees, meet payrolls, and generate multiplier effects much like those generated by the university itself. Similarly, the increased competitiveness of Colorado companies that have adopted CU's newest technologies are not modeled in this study. Although these types of organizations are not accounted for in the direct or indirect benefits of CU, their presence is important to the state and local economies.

As a major research institution, CU affects many such satellite operations. While some of these operations have loose ties to the university, for others the ties are far more tangible. A few of these operations are mentioned here.

- **Educational Facilities.** There are many ancillary educational facilities that serve local, national, and international students. For example, the Colorado Bioscience Park Aurora is the only academic-affiliated bioscience park in the country. The research park is administered by the Fitzsimons Redevelopment Authority and formally affiliated with the University of Colorado. This affiliation provides companies at the bioscience park access to the resources of the region's largest academic medical center as they pioneer discoveries benefiting health care.
- **Federal Science Laboratories.** Faculty members and professional staff at CU have numerous joint research appointments and co-manage research projects within the scientific community in Colorado. Indeed, the locations of a number of major federal scientific installations in Colorado are due to the presence of the university. The direct effects of these federal facilities are not accounted for in this report, but the magnitude of their operations is significant. The National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA), two federal facilities in Boulder, account for nearly 2,000 employees, and the National Renewable Energy Laboratory (NREL) and the National Center for Atmospheric Research (NCAR), two federally funded research centers, were budgeted \$330 million in FY 2005.
- **Public Health Programs** through CU-Denver and Health Sciences Center, including its Colorado Area Health Education Centers, Allied Health Program, and related community outreach initiatives, seek to improve the health and well-being of Colorado's citizens, while reducing the fiscal impact of health-related costs to the state.
- **The Colorado School of Public Health.** CU is collaborating with Colorado State University and the University of Northern Colorado to establish the Colorado School of Public Health with the goal of enhancing education, research, and science. It will provide the opportunity to expand university partnerships and bring together leading experts from a variety of public health specialties.
- **The Coleman Institute,** established by a private grant, supports research into cognitive disabilities by integrating research across several fields, including engineering, psychology, and neuroscience, into effective technology and programs to help those with cognitive disabilities become active participants in society.

# Definitions of Economic Terms

- Gross State Product (GSP).** A measure of the total value of goods and services produced in Colorado.
- Demand-Side effects.** The effects the university has on the Colorado economy based on what goods and services it and its employees, students, and visitors purchase locally.
- Supply-Side effects.** The effects the university has on the Colorado economy based on the resources it offers to the state, such as research facilities and highly skilled labor.
- Multiplier.** A ratio used to estimate total economic effect for a variety of economic activities by quantifying the induced and indirect effects of an economic engine (like CU) and adding it to the known demand- and supply-side effects.
- Direct effects.** The number of dollars or jobs an economic generator contributes into the economy by way of its demand- and supply-side effects. These include the university's payroll and operating expenses spent locally, and local purchases made by students and persons attending university-related functions.
- Indirect effects.** The first layer of economic activity captured in the multiplier, indirect effects represent the economic activity generated among Colorado firms in order to meet the university's need for goods and services.
- Induced effects.** The second layer of economic activity captured in the multiplier, induced effects are the results of demand for personal goods and services by CU employees, which are not directly related to CU expenditures (clothing, food, automobile services, etc.) but require companies to hire employees to meet that demand.
- Total economic impact.** A measure of the direct, indirect, and induced effects of CU on Colorado's economy.
- Research and development awards.** Contracts and grants awarded to CU faculty. Many are multiyear contracts, which are only partially accounted for in research and development expenditures reported for one year.

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**JACK O. BURNS**

**Vice President for Academic Affairs and Research**

The Office of the Vice President for Academic Affairs and Research supports research and development, facilitates the commercialization of CU intellectual property, and promotes excellence in teaching to ensure the quality of Colorado's workforce.

As one of the nation's premier research universities, CU propels the state economy by introducing new products and technologies and bringing them to the marketplace. This spawns new companies, helps Colorado's existing companies to grow, and attracts out-of-state companies seeking to expand.

CU is an integral part of the state economy and crucial to future economic growth. As this report illustrates, the university's reach extends beyond campus boundaries, directly impacting Colorado's economic competitiveness.

To succeed in the global economy of the 21st century, businesses in Colorado require a quality, responsive higher-education system. If Colorado is to prosper economically, then our workforce must meet the business imperative for constant innovation. The continuous upgrading of the skills and knowledge of our workers must be a top priority for our state. To this end, CU has increased its accountability and performance by being innovative and market-responsive, a change that now defines the world economy.

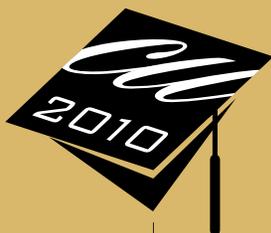
—Chuck Berry

*President, Colorado Association of Commerce and Industry*



## More than ever CU is a sound investment in Colorado . . .

- CU contributes more than \$4 billion to the Colorado economy.
- For every dollar in state support, CU contributes \$26 to the Colorado economy and for every state dollar invested in CU, \$1.04 is recaptured as state tax revenue.
- Research conducted at CU leads to new products and advanced technologies that generate business activity, attract jobs, and improve the lives of all Colorado residents.



University of | Colorado System

*Boulder • Colorado Springs • Denver and Health Sciences Center*