

Flagship 2030
Research, Scholarship, Creative Work Subcommittee (RSCW)
White Paper
April 2, 2007

Executive Summary

1. Take CU to the world, and bring the world to CU. Make CU into an international and national crossroads and provide a range of opportunities for our students to explore other cultures and countries.
2. Make hands-on education and training the hallmark of CU-Boulder. Engage our students in the creation of knowledge and art by close collaboration with faculty and staff.
3. Invest in the traditional disciplines that define a liberal arts education as well as interdisciplinary collaborations and programs. Prepare our students to think critically about complex and global problems.
4. Create nimble and adaptable administrative structures. Create an administrative infrastructure that allows us to respond and innovate.
5. Invest in faculty, students, and infrastructure to support our mission of research, scholarship and creative work. Provide the workplace that allows faculty and staff to focus on teaching, scholarship, research, and creative work.

Assumptions about developments in research, scholarship, and creative work leading to 2030

One main virtue of choosing such a far horizon for strategic planning is to force us to look beyond current problems and admit that we cannot imagine today how different the world will look by 2030. If we think back to how the university has changed since 1984—when we were just adopting the first PCs on campus, before there was any internet, when campus activists were busy protesting the U.S.-sponsored wars in Central America, when no one had yet heard of AIDS or global warming—it is clear that the future for which we must prepare is highly uncertain.

While there is a certain temptation to think of the key challenges for the future as developing new technologies—for carbon sequestration, fighting cancer and extending human life, cleaning up our oceans, and creating new products – many of the gravest and enduring problems of the emerging global society are not solely scientific or technological, but also include broad social constructs. For example, alleviating global climate change requires not only scientists and engineers from multiple disciplines but also social scientists, educators, city planners, political scientists, among others. There are other problems for which divergent forms of scholarship are essential, such as war, violence, poverty, and crime. And, if we believe that human nature in fact changes quite slowly, then issues of (individual and collective) love and honor, power and greed, good and

evil, horror and beauty will also be critical issues in the university of the future. At a minimum, we will need many diverse kinds of knowledge in 2030, spanning science and technology to social sciences, humanities, and the arts.

In thinking back to 1984, we can ask ourselves what should we should be teaching our undergraduates to prepare them for life in 2007 and beyond. Our list includes critical thinking (about values as well as facts), problem-solving, effective communication, the ability to learn new technologies, to understand our past, to understand others, and to understand the physical and natural world we live in. In an age of continuing knowledge specialization, students and faculty will be faced with even greater tasks of integration across specialties, in dealing with issues like energy or climate change, conception and abortion, living and dying, which involve not just one discipline or sub-discipline, but require us to grapple with science, uncertainty, human behavior, natural systems, values and beliefs, all in the same question. If the assumptions above regarding the growing demand for “useable knowledge” are correct, we will not have the luxury of researching only our specialized technical piece of these issues. In our future research on sustainable energy choices, for example, we will have to integrate the climate science, the chemistry, the engineering, the economics, the human behavior, the business, the ethics, and the policy, rather than assuming that it is someone else’s job to figure out where our piece of the puzzle fits in.

Trends of recent decades lead us to make the following projections:

- We are more globally interdependent and interconnected, while still fractured socially, politically and economically. Our graduates will be faced with even greater challenges of integration throughout their careers.
- Technology continues to evolve at a rapid pace and technological competence will be required in nearly every discipline. Updating our skills will be as important as updating our hardware.
- We are more populated locally, nationally and globally, with increasingly diverse populations
- Colorado continues to be a leader in high technology industries and research, increasing the need for a highly educated workforce
- Worldwide communication and information access continues to be easy and instantaneous, making the location of individuals, ideas and resources less important
- Communities of practice continue to provide networking and face-to-face communication with colleagues distributed nationally and internationally
- The academic marketplace continues to be increasingly mobile and transient
- Education is increasingly distributed, within the university community, as well as externally, in local, national, and international communities
- Students will need skills in critical thinking, problem-solving, effective communication, the ability to learn new technologies, the ability to understand human interaction, as well as the content of the discipline.

- Universities must be innovative if they are to survive in the global economy and solve global problems. The flexibility to rapidly and effectively respond to changing circumstances is critical for success.

The envisioned scenario in 2030 that CU-Boulder will have to respond to (related to your topic)

In 2030 the United States is not the preeminent economic power in the world but rather is both a competitor and a partner in the world economy. Many countries and economic unions around the world are economically and technologically advanced yet there are wide divisions between the haves and have-nots and poverty, hunger and disease are everyday concerns of billions of people. The citizens of Colorado, the United States and the world depend on each other in many ways that are not imaginable from our current perspective. Highly educated work forces across the world are inventing and developing the products, services and technologies that drive the evolution of society. The ideas that shape the world occur and are developed in a wide variety of venues -- in seamlessly integrated collaborations of universities, government laboratories, and large and small companies and in the art studios, music rooms, libraries and garages of talented individuals around the world.

Increasingly, universities serve as the research and development incubator for U.S. industries. Many industries have reduced the amount of investment in research and development, which has made universities even more relevant in research and scholarship. It is tempting to think of CU as the flagship of this endeavor, and CU's success has certainly been a factor in the region's and state's success. However, a better metaphor might be found in Richard Newton's notion that, related to the University of California – Berkeley, the "Bay area is the corporation". As with UC – Berkeley, CU, the state and the broader Boulder community are inextricably linked and CU will continue to benefit from the general success of our industries, K-12 education, and our economy.

The metaphor we would like to adopt is "CU – a mountain in a flat world", which views CU as a resource, an exemplar, and a leader in the state and region. Our success is inextricably interrelated to that of our larger community's. If we view CU as part of Colorado's "research diamond", partnerships and collaborations help us and our larger community. The success of Colorado and the United States is critically dependent on the training of students to be successful in a globalized world. Universities provide both new ideas and a trained workforce for the strongly interconnected array of public multinational companies that drive the global economy. Students have an advantage over less flexible competitors when they are trained in depth and breadth in their discipline and when they possess skills that allow them to adapt to new problems, cultures, and careers. The global workforce is highly trained in the scientific and technical fields on which the world economy depends but students who are not trained in the languages, history, philosophy, cultures, religions, social structures, and

economies of the world find themselves at a serious disadvantage. To train this global workforce, universities collaborate globally by freely exchanging students, faculty and ideas.

In general, Colorado has been very successful in attracting and supporting businesses and industries that bring jobs requiring a highly trained workforce.

- We expect Colorado to maintain and strengthen its competitive edge in a variety of businesses, including those that employ highly educated people with high-paying jobs.
- Colorado's highly educated workforce and entrepreneurial environment will continue to attract and create new companies, with a high concentration of scientists and engineers.
- The quality of the K-12 educational system will continue to provide our universities with a pool of well-educated students. A well-educated workforce will create an increased demand for high quality postsecondary education for their children.
- Businesses, industries, health care, education, and arts will continue to need a well-trained workforce both in terms of initial degrees as well as continuing education.

CU-Boulder's current strengths and weaknesses in responding to that scenario; barriers to and opportunities for responding to that scenario

Strengths

- The University of Colorado at Boulder is internationally recognized in many core disciplines and in its many interdisciplinary programs. Many of our faculty are recognized with the highest national and international awards and recognitions.
- UCB has a long history of strong federal funding for research and CU's funding base is very diversified across many different government agencies.
- The University of Colorado at Boulder is located in a metropolitan area with numerous unique regional strengths including several large federal government laboratories and many outstanding companies that have built their businesses upon research and development. The University has many strong partnerships with government laboratories and private companies in the area: NCAR, NIST, NOAA, NREL, Ball, Lockheed-Martin to name a few. Nearby excellent universities create many opportunities for collaborations with government laboratories and the private sector.
- The State of Colorado has a very well-educated and highly paid work force. Colorado per capita income is the 8th highest in the nation and Colorado ranks 4th in venture capital investments.
- The University of Colorado has a tradition of success in its many broadly interdisciplinary research centers and institutes.

Barriers

Current organizational structures pose significant obstacles to integrating research, scholarship and creative work into classroom, especially across disciplinary boundaries. Departmental structure, while useful in many regards, can create barriers to collaboration in teaching, curriculum, advising, grants, and research. While these barriers are surmountable in theory, in practice rules and practices often are difficult and time-consuming to overcome, leading to disincentives to self-organized collaboration. Specific barriers include issues regarding ICR dissemination, laboratory space allocation, matching funds for grants, creating and staffing interdisciplinary courses and reward mechanisms for faculty who work in domains that cross departmental lines. All these discourage innovation and collaboration.

Campus infrastructure is weak in many domains and levels. Examples include lack of suitable laboratory and office space for faculty and staff, chronically underfunded libraries, weak institutional support for grant applications and administration, and insufficient funding for teaching and research staff.

Financial support for graduate students is chronically underfunded for all units across campus. CU is often not able to recruit and retain outstanding graduate students because our fellowship packages are not competitive with those at peer institutions. While many students are funded on research and training grants, many disciplines have few resources to recruit and retain the best students. Students in many domains are unable to focus on research, scholarship, and creative work because of the need to support themselves through teaching or other work. This adversely impacts our research productivity and the quality of our graduate training.

CU has very few professional master's programs. Investment in both Ph.D. and professional masters programs would allow CU to evolve toward a healthier mix of graduate and undergraduate students on campus.

Too few of our graduate and undergraduate students come from other countries.

We need better mechanisms to connect CU to the surrounding businesses, government laboratories, and education and arts communities. There is little central leadership and almost no resources are devoted to this.

The state and regional community often does not know or understand what we do. We need more community engagement and opportunities to bring a wider array of individuals into the CU environment.

Significant constraints exist to working with other institutions of higher education in Colorado both in terms of research and student coursework.

The University invests too little in new opportunities for expanding and diversifying our research, scholarship and creative work. There is limited seed money available and the vast majority of that is targeted for projects with potential for future grant funding.

Our administrative model does not encourage long-term strategic planning. Strategic planning is distinct from departmental level planning, and local and campus goals often contradict each other.

CU-Boulder's necessary responses to be successful in that envisioned 2030. These responses can be described as the characteristics and traits that CU-Boulder will need in 2030 to be successful.

1. Take CU to the world, and bring the world to CU

University of Colorado at Boulder should strive to be more than to be just a leading university in the region and the nation. We should become an international center of learning and a crossroads for faculty and students from around the world to work together to create and synthesize the knowledge that will drive society in 2030. This will involve two related initiatives. First, our campus should strive to be an international university with an international student body and faculty and fields of study that are designed to bring scholars, researchers and artists from all over the world to CU. In this environment, students and faculty can work together to understand, appreciate and solve the global problems that will be critical to the strategic and economic security of our state, the country and the world. Their training in the cultures, languages, literatures, arts, religions and societies of the world will allow our graduates to work freely in the global economy. Our rostered and visiting faculty will consist of scientists, scholars, humanists, artists, musicians, engineers and business leaders from around the world. Our students will be trained to attack global problems by immersion in an academic environment that encourages inquiry into a complex array of scientific, social, cultural and political issues. Second, CU should reach out to the world and establish academic footholds in key cities around the nation and world, providing opportunities for our students to expand their academic horizons. They can learn first-hand by studying in Washington or outside the U.S. while still being part of CU and working closely with CU faculty. Our international focus will attract talented students and faculty from around the world. Companies needing to compete in global markets will come to us to invest in our programs and support our students. This investment will cut across all disciplines. Colorado will benefit from a university that is not just a regional and national power, but is a leader in the creation of the interconnections and relationships that will define academic research and scholarship in 2030.

2. Make hands-on education and training the hallmark of CU-Boulder

All of our students should be engaged in the creation of knowledge by teaching them the tools and processes of academic inquiry. Close collaboration with researchers, scholars and artists gives students the tools to answer deep questions and solve real-world problems. Students engaged with faculty and staff increases and enhances the research, scholarship and creative work output of the faculty while preparing students with the skills they will need to be successful.

Our classroom teaching should reflect the kinds of interdisciplinary and global problems that will face our students. Our courses and curriculum should be as innovative as our research, scholarship, and creative work, involving team and interdisciplinary teaching. We need to model the kinds of scholarly inquiry that are required to solve complex and global problems.

Cultivating students to think critically and synthetically are important attributes of college pedagogy. Equally important is our ability to encourage student's dreams. Flights of imagination not only help solve complex problems, they also address fundamental issues what it means to be human and humane.

Giving every student the opportunity to experience the joy of discovery will benefit them and us in countless ways. Our success in training the innovators, scholars, artists, and leaders of the future will be our most enduring legacy.

3. Invest in the traditional disciplines that define a liberal arts education as well as interdisciplinary collaborations and programs

Universities represent one of civilization's greatest accomplishments, and the traditional disciplines that have defined the core of university life for centuries have provided the intellectual space in which many of our most valuable achievements have been realized. Among the traditional disciplines, the arts and humanities have always been central to the core values that define a true university: it is here that students, scholars, and artists explore and interrogate the legacy of human history, human thought, and human creativity, keeping alive the best of past knowledge while also discovering new knowledge about what we thought we already understood. Our greatest gift to society is the training of students to exercise that freedom of thought and creative imagination -- driven by restless curiosity, grounded in the power of reflection, and responsible only to truth and beauty -- that a liberal arts education is meant to foster. If the University is to succeed in the future, it must ensure strength across a wide variety of disciplines, both those that will emerge and those that have long made higher learning so uniquely valuable an institution. Deep study of literature, history, art, music, philosophy, mathematics, and the sciences, both natural and social, are essential to the education of ethical and compassionate humans, as well as thoughtful and engaged citizens.

At the same time, many of the biggest problems our society and world face require collaboration across disciplines in the sciences, humanities, and arts. In many ways, a university that serves a comprehensive range of science and scholarship needs to maintain a balance between the depth a scholar needs in a traditional discipline while encouraging a more entrepreneurial model that interdisciplinary work often entails. We need to foster and encourage new interdisciplinary work and teaching, allowing faculty and staff to explore the complexity of problems and questions from multiple perspectives.

Graduates who have been trained to think critically and synthetically across a wide array of disciplines will be critical to addressing the most enduring, complex and challenging global problems. Global solutions will require students who can think broadly and creatively and who can work in interdisciplinary teams: scientists and scholars, engineers and artists, social scientists and lawyers, accountants and writers, entrepreneurs and teachers.

4. Create nimble and adaptable administrative structures

CU needs encourage and support a variety of flexible administrative models and structures that support the faculty, remove barriers and encourage interactions across all disciplines. Rapid response to changing academic conditions will be critical to CU's success. Rather than to try to suggest new administrative models, we instead describe some of the characteristics that a nimble and adaptable organizational structure should have.

- Allows for multiple administrative models to meet the needs of a diverse array of disciplines and interdisciplinary collaborations.
- Allows for systematic review of what's working and what's not.
- Invests in and rewards innovation and creativity.
- Provides a supportive environment to attract, nurture and retain high quality faculty, staff and students.
- Provides opportunities for focused early strategic investment in emerging areas.
- Encourages entrepreneurship.
- Encourages and supports interdisciplinary and multidisciplinary collaborations.
- Provides opportunities for rapid strategic redeployment of resources.
- Nurtures collaborations and partnerships with other universities, government organizations, education, and the private sector.
- Provides reward structures to encourage individuals and units to contribute to university strategic goals and initiatives.

- Develops and rewards skilled and flexible staff that can move across administrative structures.
- Creates an inclusive process that continues to engage faculty, students, staff, and others in co-constructing CU's future

5. Invest in faculty and infrastructure to support our mission of research, scholarship and creative work

For the University of Colorado to be an international leader in the creation and synthesis of new knowledge we must recruit, support and retain the best faculty and we need to provide them and their students with the academic infrastructure necessary to support that mission. Without this investment, any new initiatives are moot. Investments should include:

- Modern research laboratories and spaces for scholarship and creative work
- Outstanding research libraries
- Excellent visual and performing arts spaces
- Highly trained academic and research support staff
- Competitive fellowships and stipends to recruit outstanding graduate students
- Competitive faculty salaries and startup support