

What California’s business leaders are saying about the Institutes for Science and Innovation

“With one in five new jobs in the high-technology sector, California is the nation’s leader in research and development. In part, that results from the rich collaboration between our great universities and private industry – a nexus that has given birth to some of the world’s most innovative and productive high-tech firms that create hundreds of thousands of high-wage jobs and billions of dollars in income and revenues.”

Gov. Gray Davis
State of the State Address, 2000

“The research innovations and skilled workforce provided by UC have played a critical role in the success of the California economy in the 20th century. These centers will help California remain competitive in the 21st century by mobilizing the state’s best scientists and engineers to stimulate innovation in fields critical to our collective future.”

Richard C. Atkinson
President, University of California

“With the California Institutes for Science and Innovation, Gov. Davis is taking a national leadership role in the advancement of science and technology. I am encouraged to see the state of California stepping up to support research in this collaborative manner. These cutting-edge institutes will make substantial and far-reaching contributions to fields of scientific inquiry that will help keep our nation’s economy growing and improve the quality of life for all our citizens for decades to come.”

Neal Lane, Assistant to the President for Science and Technology

“Success in today’s competitive global economy requires a strong R&D base and a highly skilled workforce. Governor Davis’ initiative will help California and the nation continue to be leaders in the world’s knowledge-driven economy.”

Gordon Binder
chairman, Amgen Inc.

“This is precisely the bold initiative for research and education we need to keep California the leader in new technologies, and in creating the new companies and jobs which result.”

Richard LeFaivre, Ph.D.
managing partner, technology
IdeaEDGE Ventures

“The new R&D-driven economies of the world are dependent upon continuing cycles of new business formation. Governor Davis’ initiative for launching the California Institutes for Science and Innovation will expand the essential substrate for our economy.”

Sanford R. Robertson
principal, Francisco Partners

“The Institutes for Science and Innovation program developed by Governor Gray Davis is a brilliant way to leverage state, federal, private and academic resources to ensure economic competitiveness in California.”

Eileen Lyle
executive director, Telecom Council
San Diego

“I am very enthusiastic about Governor Davis’ initiative to establish the California Institutes for Science and Innovation. It builds on California’s seminal role in developing the biotechnology industry, and the economic and social benefits derived from it. The new institutes will provide more useful scientific knowledge, technical innovation and more trained personnel – precisely what is needed to support our leadership of this industry, and fuel the continued economic expansion of California and the nation, and in so doing, improve the quality of life for all humans.”

William J. Rutter
chairman emeritus
Chiron Corp.



“Fifty years ago, there was no Silicon Valley. Thirty years ago, there was no biotech industry. Ten years ago, there was no Internet. Who knows what new enterprises will be created or what medical breakthroughs will result because of our institutes? But this we do know: Breakthroughs will occur. And I want to make sure they will occur right here in California.”

Gov. Gray Davis
State of the State address, 2000

Institutes’ key features

- Proposed by Governor Davis to keep California economically competitive.
- Focused on next-generation research in specific scientific fields.
- Discoveries can be more quickly transferred to the marketplace, creating new companies, jobs and products.
- UC scientists pair with industry on cross-disciplinary research and teaching programs.
- Offers innovative education for students and prepares workforce for new technologies.
- Enhances UC research through multidisciplinary approach and “real-world” industry applications.
- State funds matched by private and federal funds.

California Institutes for Science and Innovation: A foundation for California’s future

Sustaining California’s economic competitiveness

Governor Gray Davis and the California Legislature have launched a bold plan to create the California Institutes for Science and Innovation, to be located at campuses of the University of California. The institutes will increase the state’s capacity for creating the new knowledge and highly skilled people that will drive entrepreneurial business growth and expand the California economy into new industries and markets – and bring the benefits of innovation more quickly into the lives of people everywhere.

Economists attribute 50 percent of U.S. economic growth since World War II to investments in research and development. Recognizing that today’s investments will bear fruit for years to come, Gov. Davis’ plan calls on UC to create these new institutes to support research discoveries and to educate new generations of scientists. These new scientists will translate institute discoveries into new applications and other innovations that will lead to new industries, businesses and quality jobs in California.

Partnerships between UC, industry and the state

The California Institutes for Science and Innovation are an unprecedented three-way partnership between the state, California industry, and the University of California. The institutes will be devoted to basic and applied cross-disciplinary research, focusing on large-scale problems where scientific advances may spur future economic growth.

Each institute will focus on a research field key to the future of California’s economy, bringing together UC’s world-class scientists and students with industry researchers in a cooperative research and education effort that will produce both new knowledge and the next generation of scientists and technological innovators.

The institutes will undertake basic, multidisciplinary research on complex problems that require the kind of scope, scale, duration, equipment, and facilities that they uniquely provide. The cooperative UC-industry effort will speed the delivery of public benefits through new products, technologies, services, and jobs.

Leveraging the state’s investment

This initiative challenges industry and the University of California to match every dollar provided by the state with at least two dollars in non-state funding. The state plans to invest \$300 million over four years, with the initial launch of the three institutes partly supported with \$75 million provided in the 2000-2001 state budget. Total funding will be no less than \$900 million, with the required \$600 million match.

The selection process

Three institutes were selected from six proposals submitted by UC campuses, through a competitive, merit-based and peer review-driven process. Multiple campuses are collaborating on each institute. Gov. Davis announced the selection on Dec. 7, 2000:

- California Institute for Bioengineering, Biotechnology and Quantitative Biomedical Research
- California Institute for Telecommunications and Information Technology
- California NanoSystems Institute

The governor has pledge to request state funding this year for a fourth institute:

- The Center for Information Technology in the Interest of Society.



The California Institutes for Science and Innovation

A Bold Initiative

The four **California Institutes for Science and Innovation** enable California to address scientific problems of exceptional scope, complexity, and economic relevance. They couple the intellectual and scientific resources of the University of California (UC) System and more than one hundred of the state's most innovative R&D-driven companies in cooperative effort. The initiative is delivering scientific excellence coupled with a strategy for rapid application of new knowledge in California's unrivaled innovation economy.

An unprecedented three-way partnership

In 2000, California Government, Industry, and the University of California joined together to advance four major fields of science and technology that are critical to economic competitiveness – quantitative biomedicine, nanosystems, communication and networking, and information technology.

The State of California provided \$400 million, primarily for capital programs that gave the University of California exceptional new research facilities. The State required that the University raise \$2 in non-state funds for every \$1 provided. The required match was met and exceeded. Combined funding has already grown to more than \$2 billion from State, Industry, Federal, foundation, private, and other sources.

New paradigms for the 21st century research university

Research universities are increasingly challenged by converging rapid pace of advances in science and technology, expectations for rapid development and application of new knowledge, and needs for accelerated public benefits. The California Institutes for Science and Innovation are providing UC with a remarkable opportunity to explore new ways of productively performing research and education at the intersection of these dynamic forces.

Each of the four Institutes:

- is a regional-scale, multi-institutional and multi-sector effort
- attracts the best talent by engaging two or more of UC's ten campuses and three National Laboratories – an opportunity uniquely afforded by the University of California's organization as a system
- partners companies into multidisciplinary, cooperative research programs, enabling participating firms to gain exceptional leverage on their R&D investments. Each is integrating new educational programs in all aspects of their rapidly evolving research platforms

Research facilities to tackle grand challenges

Major new buildings have been designed to house research and education programs performed in innovative new ways. They provide an environment that promotes interaction and collaboration. They house an exceptionally broad array of research programs, fostering multidisciplinary efforts never before imagined.

<http://ucop.edu/california-institutes/>



The California Institutes for Science and Innovation

California Institute for Quantitative Biomedical Research

QB3 Director Regis Kelly

QB3 is a joint effort of UC San Francisco, UC Berkeley, and UC Santa Cruz focused on bioengineering, biotechnology and quantitative sciences – mathematics, physics, chemistry, engineering and biomedicine. QB3 researchers aim to create fundamental new discoveries, products and technologies for improving human health.

California NanoSystems Institute

CNSI Director Fraser Stoddart

CNSI couples UCLA and UC Santa Barbara in an exploration of how the manipulation of structures, atom-by-atom, can enable production of new materials and devices that will revolutionize virtually every aspect of our quality of life. Applications include computers, energy, communications, environmental technologies, and healthcare.

California Institute for Telecommunications and Information Technology

Calit2 Director Larry Smarr

Calit2 is a grand scale collaboration between UC San Diego and UC Irvine that is envisioning the next generation Internet. New technologies are needed to enable the Internet to accommodate worldwide expansion of users, conversion to broadband connections, and an explosion of wireless information appliances embedded in homes, offices, vehicles, and community infrastructures.

Center for Information Technology Research in the Interest of Society

CITRIS Director Shankar Sastry

CITRIS is the largest collaborative effort, with UC Berkeley, UC Davis, UC Merced, and UC Santa Cruz seeking to engage information technology solutions in some of the most important problems facing society: energy, transportation, education, emergency preparedness, health care, seismic safety, farming and natural resources.

<http://ucop.edu/california-institutes/>



FACT SHEET: Intellectual property

Background

When scientists and students at the University of California, through the course of academic research, conceive an idea that has practical utility, that intellectual property becomes valuable to industry and the public. As with other research enterprises in which the university is involved, the UC Board of Regents will generally own the intellectual property deriving from the work of UC employees at the California Institutes for Science and Innovation.

Key points

- UC routinely licenses the rights to commercialize its intellectual property to companies.
- Companies often fund specific research projects in anticipation of rights to commercialize research advances. Entering into such arrangements, UC retains ownership of the intellectual property and grants the sponsor a right to negotiate a license to that intellectual property once the research is completed and obligations to all other research sponsors are assessed.
- These licenses are typically royalty-bearing and may be granted exclusively or non-exclusively. In rare cases, UC issues royalty-free, non-exclusive licenses to introduce new technology into rapidly advancing fields of technology.
- UC is a national leader in the management of intellectual property and currently manages more than 3,000 U.S. patents and nearly 600 active licenses with annual royalty income of approximately \$80 million.

Licensing institute research has several benefits:

- Facilitate access to institute research by a full spectrum of California businesses.
- Provide incentives for California's entrepreneurial businesses engaged in cooperative research and education at UC.
- Ensure that licensees demonstrate diligence in undertaking the investments necessary to commercialize new technologies.
- Promote respect among UC researchers for the academic principles of open dissemination of research results and an open educational environment.



FACT SHEET: Technology transfer

Background

Technology transfer is a formalized mechanism through which universities speed the delivery of public benefits by enabling companies to utilize research discoveries in their product and technology development programs.

Key points

- Technology transfer is a two-way flow of benefits between universities and businesses. This practice began long before today's "New Economy." Since the early 1800s, companies have started up and depended upon university expertise. As early as 1943, the University of California initiated a patent policy to enable technology transfer activities.
- Companies invest in university research for a variety of reasons: to access expertise of faculty; to identify new recruits for their R&D departments; and to leverage their limited R&D budgets and intellectual property interests.
- Technology transfer improves the quality of undergraduate and graduate education through collaborative research with industry scientists; prepares students for greater success after graduation.
- The research university is often the only institution that advances important fundamental research that lays the foundation on which future economic opportunities are built.
- Technology transfer enables research advances to be transformed into products, technologies, services and other benefits the public can use. Technologies are often "transferred" for commercial purposes through the licensing of UC-owned intellectual property by private companies. These licenses are standard practice at universities throughout the country.
- Companies that license university inventions usually undertake substantial subsequent R&D efforts in order to bring new products, technology and services to the market.
- Small businesses (under 500 employees) account for roughly 60 percent of technology licensing agreements made by universities, federal laboratories, and non-profit research laboratories, according to the Association of University Technology Managers 1999 licensing survey.
- Technology transfer helps maintain the country's competitive edge in the quick-changing, global economy and generates new jobs – an estimated 270,000 jobs in FY 1998-99.
- The commercialization of academic research resulted in more than \$40 billion in academic activity in 1999, according to the Association of University Technology Managers licensing survey. UC earned \$80.9 million from commercialized inventions in FY 1999.



At the institutes

The California Institutes for Science and Innovation will foster an environment that increases opportunities for cooperation between industry and UC to speed delivery of public benefits from research and education. UC has a long history of cooperation with industry in the support of research, instruction and public service and has implemented effective policies and procedures for faculty, students and staff on identifying and managing interests in these settings.

Managing the proposal review and selection process

From the six proposals submitted by UC campuses, the three institutes will be selected through a competitive, merit-based peer review-driven process. The UC General Counsel's Office provided guidance to UC employees on managing interests during the review and selection process.

Key points:

No individual with direct or indirect interest in one of the six submitted proposals participated in the peer review process managed by the Office of the President.

No individual with direct or indirect interest in one of the six submitted proposals participated in the selection committee's review process.

UC conflict of interest standards have been applied to all UC employees involved in the institutes' selection process.

FACT SHEET: Managing interests

Background

Each University of California agreement with an external party must recognize the importance of managing the results of research to enhance the teaching and research programs of University faculty, researchers, students, and postdoctoral scholars. UC has a commitment to make the fruits of its research widely available through publication and open distribution of research products. The university also seeks to protect the viability of its research programs, to foster open inquiry beyond the interests of any one research partner and to recognize its fiduciary responsibility as the beneficiary of a publicly funded research infrastructure.

Guiding principles for faculty and students

The University of California increasingly is called upon to participate in a broad spectrum of research relationships with governmental agencies, nonprofit foundations and industry. Such relationships encompass traditional extramural research funding arrangements, research collaborations, multi-party research consortia, visits by others to UC laboratories, student and faculty visits to external laboratories, and use of UC equipment and facilities by others. Other university relationships with external parties, such as purchasing or real estate transactions, may also have implications for future university research results. Properly cast, all such relationships can help both UC and the external party advance their respective and mutual research interests.

For University relationships with external parties to succeed, agreements must address the parties' interests in future research results through flexible application of fundamental principles to a broad range of specific circumstances. Rights and obligations associated with future research results shall be based on the following principles:

- 1. Open dissemination of research results and information:** Agreements with external parties shall not abridge the ability of UC researchers to disseminate their research methods and results in a timely manner. UC's most fundamental tenet is the freedom to interpret and publish or otherwise disseminate research results in order to support the transfer of knowledge to others and maintain an open academic environment that fosters intellectual creativity.
- 2. Commitment to students:** Agreements for research relationships with external parties shall respect UC's primary commitment to the education of its students.
- 3. Accessibility for research purposes:** Agreements with external parties shall ensure the ability of university researchers to use the results of their research to perform future research.
- 4. Public benefit:** Agreements with external parties shall support the ability of the university to make available for the public benefit in a diligent and timely manner any resulting innovations and works of authorship.
- 5. Informed participation:** All individuals involved in research governed by a university agreement with an external party shall have the right and responsibility to understand the rights and obligations related to future research results embodied within the agreement.
- 6. Legal integrity and consistency:** Commitments concerning future research results made in agreements with external parties shall be consistent with all applicable laws and regulations and the University's contractual obligations to others.
- 7. Fair consideration for university research results:** Agreements with external parties shall provide fair consideration to the university and the general public for granting commercial access to future University research results.
- 8. Objective decision-making:** When establishing or conducting university relationships with external parties, decisions made about rights to future research results shall be based upon legitimate institutional academic and business considerations and not upon matters related to the personal financial gain of any individual.

California Institutes for Science and Innovation

California Institute for Bioengineering, Biotechnology, and Quantitative Biomedical Research	UC San Francisco in collaboration with UC Berkeley and UC Santa Cruz The California Institute for Bioengineering, Biotechnology and Quantitative Biomedical Research, a cooperative effort among three campuses of the University of California and private industry, will harness the quantitative sciences – mathematics, physics, chemistry and engineering – to biomedicine to create fundamental new discoveries, products and technologies for improving human health. The institute will train a new generation of students who will forge the union of the quantitative sciences and biomedical research.
California NanoSystems Institute	UCLA in collaboration with UC Santa Barbara The California NanoSystems Institute will explore the power and potential of manipulating structures at the nanometer scale to engineer atomically precise structures-by-design with idealized properties far beyond those found in nature. Such research has enormous implications for medicine, information technologies and the environment. Institute-developed materials, devices and systems will revolutionize every aspect of our lives.
California Institute for Telecommunications and Information Technology	UC San Diego in collaboration with UC Irvine The California Institute for Telecommunications and Information Technology will team UC San Diego and UC Irvine faculty, students, and research professionals with leading California companies to extend the reach and capacity of the “new Internet.” The institute will create revolutionary advances in applications important to California’s economy: environmental and civil infrastructure assessment, transportation, health care, artistic expression, e-commerce and education.
Center for Information Technology Research in the Interest of Society	In addition to the three institutes selected in Dec. 2000, Gov. Davis also announced his pledge to request state funding in the upcoming budget for a fourth institute:
	UC Berkeley in collaboration with UC Davis, UC Merced and UC Santa Cruz The Center for Information Technology Research in the Interest of Society will seek new ways of putting information technology to solve problems facing society. Many challenging social issues depend on widespread, reliable, and secure information systems that adapt to the varied needs of users and continue to perform even if part of the system is down, disabled or under attack. Institute research will help realize information technology’s potential for solving many of society’s challenges, including those in transportation, education, emergency preparedness, health care and the environment, among others.
More information about these institutes and links to the web sites of the individual institutes is available at www.ucop.edu/california-institutes .	

Three ways for growing California’s economy

Basic research at the California Institutes for Science and Innovation will lay the foundation for future economic opportunities through new commercial products and technologies and markets.



Multidisciplinary education at the California Institutes for Science and Innovation will produce California’s future leaders and workforce in the high-tech and bioscience fields.



The institutes will strengthen scientific leadership for California’s knowledge-driven economy.



- 1. Research** Academic research is important to the economy. In major commercial sectors, including biomedical and information technologies, 19-31 percent of the new products and 11-20 percent of new processes introduced from 1986-1994 could not have been developed so quickly without the aid of recent academic research.*

At the California Institutes for Science and Innovation, basic research activities will create new knowledge and forge new frontiers in science and engineering. These discoveries will open new commercial opportunities for existing California industries, strengthening their competitiveness in worldwide markets and stimulating the creation of entirely new markets.

These opportunities will catalyze the development of new companies and attract new cycles of private investment in California’s promising, young entrepreneurial firms.

Companies will undertake needed subsequent R&D in their own laboratories to transform the new knowledge into viable commercial products and technologies.

By encouraging company scientists and engineers to participate in and support institute research programs, an accelerated path will be created for transferring knowledge and putting it to work in the private sector to produce tangible public benefits.

UC policies enable a full spectrum of California businesses to access intellectual property rights to Institute research discoveries. Intellectual property provides market protection for participating companies and leverages their R&D investment. R&D investments provide society with a rate of return that economists have shown averages roughly 50 percent.
- 2. Education** California gained more than 210,000 new jobs in high-tech and biotechnology between 1993 and 1998,** more than making up the 200,000 jobs lost to defense cuts, banking consolidation and reduced mining activities. These area’s accounted for 77 percent of the state’s job losses in that period, according to the state Department of Employment Development. Total employment in the high-tech and biotech sectors is more than 885,000, and average incomes exceed \$60,000. Most of these new jobs were created by small companies, many of which did not even exist 10 years earlier.

Through their multidisciplinary educational activities, Institute faculty and participating industry scientists will create entirely new curricula and research opportunities for students.

Students will be educated in broadly multidisciplinary courses that prepare them for working in California’s rapidly evolving high-tech and bioscience industries. They will also participate in basic research projects that explore critical problems in science and engineering as well as through internships created by participating companies.

Instructors will include scientists and engineers drawn from California industry, who will provide perspective on critical technology challenges and how companies undertake R&D to create new products and enter new markets.
- 3. Leadership** UC has been a substantial contributor to California’s high-tech and biotech economy. For example, 1 in 4 California biotech firms were founded by UC scientists, including three of the world’s top five (Amgen, Genentech and Chiron). At the same time, UC graduates hold executive positions at least 1 in 3 California venture-backed high-tech firms.

The California Institutes for Science and Innovation will play a key role in the next wave of technological innovations and economic growth. Its faculty will consult with California’s entrepreneurial businesses and extend their scientific and engineering expertise to young, entrepreneurial companies, for example, through service on scientific advisory boards. Access to UC’s scientific leadership strengthens the firms’ R&D plans and helps them attracts investors.

* Research Policy, 1998, V26(N7-8): 773-776.
** Based on data from American Electronics Association, Ernst and Young Biotechnology Industry Annual Report.