

THE CALIFORNIA SOLUTION
By Richard C. Atkinson
President, University of California
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Ladies and Gentlemen:

Let me begin by taking a moment to thank those whose hard work and dedication have made it possible for us to be here today. I want to acknowledge especially the members of the steering committee--representatives from industry and local government, as well as researchers and academics--who have had the responsibility for planning and guiding this conference to fruition. The steering committee has done a remarkable job. And a word of thanks is also due Ms. Karen Hull, who as conference coordinator has gone to heroic lengths to see that everything happens according to plan.

Finally, it is a special pleasure to congratulate M.R.C. Greenwood for her leadership in bringing this conference together. Only someone of her boundless energy and optimism could take on the challenge of getting so many incredibly busy people together in the same place at the same time--and get it done the day after a holiday. I take great pride in having helped persuade her to accept the Chancellorship of the University's Santa Cruz campus, where she will take office as of July 1.

I am delighted to help open this conference. This is a very sophisticated audience that is well-informed about science and technology. So I want to reassure you at the outset: I have only three messages for you this morning, all of them very simple. One is that we are living in one of the most exciting periods of intellectual discovery in history, and the economic potential of the explosion of knowledge is tremendous. Another is that we need to be much more active than we currently are in promoting industry-university partnerships in research. And the third is that we must organize ourselves in new ways if we hope to succeed in tapping the productive power of new knowledge to drive the California economy.

Whether you look at agriculture, medicine, aerospace, communications, computing, or a number of other industries, there is no question that we are living through a series of revolutions that are remaking our ideas about what is possible. It's been said that a hundred years from now the most memorable event of our era will be the birth of the biotechnology industry. The next step in human evolution may well be determined by humans themselves. And that is only one field in the vast estate of learning.

California's situation today resembles that of the United States around the middle of the nineteenth century. Then the nation was poised to capitalize on the advances of the industrial revolution. Today we have a strategic opportunity to capitalize on the technological revolution that will carry us into the next century. The principal advantages our nation possessed in the last revolution were our vast internal markets and our bountiful natural resources. The critical advantages we have today are our brainpower and our entrepreneurial skills. The successful economies of the twenty-first century will be those that excel in the generation and application of knowledge.

The implications for California are clear. This is a state that has been through a damaging five-year recession. We have seen military base closings, the near-collapse of the real estate industry in some parts

of California, and a dramatic reduction in the State's ability to support essential activities like education and health and welfare.

California urgently needs to invest in the emerging industries that are replacing our defense-related and other declining industries. Biotechnology, pharmaceuticals, agriculture, communications--these and other high-technology industries represented at this conference are generating research breakthroughs that will have major commercial applications, creating jobs and increasing state revenues. And now that California is emerging from the punishing economic years of the early 1990s, we have a window of opportunity. This is the time to invest in the knowledge-based industries that will drive the economy of the next century.

How do we do that? Let me make my biases clear. I'm the president of a large research university, one that receives about 10 percent of all federal dollars spent on university research every year. I believe in basic research. I will be participating in a press conference later this morning to announce the results of a recent poll designed by Research!America, which indicates that eight out of ten Californians believe in basic research too, and agree that it should be supported by the federal government, even if there is no immediate prospect of payoff.

But I am not here to convince you, whether you are in government or industry, to support university research, though of course I believe that's a wonderful idea. I am here to tell you about how I think research universities like the University of California can be involved, and very much need to be involved, in creating the economy of the future.

I don't believe that research universities can be passive recipients of research dollars or passive producers of knowledge for industry. Rather, we need to be involved with all aspects of our knowledge-based economy, as partners with industry and government. Our contribution will differ in some respects from the important contributions of the California State University and the Community Colleges, principally because research is one of our primary missions. But we want to contribute in our way, as they are contributing in theirs, to providing the new ideas and the well-educated and professional-level workforce on which our economy depends.

And that leads me directly to my second message. We need to be much more vigorous in our pursuit of industry-university coalitions in stimulating economic growth.

Why? There is a small but increasingly influential group of economists who have been actively promoting what they sometimes refer to as "new growth theory." Simply stated, they assign central importance to science and technology-based innovation as factors accounting for 50 percent of this nation's economic growth and its international competitive position.

I was the director of the National Science Foundation during the late seventies, and at that time there wasn't much solid economic research on investments in research and their role in the economy. There was lots of anecdotal evidence. One could, for example, point to the transistor and Bell Telephone Laboratories, but there wasn't much hard evidence. While I was director of NSF we mounted a program supporting research in economics focused on just this issue--to try to tie down the impact of research and development on economic growth. In the intervening years a substantial body of economic research and theory has emerged that paints in intriguing picture. The October 1995 report of the Council of Economic Advisors put it this way: "Increasing the productivity of the American workforce is the key to higher living standards and stronger economic growth in the future. Investments in research and

development are the key to increasing productivity, accounting for half or more of the growth in output per person and to the creation of new products and processes."

Let me restate that conclusion: 50 percent of our economic growth since the Second World War is attributable to investments in research and development, with university-based research playing a key role. And there is another very interesting result that follows from the research supporting the new growth theory. When the country increases its investments in basic research, that's followed sometime later by industry's increasing its investments in research and development. When we cut back on basic research, it's followed by a cutback in industry's investments in research and development. There's a very simple reason for this. When universities are generating basic research, they're pursuing new ideas that industry can build on, and invest in as applied research and development. When the country pulls back, then industry doesn't have that base of new ideas on which to build. So the government's investment in university research is very important in driving industry's investments in research and development.

Back in the pre-Sputnik days, universities maintained very close, collaborative efforts with industry. But in the years following the launch of Sputnik in 1957, so much money poured into universities from the federal government that we lost sight of our links with industry. It's only in recent years that we've begun again to realize the importance of close ties with industry in order to ensure that the ideas developed in our laboratories are transferred into the private sector.

I'd like to mention a concrete example, one I happen to be familiar with because it began while I was Chancellor of the University's San Diego campus. In 1985 some leaders in the business community came to me and urged that UC San Diego play a more active role in regional economic development--specifically, in the high-technology and biotechnology industries. The result was a program called UCSD CONNECT. Many such programs emphasize either technology or business. CONNECT draws on expertise across all campus departments and from all professional sectors. It serves the needs of high-tech entrepreneurs by linking them with the financial, managerial, and technical resources they need to succeed.

What this means, for example, is that CONNECT will act as an agent on behalf of small local companies to help them locate investors and find the research they need to develop new products. Working with companies as early as the business plan stage, CONNECT will help an entrepreneur find contacts for raising capital, forming strategic alliances, gaining marketing and management expertise and technical advice. CONNECT is often referred to as an "incubator without walls" because it has nurtured so many successful businesses in San Diego. It has contributed to the economy of the San Diego region by encouraging the formation of high-technology companies and promoting cooperation between the University and the business community--and local government as well, which we work with in both formal and informal ways.

CONNECT is just one example of the kind of help UC is committed to providing. There are efforts on every one of UC's nine campuses to bring venture capitalists, people from the industrial sector, together with scientists and engineers on the campuses to try to move University research ideas into application. The UC MICRO program aids electronics companies in developing the technologies for new products. The STAR Project, a new industry-university program, will expand the kind of research needed to keep California's world-class biotechnology industry on the cutting edge. Our Office of Technology Transfer is currently managing over 1,000 active U.S. patents, and has almost another 1,000 in development, making UC the most productive university in the nation in moving ideas into the marketplace. Through UC ACCESS, an online information system and matchmaking service, we foster research collaboration

with private industry, technology transfer, and resource sharing among our nine campuses, the three Department of Energy Laboratories we manage for the federal government, and private industry.

What we have learned from these and other cooperative research programs is that the bridge to industry is key. We are so convinced of the importance of this bridge that we have established what we are calling the Industry-University Cooperative Research Program. This program builds on our earlier experience in industry-university cooperation and encompasses our various efforts into one program. We will work with many industries--biotechnology, information technology, agriculture, entertainment--but will focus initial efforts in biotechnology.

We have allocated \$3 million of our own money and have asked the Governor and the Legislature to support it through the University's budget. The Governor has included in his budget a proposal for raising the research and development tax credit from 12 to 24 percent for the support of university-based research by the private sector. The tax credit has passed the Assembly and is now in the Senate. This is particularly critical because the tax credit will help us encourage industry involvement. In addition, the Senate budget subcommittee has added \$5 million to our budget to help expand the Industry-University Cooperative Research Program. This support is encouraging because I believe the program is very important to the future economy of California.

And that brings me to my third and final message. We can all be proud of the individualism and entrepreneurial spirit that have made California one of the most dynamic societies in the world. But we also need to recognize when the times call for cooperation rather than competition. California must speak and act with a unified voice when it counts, whether we are making our case for federal grants or making the most of our economic and market advantages.

And we haven't always been as organized about that in the past as we will need to be in the future. If we are going to sustain the university research enterprise in California that keeps ideas flowing into industry, for example, we have got to see that peer review remains the criterion for selecting projects funded by the federal government. I believe we can keep our research efforts vigorous, even in an era of declining federal funding, as long as quality is the standard by which programs are judged. When quality is the factor that determines what projects are funded, California does very well. That's because the quality of the faculties that have been assembled in our universities will more than guarantee California's success.

But there is no question that we will have to look less to the federal government and more to ourselves. The actors at the state and local level are becoming increasingly important as the federal investment in basic research shrinks.

So what brings us together this morning is our shared sense that we have to come together in new ways and with a new vigor. We need to create a coalition of forces and regions that, together, will add up to a strategy for California. There is an important role for all of us-- individual entrepreneurs, large and small companies alike, State government, local government, colleges and universities, and everyone involved with the California economy.

Our tendency as a society is to concentrate on the short-term. Our tendency in California is to rely on individual talent and initiative. But if we are going to have an economic strategy for California in the twenty-first century, our job is to think about the long-term investments and cooperative arrangements that will reinvigorate the three-way partnership among industry, government, and universities. We've learned a lot from our experience over the past ten or fifteen years. We've learned how to draw on each

other's strengths in ways that respond to the economy's need for a constant supply of innovative ideas. We know how to create these partnerships and how to make them work.

But today we have an even bigger task. Our challenge is to organize ourselves up and down the length of California, industry by industry and region by region, to create and sustain the industries of the future. California has all the ingredients of a solution--dynamic industries, supportive local and state government, great universities. But do we have the will? This conference encourages me to think the answer is yes.