

# INNOVATE

The background of the entire page is a dark, starry sky filled with white lines representing constellations and star patterns. Overlaid on this is a network diagram consisting of numerous white nodes (represented by small circles, squares, and crosses) and arrows of varying thicknesses. Some arrows are solid, while others are dashed. The nodes and arrows are scattered across the page, creating a sense of interconnectedness and flow. The overall aesthetic is technical and futuristic.

Office of the Chief Investment Officer of the Regents

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**INNOVATE**  
**UC INVESTMENTS**

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Cover:  
Subatomic particle event.  
Photograph taken April 2, 1958.  
Bubble Chamber-380A.  
Photo courtesy of Berkeley Lab.

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**5**

**FIVE INNOVATIVE IDEAS.  
FIVE YEARS. AND A PATH  
TO THE NEXT CENTURY.**

**A CONVERSATION WITH  
JAGDEEP SINGH BACHHER  
& ASHBY MONK.**



Jagdeep: Ashby, every time we get together, I always ask you: as you've traveled around the world, what are the best ideas you've seen? Who are the most interesting people you've met? What are the things that are making you say, "Aha, this is interesting!"? You've always got, like, 10 things to tell me, and even if we pick up on just one, it's always the most interesting thing we do. So what's going on out there right now that's exciting you?

Ashby: All the work I'm doing right now is around how investors are using technology to change the way they invest. And by that I don't only mean what we're investing in, but also how we're investing. If we take a step back and think of the world of long-term investors – pensions, sovereigns, endowments, etc. – we've already put in place the collaborative model of institutional investment: aligning interests and improving outcomes. That was just phase one of our project to empower long-term investors. Now we're on to phase two, which is all about using technology to leverage our comparative advantages more thoughtfully. I think technology will empower – as in literally give power to – long-term investors such that they can hopefully close the hegemonic cycle where Wall Street dominates the pension plans. Through phase one (collaboration) and phase two (technology), the long-term investors will once again regain their power in the marketplace.

But this comes with a big caveat: innovation is very hard. These plans are often set up purposely to avoid creativity or innovation. But if we want to get away from the expensive fee structures that still generate higher returns, we need to walk a different path. So, a lot of what I do is think about how to help these funds innovate.

J: Yes, it's hard, but I think it's safe to say there is absolutely going to be innovation, and especially technological innovation, in the financial services industry in the coming decade.

A: Yeah, I agree. For the last 50 years, all the technology in finance has gone toward making the financial services industry richer, not making the financial services industry better. The good news is that over the next 10 years, I think technology in finance will be about empowering the ultimate owners of the capital – the pension funds, the endowments, the foundations – so they can be better stewards of that capital. It's going to be a big push back against what I call the fee machine of Wall Street and toward getting a better deal for asset owners.

J: Here's an example of how technology is affecting financial services right now. Until very recently, an insurance company asked you just a few questions before they wrote your life insurance policy: Do you smoke? Do you have any heart conditions? Do you have any permanent medical issues? How old are you?



Today, they may ask you those questions but they also give you an Apple Watch.

A: Do they really? A free Apple Watch?

J: Yes! They're basically giving you a discount right off the bat for using the Apple Watch. Then if you meet your fitness goals, which they can tell because of the health data from your watch, you'll get another discount, because they're able to underwrite better using your real-time data. This is where the world is heading. You have to start thinking: "How can I use technology to be innovative? How can I use innovation that's taking place in other industries to better inform the decisions I make?" So at the core of it, in our business – finance and investments – it's about the data you have, the insights you can gather and the kind of decisions you make from it. So every leader at every financial institution has to be reevaluating their budgets and shifting their spending priorities to data and IT capabilities.

A: But we should be clear: the asset management industry today is as paranoid about technology as any industry. They're paranoid because they now realize their lunch will soon be eaten by Boston, Silicon Valley, Tel Aviv, the places where the real tech innovations are coming from that will disrupt the finance industry. Here's something interesting I've noticed that's related to this. Traditionally, the kids from our program at Stanford who got paid the most were those that went off to work with hedge funds. But three years ago, that started to change. Now it's the kids who are going to work on the AI teams at Google, Facebook and Amazon that are making the most, and they're making twice as much as the hedge fund kids.

J: A few years ago that would have surprised me, but it doesn't today. The world is just changing so fast. A few years ago, we never imagined that there would be something called a trillion dollar company. But right now, we're in striking distance of that, and in the next 10 years, we may have half a dozen trillion dollar companies.

A: The pace of change has definitely accelerated, and the cost of doing a startup is much lower, which

means the path to a minimum viable product is much shorter. So bringing it back to what we're doing, these are some of the things that I think about: how do we position an investment office that's been around for 75 years for a future where we can't even figure out exactly what our kids will be doing?

J: Okay, so let's not even talk about the next 10 years. Let's talk about the five things we could focus our attention on over the next five years. Like if we looked back five years from now, what would we wish we had been working on?

A: So, I've got two that come to mind right away. The first is the digitization of the real economy. We use all these different devices to understand the physical infrastructure that we operate in: buildings, lights, energy. The digitization of our environment is happening, but that's just one side of the coin. The other side is the digital investor. In a world that's more quantified, we're going to have to have better financing, lower cost of capital, and more resource efficiency. But over time, we're also going to be developing models of the world that are grounded in data and bottom-up understanding as opposed to what we have today, which are these top-down models with assumptions and heuristics that are often proven wrong, especially in crises.

The second idea I have is related to this, because

as we digitize the built world, there's a whole set of assets that will end up potentially being what we call stranded assets. And I think the most obvious of these is the shift to autonomous transport. Whether it's personal mobility or the transport of goods, things are going to change in the next five years. You'll take your car into the city, but you won't park it in a garage. It will go to the cheapest place it can idle until the next person picks it up via a ride sharing app. I'd be very nervous if I owned a parking garage right now. And then if you add drones and personal vehicles flying through the sky to that, it's a major shift.

J: So we have to take these ideas into account as we structure our portfolios. For example, if we are going to build three new hospitals in our system during the next five years, why are we going to replicate the cookie-cutter approach we've used in the past? We've got to step back and fundamentally rethink what a hospital needs to look like in the future.

Now that we're talking health care, I'll add in a third idea: what's happening at intersection of data and life sciences, biology, chemistry, and physics. In the next five years, we will likely see more and more previously incurable diseases become curable. So we need to be investing in the new tools, the picks and shovels you might say, that will enable that revolution. This is huge, life-changing stuff that we could have



“UNIVERSITIES ARE THE EPICENTERS OF INNOVATION AND ENTREPRENEURSHIP, AND WE’RE POSITIONING OURSELVES TO TAKE ADVANTAGE OF WHAT WE BELIEVE IS A PROMISING NEW ASSET CLASS.”  
JAGDEEP SINGH BACHHER

hundreds of conversations about. And it’s already started, right here at UC.

A: You’ve got five massive hospital systems right here at the UC at the cutting edge of this technological shift. It will be fascinating to watch this tech play out.

A fourth area I think will be critical is the gamification of our world. I know it sounds whimsical, but I think it’s actually going to be quite profound. We’ve seen firsthand the power of games to motivate people to change their behavior. We love games. We love solving things. Even little “prizes” are surprisingly strong motivators. Over the next five years, I think we’re going to end up seeing quite a bit of innovation in this sector that unlocks different human behaviors that have been nearly impossible to reach, such as in the case of personal savings or health and fitness.

J: I’m seeing a common thread to all of the things we’ve been talking about: The world is getting more and more complex, and the speed of change is so fast that we can no longer work in isolation. So I think the fifth big idea for this chat should probably be interdisciplinarity. We need to leverage all of the talent and resources at our disposal. That’s going to be the key competitive advantage. We’re going to need to work with governments, with researchers, with entrepreneurs, with people of all stripes.

A: That’s an interesting frame, and it goes to some of what we spoke about in the collaborative model of investing. You need to create deep relationships with managers. You have to tap into new and unique sources of data, such as that of your sponsor. You have to be willing to work with players that most investors aren’t accustomed to working with.

J: I’ll also add a bonus idea here for good measure. We live in a world today that is populist...

A: Here we go.

J (laughs): Hang on. It’s all about our own countries and our own interests. But in the next decade, I am going to make the argument that globalization is going to become even more important. If I’m a leader today in America, one of my measures of success five years from now will be: Did I take five trips to China? Did I take five trips to India?

A: That’s a lot of trips, man.

J: You have to be a global leader, because 30 years from now, China is going to be a huge superpower. And India is going to go from a \$2.5 trillion economy to a \$5 trillion dollar economy in the next seven years. How can you ignore that? So five years from now, I need to be able to say I know what’s been going on in the world because I’ve been there. I’ve got the relationships. We are participating in the global marketplace of opportunities. We’re active.

And one final thing. And this may be the most important. All of these things we’ve been talking about are fantastic, but we’ve got a very biased view from where we sit. We have to remember there is a tremendous portion of this world that is poor. There’s a tremendous portion of the world that doesn’t have resources and that can’t even fathom what it’s like to discuss these things with us because they don’t have a meal on the table.

In the last five years, it’s become crystal clear that you cannot lead without having a social conscience. In the next five years, it’s not that we just use data to make better decisions, but we also have to think about the implications of our decisions on society. So five years from now, I hope to say that we not only have a better awareness of the global opportunities available to us, but that when we make these decisions, we constantly think about what the implications are to humanity, to the environment, to the individuals that we serve. Social awareness has to be embedded into and is, in fact, at the core of our decision-making.

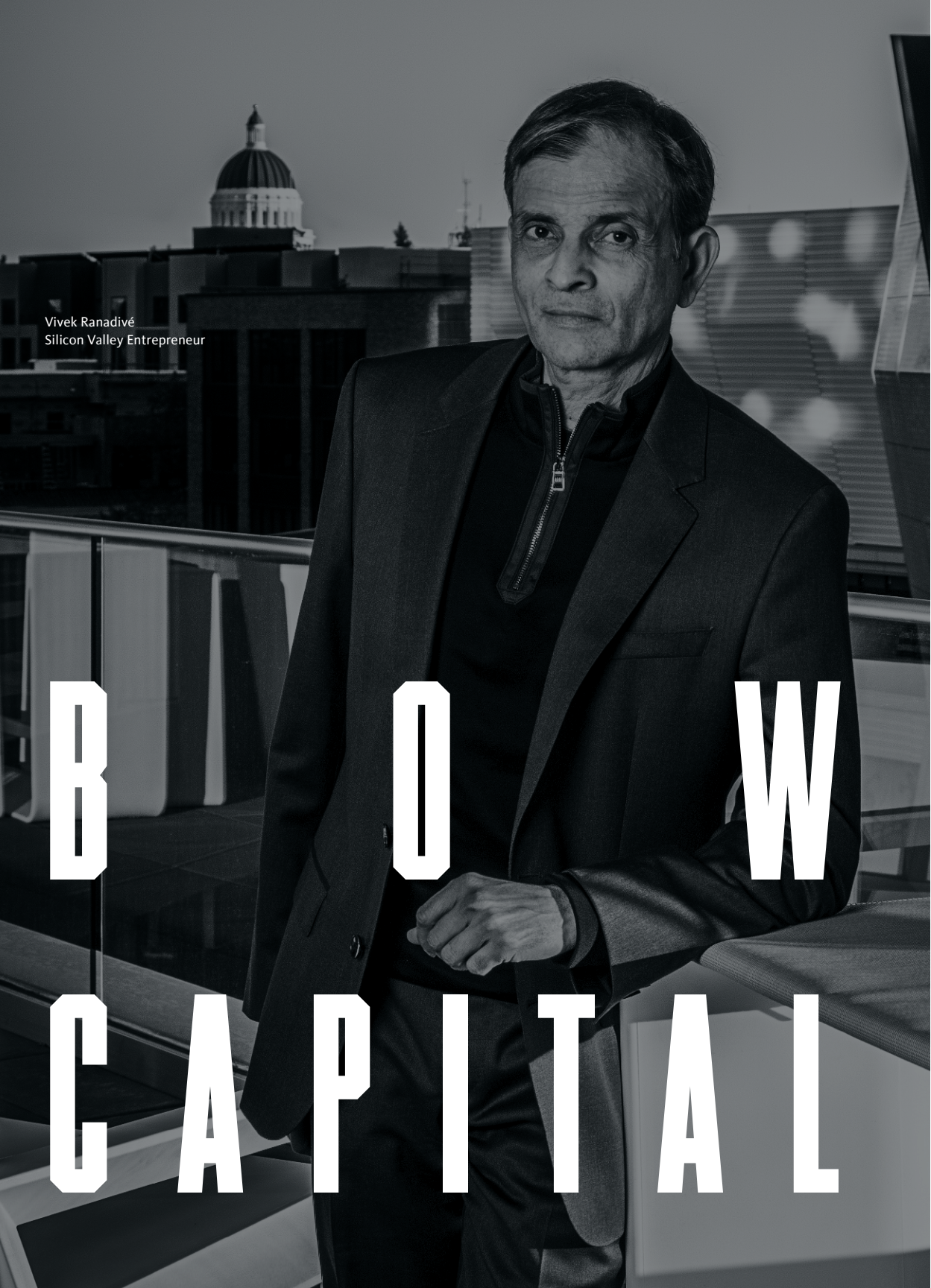
A: I’ll cosign that.

J: I thought you would. So are we done? I think we’re done.

A: Yeah, we’re done. That was great.

Jagdeep Singh Bachher is the Chief Investment Officer at the University of California. Ashby Monk is the Executive Director & Research Director at the Stanford Global Projects Center.





Vivek Ranadivé  
Silicon Valley Entrepreneur

# BOW CAPITAL

## INVESTING IN UC, CREATING A BETTER WORLD

Every day on campuses, med centers and labs across UC, the future is being created, one idea, one conversation, one experiment at a time.

But moving groundbreaking research and discovery out of the lab and into the marketplace is no small feat. It takes nurturing and investment to create the bold solutions needed to solve today's biggest challenges.

Several years ago, it became clear that supporting UC's own inventors and builders and makers – the best in the world – was both the right thing to do and had the potential to provide tremendous long-term value to the university.

So in 2014, UC Investments started talking with renowned Silicon Valley entrepreneur Vivek Ranadivé about what a university-affiliated venture fund might look like. "Part of what Jagdeep and I saw was that there is a massive shift happening in our world right now," says Ranadivé. "We call it Civilization 3.0 – the time when we shift from the industrial era, the age of the corporation and efficiency, to the digital age of information and service. We believe that the disruption as we make this shift is going to come out of academia, and UC was the perfect place to launch because they spend more on research, they have more patents, and they have more diversity than any other university system in the world."

After months of talks and a \$250 million commitment, a new kind of venture fund was born. UC partnered with Ranadivé to create Bow Capital – "Bow" stands for "better our world" – to work together to discover, provide capital for, and then capture value from the ideas and research coming out of the UC's own ecosystem. They're most aggressively pursuing sectors they believe will generate at least a trillion dollars, including gene editing and the microbiome.

Most importantly, Bow Capital has a profound mission: focus on funding technologies that will have the most positive effect on our world. "In order to make the world better, faster, you have to accelerate the path from science to society," Ranadivé says. "UC's ideas, data, technology and people combined with our

connectivity to the corporate world will help these companies reach escape velocity."

They've already created strong relationships top-tier co-investors as well as with every one of UC's 10 campuses, each of which has one or more of what Ranadivé calls "superpowers." Most of UC Venture's deals have a strong UC component – research, alumni, incubators; they're co-investing alongside venture capital firms investing in "high-conviction" discoveries made at UC. But they're also looking beyond the state's borders: UC Ventures is one of the lead investors in MIT's incubator program, The Engine.

One of their first UC investments was in GenEdit, a company founded by UC Berkeley scientists to develop targeted delivery technologies for CRISPR/Cas9 therapeutics. CRISPR, dubbed "the discovery of the century," is itself a UC innovation. It was discovered by UC Berkeley researcher Jennifer Doudna and enables precisely targeted genome editing and the potential to cure hundreds of genetic diseases. GenEdit is actively working on how to deliver CRISPR treatments into the human body with a proprietary, non-viral delivery system that's safe and effective.

In addition to GenEdit, Bow Capital has made about a dozen other investments, including Evolve BioSystems, a company that developed an infant microbiome product to return a baby's gut to its natural, healthier state, and the Flex Company, which is making menstrual discs that are more comfortable and a longer lasting alternative to tampons.

"Money for startups is available from many sources, but smart money, value-added money like ours is rare," Ranadivé says. "So entrepreneurs are eager to work with us and help us deliver on our promise to work with 'social unicorns,' companies that have the potential to reach a billion people."

Ranadivé predicts that Bow Capital's disruptive investment approach will set the standard for others in the future. "This program is really the first of its kind," he says. "We believe other universities are going to mirror this approach, and we're very excited to work with a visionary like Jagdeep."



# UC'S TECHNOLOGY COMMERCIALIZATION IN 2017

INVENTIONS: 1,716

U.S. PATENTS: 555

INTERNATIONAL PATENTS: 900

LICENSES: 257

STARTUPS: 96

# SPARKING INNOVATION AT UC NATIONAL LABORATORIES



The three National Laboratories we manage and operate for the U.S. Department of Energy – Lawrence Berkeley, Los Alamos, and Lawrence Livermore – are known as the world’s most fertile ground for launching innovations that change the world.

And the National Labs have always been involved in technology commercialization and partnerships with industry. But over the last few years, the federal government has put more emphasis on the Laboratories not just making their research available to the outside world, but actively seeking outlets for the research to have a broader public impact.

So when UC Investments approached the National Laboratories Vice President Kimberly Budil about building an investment vehicle to foster innovation there, it made perfect sense to her. “For the Laboratories, it’s an opportunity to really incentivize and facilitate our native entrepreneurial spirit,” Budil says. “When Jagdeep came to us to talk about developing a pipeline of investments to better leverage all of this tremendous intellectual capital, I was very excited. There’s a huge amount of capacity here, and this is a perfect way to ignite that.”

Less than a year after embarking on the mission, the Labs have a new partner: Congruent Ventures, a San Francisco-based, early-stage venture fund partnering with entrepreneurs to build companies addressing sustainability challenges. To follow through on its commitment to investing in UC’s own innovations, UC Investments contributed \$50 million to Congruent Ventures’ first round of funding.

“Not every institution can summon an impressive group of people like this to the table,” says Budil. “The size of the university’s investment portfolio gives us unique leverage. It also means we can derive benefits from all of our own intellectual activity without the downsides of owning all the risk.”

The partnership has a unique side benefit: helping the National Laboratories recruit and retain the very best scientists, technologists and entrepreneurs. With the plethora of opportunities in “hot” industries, particularly in Silicon Valley, the competition for talent is fierce. “The key perk of being part of the National Labs family is the sense of purpose and mission and service to the nation you get from working in our environment,” Budil says. “Creating this partnership helps us fulfill our goal to find ways to invigorate people’s careers to make them feel that we’re invested in their future and keep the vitality of the research enterprise high.”

And it’s also a way for the University of California to demonstrate the kind of unique value it can add to the National Laboratories ecosystem. “I believe the government is deriving real benefit from this,” Budil says. “It is an extraordinary benefit that we can uniquely provide at this scale.”

# OUR NEWEST NOBEL ERIC BETZIG, PHD

If there's one thing that Eric Betzig's winning the 2014 Nobel Prize in chemistry proves, it's that innovation and discovery don't happen in isolation. In fact, he believes the best science often occurs when people and ideas "collide." That kind of interdisciplinary collaboration, like what happens regularly in the open-plan Li Ka Shing Center for Biomedical and Health Sciences on the Berkeley campus, is one of the many things that appeals to him about Berkeley.

And it's one reason that this summer, Betzig became UC Berkeley's eighth active Nobel Laureate, bringing its list of lifetime faculty members to 22. He's on the faculty in the Molecular Biophysics and Integrated Bioimaging Division of the Biosciences Area at LBNL, serves as a professor in the Departments of Molecular & Cell Biology and Physics, and is also a member of the Helen Wills Neuroscience Institute. And he's doing all of this while continuing to keep his lab running at the Janelia Research Campus of the Howard Hughes Medical Institute in Ashburn, Virginia.

Betzig took probably the world's most unconventional path possible to the Nobel. After obtaining a BS in physics from Caltech and getting his PhD at Cornell – all traditional enough – he became a principal investigator at AT&T Bell Labs. There, he was the first to image subcellular details beyond the so-called diffraction limit, which had so far hampered scientists' ability to see details of proteins inside cells.

Okay, so far, so good. But he'd only been at Bell Labs a few years, when the record-scratch moment comes: Betzig hated academic science so much, he quit with absolutely no idea of what was next.

The only thing he did know was that he loved to invent things. So he got his dad to agree to hire him as vice president of research and development at the elder Betzig's machine tool company in Michigan. While there, he developed a precise motion control technology for automated cutting tools. But after

**"I'm not comfortable with labels. I'm trained in physics but don't think of myself as a physicist. I have a Nobel Prize in Chemistry, but I certainly don't know any chemistry. I work all the time with biologists, but any biology I have is skin-deep. If there is one way I characterize myself, it's as an inventor. My father is that, too. He spent his life inventing and making tools for the automotive industry. I grew up around inventors."**

*Eric Betzig to [The New York Times](#)*

spending four years trying market his invention to auto manufacturers, he made only two sales.

"I spent all of my dad's money and had nothing to show for it," Betzig says. "Now I had two failed careers and was unemployed again. I seriously thought I might end up working at Walmart."

But his insatiable curiosity and a feeling he hadn't finished what he started at Bell Labs led him back, with trepidation, to science. He got in touch with his former Bell Labs colleague, Harald Hess, and they started working on microscopy again from Hess's living room in La Jolla, California, paying for all the R&D themselves.

And it was there in that living room that Betzig devised a simpler approach to optical imaging of cells at near-molecular resolution, termed photoactivated localization microscopy, or PALM. A few years later, that invention led to him finding himself in a tailcoat sitting next to the Crown Princess Victoria of Sweden at the Nobel Prize Banquet in Stockholm. And so it was that the roller-coaster ride from unemployment to Nobel was complete.

Betzig joins the Berkeley faculty for two big reasons. One is that he was drawn to the campus's reputation as a world leader in imaging and its extremely broad disciplinary reach. The second, and equally important reason: his wife. Na Ji, a distinguished biophysicist, was recruited to Berkeley from Janelia as well. Ji, who earned her PhD in chemistry from Berkeley, joined the Berkeley faculty as an associate professor in the Departments of Physics and Molecular and Cell Biology. Ji has made major advances in sharpening microscopy images using adaptive optics for the study of the activity of neural circuits in the cerebral cortex.

Betzig is spending the first year at Berkeley with an open mind and a blank whiteboard. Once again, he's not sure what's next. "There's nothing left for me to prove in microscopy," he says. "At Berkeley I want to feel scared again. I have nothing to lose."



# UC NOBEL PRIZE WINNERS

Name	Campus	Year	Award
Akerlof, George A.	Berkeley	2001	Economic sciences
<b>Alfven, Hannes*</b>	<b>San Diego</b>	<b>1970</b>	<b>Physics</b>
Alvarez, Luis W.*	Berkeley/Berkeley Lab	1968	Physics
<b>Bishop, J. Michael</b>	<b>San Francisco</b>	<b>1989</b>	<b>Physiology or medicine</b>
Blackburn, Elizabeth H.	San Francisco	2009	Physiology or medicine
<b>Boyer, Paul D.</b>	<b>Los Angeles</b>	<b>1997</b>	<b>Chemistry</b>
Brenner, Sydney	San Diego	2002	Physiology or medicine
<b>Calvin, Melvin*</b>	<b>Berkeley/Berkeley Lab</b>	<b>1961</b>	<b>Chemistry</b>
Chamberlain, Owen*	Berkeley/Berkeley Lab	1959	Physics
<b>Chu, Steven</b>	<b>Berkeley/Berkeley Lab</b>	<b>1997</b>	<b>Physics</b>
Cram, Donald J.*	Los Angeles	1987	Chemistry
<b>Crick, Francis H. C.*</b>	<b>San Diego</b>	<b>1962</b>	<b>Physiology or medicine</b>
Crutzen, Paul	San Diego	1995	Chemistry
<b>Debreu, Gerard*</b>	<b>Berkeley</b>	<b>1983</b>	<b>Economic sciences</b>
Dulbecco, Renato*	San Diego	1975	Physiology or medicine
<b>Engle, Robert F.</b>	<b>San Diego</b>	<b>2003</b>	<b>Economic sciences</b>
Giauque, William F.*	Berkeley	1949	Chemistry
<b>Glaser, Donald A..*</b>	<b>Berkeley/Berkeley Lab</b>	<b>1960</b>	<b>Physics</b>
Goeppert-Mayer, Maria*	San Diego	1963	Physics
<b>Granger, Clive W. J.*</b>	<b>San Diego</b>	<b>2003</b>	<b>Economic sciences</b>
Gross, David J.	Santa Barbara	2004	Physics
<b>Guillemin, Roger</b>	<b>San Diego</b>	<b>1977</b>	<b>Physiology or medicine</b>
Harsanyi, John C.*	Berkeley	1994	Economic sciences
<b>Heeger, Alan J.</b>	<b>Santa Barbara</b>	<b>2000</b>	<b>Chemistry</b>
Holley, Robert W.*	San Diego	1968	Physiology or medicine
<b>Ignarro, Louis J.</b>	<b>Los Angeles</b>	<b>1998</b>	<b>Physiology or medicine</b>
Kohn, Walter	Santa Barbara	1998	Chemistry
<b>Kroemer, Herbert</b>	<b>Santa Barbara</b>	<b>2000</b>	<b>Physics</b>
Kydland, Finn E.	Santa Barbara	2004	Economic sciences
<b>Laughlin, Robert B.</b>	<b>Livermore Lab</b>	<b>1998</b>	<b>Physics</b>
Lawrence, Ernest O.*	Berkeley/Berkeley Lab	1939	Physics

\* deceased

Name	Campus	Year	Award
Lee, Yuan T.	Berkeley/Berkeley Lab	1986	Chemistry
<b>Libby, Willard F.*</b>	<b>Los Angeles</b>	<b>1960</b>	<b>Chemistry</b>
Markowitz, Harry M.	San Diego	1990	Economic sciences
<b>McFadden, Daniel L.</b>	<b>Berkeley</b>	<b>2000</b>	<b>Economic sciences</b>
McMillan, Edwin M.*	Berkeley/Berkeley Lab	1951	Chemistry
<b>Milosz, Czeslaw*</b>	<b>Berkeley</b>	<b>1980</b>	<b>Literature</b>
Molina, Mario J.	San Diego	1995	Chemistry
<b>Nakamura, Shuji</b>	<b>Santa Barbara</b>	<b>2014</b>	<b>Physics</b>
Northrop, John H.*	Berkeley	1946	Chemistry
<b>Palade, George E.*</b>	<b>San Diego</b>	<b>1974</b>	<b>Physiology or medicine</b>
Pauling, Linus*	San Diego	1954, 1962	Chemistry, Peace
<b>Perlmutter, Saul</b>	<b>Berkeley/Berkeley Lab</b>	<b>2011</b>	<b>Physics</b>
Prusiner, Stanley B.	San Francisco	1997	Physiology or medicine
<b>Reines, Frederick*</b>	<b>Irvine</b>	<b>1995</b>	<b>Physics</b>
Rose, Irwin*	Irvine	2004	Chemistry
<b>Rowland, F. Sherwood*</b>	<b>Irvine</b>	<b>1995</b>	<b>Chemistry</b>
Schekman, Randy W.	Berkeley	2013	Physiology or medicine
<b>Schrieffer, J. Robert</b>	<b>Santa Barbara</b>	<b>1972</b>	<b>Physics</b>
Schrock, Richard	Riverside	2005	Chemistry
<b>Schwinger, Julian*</b>	<b>Los Angeles</b>	<b>1965</b>	<b>Physics</b>
Seaborg, Glenn T.*	Berkeley/Berkeley Lab	1951	Chemistry
<b>Segre, Emilio G.*</b>	<b>Berkeley/Berkeley Lab</b>	<b>1959</b>	<b>Chemistry</b>
Shapley, Lloyd S.	Los Angeles	2012	Economics
<b>Smoot, George F.</b>	<b>Berkeley/Berkeley Lab</b>	<b>2006</b>	<b>Physics</b>
Stanley, Wendell M.*	Berkeley	1946	Chemistry
<b>Townes, Charles H.*</b>	<b>Berkeley</b>	<b>1964</b>	<b>Physics</b>
Tsien, Roger Y.	San Diego	2008	Chemistry
<b>Urey, Harold C.*</b>	<b>San Diego</b>	<b>1934</b>	<b>Chemistry</b>
Varmus, Harold E.	San Francisco	1989	Physiology or medicine
<b>Williamson, Oliver E.</b>	<b>Berkeley</b>	<b>2009</b>	<b>Economics</b>
Yamanaka, Shinya	San Francisco	2012	Physiology or medicine

**IN LABS ACROSS  
UC, THOUSANDS OF  
RESEARCHERS WORK  
DAY AND NIGHT TO  
DISCOVER THE CHEMICAL  
COMPOUNDS THAT WILL  
EVENTUALLY BECOME  
DRUGS THAT CAN  
SAVE HUMAN LIVES.**



Dr. Michael Jung  
Professor of Chemistry  
UCLA



# ENDOWMENT INNOVATION: UCLA & XTANDI

It's a process that takes years, if not decades, and false starts, dead ends and other challenges are par for the course.

But for researchers at UC, the days are never too long and the disappointments never too deep to keep them from working and innovating.

Two years ago, the dream for a small team of these researchers was fulfilled: UCLA sold the royalty rights to Xtandi, a drug for the treatment of prostate cancer, for \$1.14 billion, the largest-ever technology transfer deal involving a University of California invention. Dr. Michael Jung, an esteemed chemist and professor at UCLA, was one of the team of eight inventors who helped create the drug.

The deal granted the royalty rights for Xtandi to Royalty Pharma, a pharmaceutical investment company. The UC Endowment received about 44 percent of the proceeds, or \$520 million.

Though Xtandi was already generating significant income for UC – \$33.3 million in royalties and other income in 2015 alone – before they sold the rights, Westwood Technology Transfer (WTT) Board Chairman Tom Unterman advised that revenue could drop at any time if drug prices were to fall or better therapies become available. So the groundbreaking deal was structured by WTT, a not-for-profit advisory board created by UCLA to assist them in identifying inventions that have commercial potential and generate the best market value for them.

"Given ongoing funding pressures, we are pleased to have these much-needed additional resources to invest in programs that directly serve the public by fostering research that leads to commercially viable products and by educating students," said Steve Olsen, UCLA's former vice chancellor and chief financial officer.

UCLA's proceeds were put into an investment portfolio managed by UC Investments with an annual payout of \$60 million until 2027. These endowment pool funds are being used to support research, faculty and students financial aid packages.

"Obviously, we were glad to sell the very large majority of the assets," said Dr. Jung, professor of

chemistry in the Department of Chemistry and Biochemistry at UCLA. "And it's wonderful because the university got this huge sum of money for both our medical school and the division of physical sciences. The money has helped enormously, allowing us to fund exciting new projects and extend the reach of others already in progress."

Though the vast majority of Jung's time is happily spent in the lab, he does relish his encounters with prostate cancer patients or the families who share their immense gratitude for Xtandi's positive effect on their lives. "Let's face it, you work hard all of your life and sometimes you never get a win like this," he said. "Knowing you're helping to extend people's lives, it's an amazing thing."

At 71, Jung has yet to head to the sidelines and enjoy the rewards of his years of labor. He's involved in more projects than ever before, many that have benefited from the funds generated by the Xtandi sale. "We're looking at breast cancer. We're looking at muscular dystrophy. We're looking at multiple sclerosis. We're looking at various viral diseases. We're looking at colorectal cancer and Crohn's disease," he said.

But one of the most exciting and potentially lucrative projects he's working on is a bit different than these: the development of a small molecule that grows hair. "We haven't put it on people yet, but we have the hairiest little mice you've ever seen," he said. "We have formed a company and are trying to finalize funding from the pharmaceutical industry to move the project forward. We know what the mechanism of action is, and it should work as we go higher up the food chain, but we won't know until somebody like me rubs it on my bald spot."

And Xtandi's influence on UCLA continues to grow, again with the help of Jung. He and his wife, Alice Jung, recently made a \$1 million donation for an Endowed Chair in Medicinal Chemistry and Drug Discovery, which was matched by the UCLA Division of Physical Sciences with another \$1 million. UCLA's matching funds came from their share of proceeds from the royalty rights sale.







WHEN YOU HEAR THE WORDS  
“INNOVATION” AND “CALIFORNIA,”  
YOU’D BE FORGIVEN IF THE FIRST  
IMAGE THAT COMES TO MIND  
ISN’T THE VAST, OPEN LANDSCAPE  
OF THE SAN JOAQUIN VALLEY.  
**WORKING CAPITAL INNOVATION:  
UC MERCED**



But in just a little more than a decade, UC Merced, the newest UC, has not-so-quietly become a hotbed for innovation, so much so that people have started calling it the heart of the “new Silicon Valley.”

“Innovation has been a part of our fabric from the beginning,” says UC Merced’s Chancellor Dorothy Leland. “Our mission was to create a modern, world-class research institution in the heart of the fastest growing region of the state and one that is dedicated to students who have not traditionally had access to UC-class higher education.”

And at UC Merced, innovation isn’t just what comes out of the university; it’s what happens inside the classroom. It’s squarely focused on interdisciplinary research as a key to learning even in the undergrad years. The university’s three schools – the School of Engineering, School of Natural Sciences, and School of Social Sciences, Humanities and Arts – work together to give all UC Merced students a deeper understanding of the world, preparing them to solve the challenges critical to the growth, health and overall well-being of the region, the state, the nation and the world.

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## UC MERCED STATS

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**99% OF STUDENTS ARE FROM CALIFORNIA**

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**77% OF UNDERGRADUATES ARE AMONG THE FIRST IN THEIR FAMILIES TO GO TO COLLEGE**

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**#3 GRADUATION RATE FOR PELL GRANT RECIPIENTS**

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**MORE THAN 50% ARE STUDYING STEM DISCIPLINES**

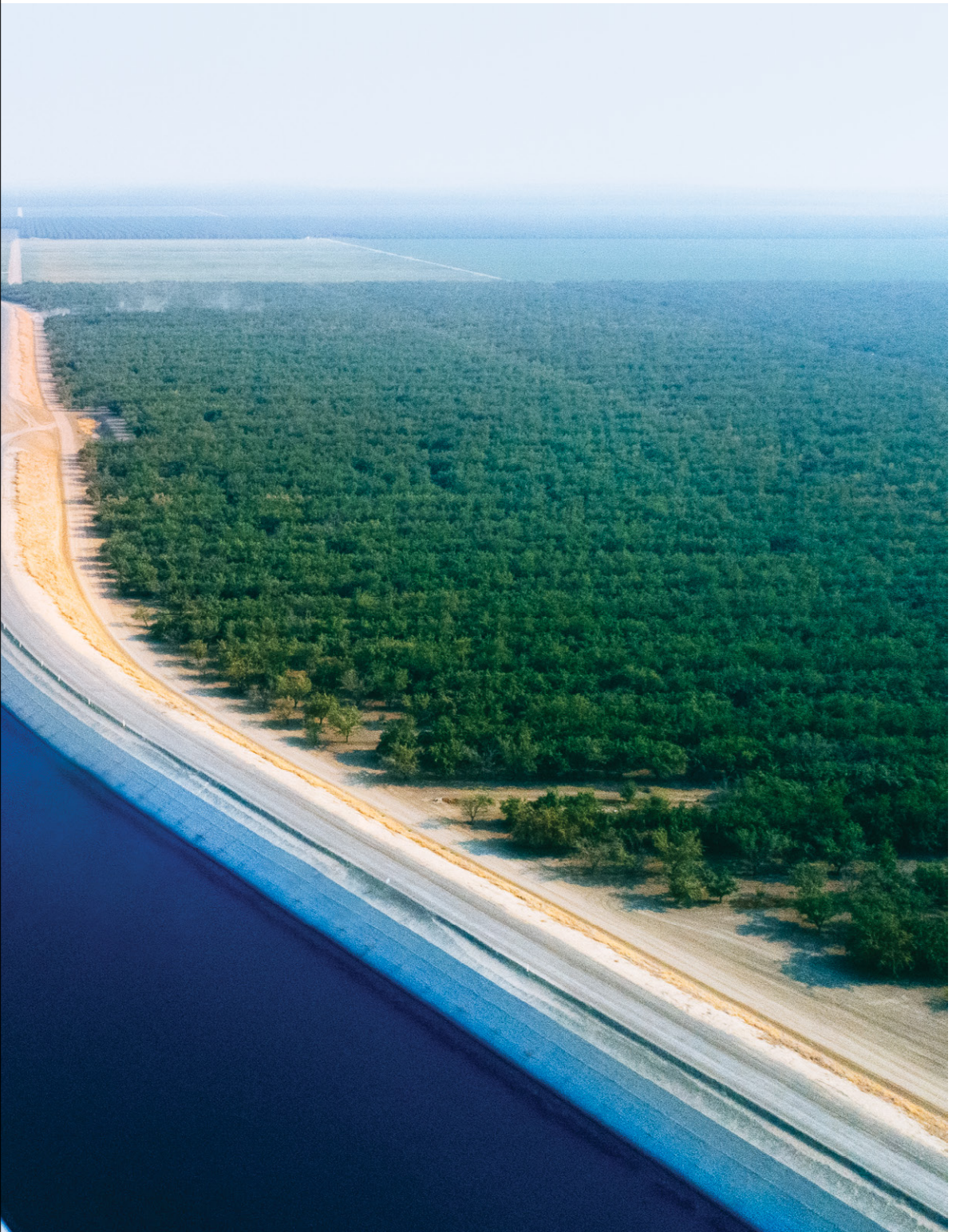
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**TOP 10 UNIVERSITY FOR SOCIAL MOBILITY**

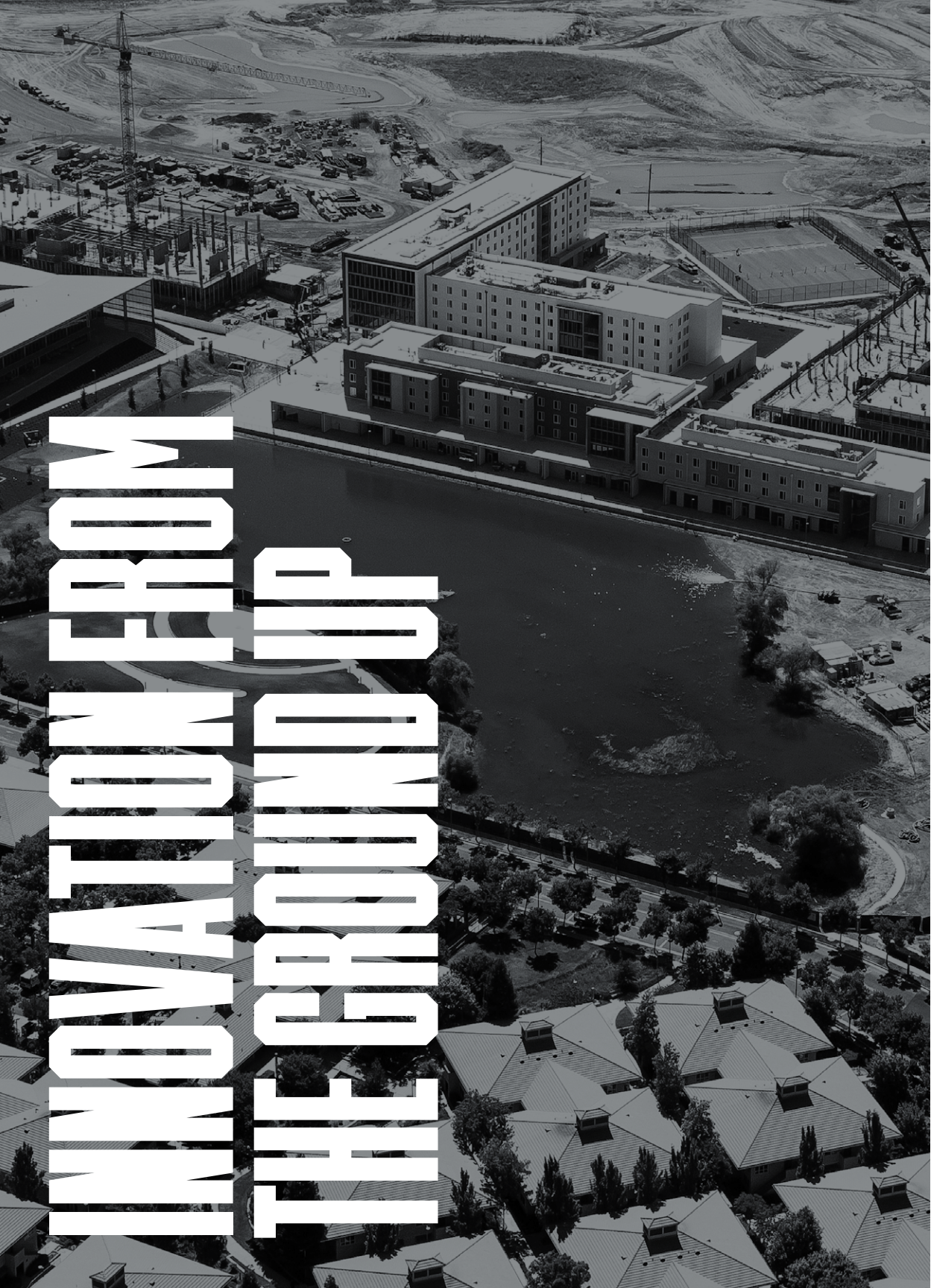
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# INNOVATION FROM THE GROUND UP

But after a decade of rapid growth – UC Merced is the fastest growing doctoral university in the nation, according to *The Chronicle of Higher Education* – the campus was bursting at the seams.

So true to their innovative mindset, they decided to pursue a campus expansion that was unlike anything ever tried before.

The 2020 Project, a \$1.3 billion, 1.2 million square foot expansion plan, will nearly double the physical capacity of the campus within an incredibly aggressive four-year period. The project, which broke ground in October 2016, with a goal of accommodating 10,000 students, uses a new model that integrates planning, design, construction, operations, and finance under a single public-private partnership (P3) competition and contract.

During construction, the university will make predetermined progress payments to the developer. Once the buildings become available for use, the university will make performance-based “availability payments” that cover remaining capital costs, as well as the long-term operations and maintenance of major building systems.

Prior to the 2020 Project, this model had only been used in transportation projects or outside of the U.S.; UC Merced is the first U.S. social infrastructure higher education project to use this specific type of public-private partnership and has already garnered recognition. It was recently named the “Americas P3 Deal of the Year” in Thomson Reuters’ Project Finance International Awards.

“Our team understood the special challenge of being the first higher education project of this scale to adopt an availability-payment concession model across such a diverse range of capital assets,” says Leland. “But what it meant is that we had to take the time upfront to really understand our users, to really understand our mission and then to translate those insights into quantitative standards for the long-term performance of the buildings.”

Here’s why that’s important: public universities often focus on the “sexy” part of a building project: a fancy design that can win architectural awards and impress would-be students and faculty. But they often don’t consider what the balance sheet issues are for maintaining the building.

The P3 variant UC Merced is using ensures that the new buildings have long lives and administrators won’t have to spend their time fundraising for deferred maintenance or worrying about how to pay for the replacement of failed infrastructure. By taking care of everything ahead of time, the university can focus its attention and its resources on its primary mission: teaching, research and public service.

As managers of UC’s Working Capital funds, the UC Investments Office sees this innovative approach as a huge advantage to the UC system overall. By using this innovative model, it provides UC Merced with long-term budgetary predictability for operations and maintenance, and enables precious working capital funds to strategically address critical projects at other campuses across the UC system.

And beyond the innovative partnership approach, the project is giving the university a cohesive, integrated campus that reflects the latest data on how students learn best. For example, all of the student housing buildings have classrooms on the ground floor to create an environment that brings academics right where students live. “This type of holistic approach to campus infrastructure is something you can only do when you’re building it all at once like we are now,” Leland says. “Throughout its history, the University of California has created institutions of remarkable academic distinction, the top public universities in the world. And now we’re going to do it again in the 21st century at UC Merced – an innovative new university for a new era.”

## Sustainable Innovation

In addition to the innovative financing model, UC Merced’s 2020 Project is groundbreaking from a sustainability perspective. Their goal is for the campus to be triple zero: zero net energy, zero net greenhouse gas emissions and zero waste through a combination of energy efficient buildings and operations. Here’s how the expansion is helping:

- All buildings will be certified LEED Gold (minimum)
- The buildings will be connected to a Thermal Energy Storage tank to provide campus cooling to reduce carbon emissions
- Low-water landscaping with native and adaptive plants
- An integrated stormwater management strategy and aquifer recharge approach

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**A BOLD NEW APPROACH TO  
RETIREMENT SAVINGS CHALLENGES**

**THE NEXT BIG**

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As people live longer and the markets continue to react in unpredictable ways, most companies and organizations have shifted from defined benefits (DB or traditional pension) to defined contribution (DC) plans that put more of the responsibility and risk on the employee instead of the parent organization when it comes to saving for retirement.

That means retirement has become something people often prefer not to think about. Too many decisions on how and where to invest. Too little information on how to make smart choices about spending their savings. And the sinking feeling that a fulfilling retirement is actually a thing of the past.

**THING**



# UC RETIREMENT SAVINGS PROGRAM STATS

ESTABLISHED IN 1967

MORE THAN 310,000 PARTICIPANTS

\$24.3 BILLION IN ASSETS

3 PLANS: 403(B), 457(B), DC PLAN

2ND LARGEST PUBLIC DC PLAN IN THE US

LARGEST 403(B) PLAN IN THE US

TARGET DATE FUND (PATHWAY) DEFAULT SINCE 2014

\$9.0 BILLION IN TARGET DATE FUNDS

UC realized that to solve the challenge of our participants outliving their savings, we'd need to search for fresh and bold ideas. Luckily, because we have one of the largest public DC plans in the country – at \$24.3 billion, we're second only to the federal government – we have the power to create innovative programs to make sure our faculty and staff are better prepared for the future.

#### **But first, a bit of history.**

In 1957, we created our DC Savings Program as a purely supplemental vehicle for our employees to save voluntarily beyond their contributions to our Pension UCRP (DB). In July 2016, the university started offering new hires a choice for their primary retirement benefit. For the first time, new employees could elect a pure DC called Savings Choice, foregoing a guaranteed pension paycheck down the road.

Since we started offering it, more than 5,000 new employees have selected Savings Choice, which includes a mandate from UC that they save at a healthy rate to help ensure they're better prepared for the retirement years ahead. Currently, employees must contribute 7 percent of their salary, which is more than matched by an 8 percent contribution from the university.

And save they have: on average, today's UC participant saves an additional 10.3 percent of their paycheck on a voluntary basis.

Along the way, we have also tirelessly innovated and evolved all of our investment choices to ensure the Savings Program funds generate superior returns. We streamlined our lineup to 14 investment choices; created a custom target date fund, Pathway, as our default option; gave all fund choices easy-to-understand names; and reduced costs wherever we could. The average management fee for our core lineup choices is a mere 0.07 percent, and our DC plan can be considered best in class.

Our strategies to innovate have been welcomed by the participants we serve. "Over the last 12 months of working closely with the UC Investments Office, it's clear that their hearts and souls are committed to helping the University of California Retirement Savings

Program and its members succeed," says Caroline Kane, past president and current member of the UC Berkeley Emeriti Association (UCBEA). "I continue to be impressed by Jagdeep and his team."

Despite the progress we've made, there's an inherent problem with all DC plans, including ours: what happens on the other side of retirement. Because DC plans don't provide guaranteed income like traditional DB plans, people have a hard time determining how to spend their lump-sum retirement savings in a prudent way. We want to create a solution that meets our fiduciary responsibilities to our participants.

#### **The next big thing in retirement savings.**

So collaborating with our partners, we are embarking on the creation of a revolutionary DC plan that gives our people peace of mind both before and after they retire.

"UC came to State Street with a challenge: to work with them to figure out how to incorporate some of the best features of their traditional DB plan into their new DC plan so employees lower their risk of outliving their assets," says Vidur Mehra, vice president of DC investment strategy at State Street Global Investors. "Though we in the industry had been talking about this issue for years, no one had cracked the code because no company had the resources or appetite to come up with a solution. But that all changed when UC came to us and said: 'We're willing to explore being the first movers here – we want to take action to create a new way to help our participants.'"

Our vision is a deferred annuity built into our Target Date Fund, Pathway. At the point of retirement, participants can choose to purchase an annuity with a portion of their savings, allowing them to maintain liquidity for the near term, but providing them with the peace of mind that guaranteed income will be available when they may need it most, at between 75 and 80 years old.

Through this forward-thinking investment strategy, we'll be easing the friction caused by changing demographic dynamics and empowering a seamless shift to helping our participants be ready for retirement – and beyond.



John Clements, MD, has been an emeritus UC San Francisco professor since 2004, but don't expect him to be available to meet without his first checking his still-busy calendar.

When you call, he might be working on a study of surface tension in the lungs, the culmination of many years of research that may shed new light on how tiny particles that are common air pollutants are eventually expelled from the lung's lower airways.

Clements, age 94, is a giant in the field of pulmonary biology, renowned for discoveries leading to the effective treatment of premature infants born with underdeveloped lungs that cannot take in life-giving oxygen.

Now, at an age when most others would no longer be working, Clements is still exploring his research field and pushing for others to carry on his work.

In 1994, Clements won the highly prestigious Albert Lasker Clinical Medical Research Award for what was "widely regarded as the most important discovery in pulmonary physiology in the last 50 years," according to the award citation.

Clements' discoveries in lung mechanics also led other UCSF researchers to develop another lifesaving treatment for the most vulnerable infants, called continuous positive airway pressure (CPAP). With CPAP, air supplied through tubes provided pressure needed to keep the immature lungs of distressed neonates from collapsing. The technique quickly spread worldwide.

Clements credits his training in sciences beyond biology as being important to his success. This is part of what is appealing about being at UCSF, according to Clements. "There is a lot of interdisciplinary work, and people help one another in ways that go beyond what is acknowledged in research papers."

Curiosity and the thrill of discovery still drive Clements, but today he spreads his curiosity around. He loves to read – with favorite topics including molecular biology, quantum physics and history. He is an accomplished pianist and maintains his lifelong passion for music, one he shares with his wife, Margot, 92.

Clements continues to meet regularly with his research colleagues, friends who also live in Marin, one retired, and one still seeing patients. "It's no longer publish or perish, but we think it's important work, want to get it out there, and hope someone else will pick up on it and carry it on." — Jeffrey Norris



# CAPTIVE INSURANCE INNOVATION: FIAT LUX & EDUCATION

UC's new captive insurance company, Fiat Lux, is creating savings and returns for the university that never existed before. Here's how they're helping Education Abroad, one of UC's most beloved programs, find renewed financial stability so they can give students the educational adventure of a lifetime.

# ABROAD



Just like every other business, the University of California spends part of its overall budget to insure itself against the unknown. But even with the large volume of policies it purchases to protect our people and our facilities, we pay market-rate prices for our insurance.

A few years ago, UC realized it could use its investment power to create its own captive insurance company and bring down costs. In 2012, it created Fiat Lux Risk and Insurance Company.

When it started, Fiat Lux had just five lines of coverage for \$25 million of premium. Today, it purchases a majority of the insurance to cover the university's risks systemwide, writing more than 30 lines of coverage at \$900 million of premium. Operating out of the department of Risk Services, which is led by Associate Vice President and Chief Risk Officer Cheryl Lloyd, Fiat Lux now ranks as one of the largest captives in the U.S.

"We are now buying (re)insurance protection on a wholesale basis as opposed to buying insurance at retail," said UC's Executive Director of Captive Programs, Courtney Clafin. "We get better coverage and terms at a lower price, and we get to capture underwriting profits and investment income that were previously retained by our traditional insurance companies."

The benefits of this approach are compelling: UC gets significant annual savings (vs. paying premiums to an outside insurance company) plus revenue (from investment income) that can be redirected into the university's mission of education, research and public service.

"Working with UC Investments, we built our own portfolio of investments," says Clafin. "Out of thin air, we've created significant savings and returns that hadn't existed before – and that's every year."

One UC program that's seen immediate benefits from writing their insurance with Fiat Lux is the University of California Education Abroad Program (UCEAP). The program has partnerships with universities in 43 countries across the world to offer UC students the opportunity to study internationally: rainforest biology in Costa Rica; laboratory research in Japan; internships in India.

Making sure students are safe even in times of upheaval – weather-related, politics-related or something else – and being able to fulfill the organization's commitments to their host countries are top priorities for the program's administrators. In the past, the Office of the President had funded the cost of the insurance needed to cover these types of extreme situations, but recently those costs had been shifted to UCEAP and they were looking for new options. They went to Fiat Lux.

"When I got into this position and looked at the financials, I saw that there was an \$8.6 million contingency fund for these types of events, but I was concerned it could be swept away in a budget restructuring at any time," says Dr. Vivian-Lee Nyitray, Associate Vice Provost and Executive Director of UCEAP. "I found out that at some point, someone had come up with this magic number, but it didn't make sense. So I asked Fiat Lux to help us determine what we really needed."

"UCEAP is an important program for UC that helps further the mission of the university – and they bring in a lot of revenue, too," says Karen Hsi, program manager for Fiat Lux. "So we worked with them to build an actuarial analysis of what was the worst thing that could happen that would cause them a loss and that they couldn't afford to take out of their budget."

The number Fiat Lux came up with was \$5 million and so they wrote a difference in conditions (DIC) policy for that amount, one that adequately covers their needs. The other very bright upside to the transaction is that it freed up several millions of dollars in the contingency fund that UCEAP can use for desperately needed deferred maintenance and upgrades, like developing a new student information system that can handle thousands of students across more than a hundred international partners and all 10 UC campuses. "We're no longer just trying to just sock money away," Nyitray says. "We're able to spend what we need and undertake new initiatives that make our program stronger for our students. Plus, our captive insurance funds will continue to earn dividends for us every year, so we can expect returns, and that helps us plan ahead for scholarships and other expenses."

"I would much prefer we spend those funds in-house as we do with Fiat Lux," she concludes. "It demonstrates our fiscal responsibility, and I feel confident I'm being a better steward of our money."

#### Fiat Lux Wins Industry Award

This year, Fiat Lux won the highest honor from the Captive Insurance Companies Association (CICA): the 2017 Outstanding Captive Award. CICA gives the award to the captive insurance company that has shown creative uses for a captive and generated successful results. Soon after the award was announced, CICA also appointed Fiat Lux's executive director Courtney Clafin to its board of directors.





# NEW UC INVESTMENTS PRODUCT INNOVATION: PRIVATE EQUITY FOR UC SAN DIEGO

While UC Investments manages the UC system's General Endowment, each campus has its own endowment, which delivers benefits directly to the individual campus.

This year, the UC San Diego Foundation was looking to increase their target to private equity among the asset allocation for their endowment, which ended this past fiscal year at \$735 million. But they just didn't have access to the types of funds needed to help them make the shift. "We have been very successful in building our endowment, and though it's a tremendous asset to UCSD, it's still a relatively small amount of money for institutional investors," says Bob Marren, chair of the Investment Committee for the foundation. "The UC Investments office manages well over \$100 billion, and that puts them at a scale that allows their investors to do things that are harder for us to do."

One of the most difficult investment spaces for smaller endowments to get into is private equity, especially the top-quartile investment funds. The more typical option for endowments of UC San Diego's size is a fund of funds (FOF), a strategy where a fund invests in a variety of fund categories that are all wrapped together. FOFs usually attract small investors eager for better exposure with fewer risks compared to direct investing, but the costs are generally higher and can sometimes even be double that of direct investments.

UC Investments saw the problem campus endowments were having in the private equity space and created an innovative solution to give them more power in the marketplace. Part of the impetus for this new product came from our office's own announcement that, similar to the UC San Diego Foundation, they were going to move the General Endowment Pool's asset allocation to the private equity/alternative space. The goal? Go from 11 percent to 22 percent in private equity over the next five to seven years.

"That's a very significant amount of money that has to be shifted, but Jagdeep was taking a very calculated, very long-term approach," says Marlene Shaver, CFO of the UC San Diego Foundation. "During the discussion of the shift, he asked if the campus

foundations wanted to be a part of this, and we definitely wanted in. We saw that by taking advantage of this opportunity, we could get into private equity funds in a timely manner and negotiate better deals because we're capitalizing on the large size of the university's asset base, which gives us purchasing power that we just don't have on our own."

The UC San Diego Foundation leadership bought into this new private equity product almost immediately. "Our campus has a long history of investing with the office of the CIO [UC Investments]," says Marren. "They have a long, successful track record in this asset class, and they've done a very good job with consistently high returns. I think Jagdeep brings even more creativity to this – reaching out to people in the field to do new and different things. We feel very good about the opportunity to invest alongside him."

Their foundation's committee and the board voted to allocate \$10 million a year over the next 10 years to reach their overall private equity target, which is about 13 percent of total portfolio, up from 8 percent previously.

"In the past, endowments the size of ours would not be able to get into the best of the best private equity investments," says Pradeep K. Khosla, Chancellor, University of California San Diego. "But Jagdeep has given us a slice of this very creative product that allows us access to high-quality private equity firms. We are very excited about the opportunity to capitalize on the UC Investments Office's investing power."

And it's not just better terms the foundation gets, it's investment expertise. "There's a lot of skill in managing private equity, not just from an investment strategy perspective, but from a financial accounting and valuation perspective as well," says Shaver. "The rigorous requirements can be quite challenging for small institutions, but Jagdeep's team is able to do those things that we can't."

"We're happy this product is being offered again and to take advantage of it," she concludes. "Being part of the UC family of funds offers us flexibility that wouldn't otherwise be available, and that's very helpful to us."



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