# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Message from the Associate Vice Chancellor</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>Fueling Innovation for a Robust Economy</td>
<td>3</td>
</tr>
<tr>
<td>About the OIC</td>
<td>4</td>
</tr>
<tr>
<td>Our Mission, Who We Are, What We Do</td>
<td>5</td>
</tr>
<tr>
<td>Start-Up Profiles</td>
<td>6</td>
</tr>
<tr>
<td>Five New Companies Using UC San Diego Innovations</td>
<td>7</td>
</tr>
<tr>
<td>Fostering Innovation</td>
<td>14</td>
</tr>
<tr>
<td>A Sample of Events That Highlight Innovation Initiatives</td>
<td>15</td>
</tr>
<tr>
<td>Results</td>
<td>16</td>
</tr>
<tr>
<td>Innovations, Patents, Licenses, Agreements</td>
<td>17</td>
</tr>
</tbody>
</table>
A MESSAGE FROM THE ASSOCIATE VICE CHANCELLOR

As the Office of Innovation and Commercialization contributes to the growing success of the University of California San Diego, I am delighted to be able to report on a very strong fiscal year 2015 for the commercialization of campus inventions.

UC San Diego led the UC system in the number of licenses of technologies to companies and was second in the UC system for the number of start-up companies arising from university technologies. We are continuing to grow and are on track to see a significant increase in the numbers of licenses in the subsequent year—and a record number of start-ups.

UC San Diego's strength lies in its collaborative approach to innovation and entrepreneurship (I&E). This has led to many more students than ever before engaging and transforming their dreams into reality through the creation of new companies, products, and services.

One of the OIC’s core missions is to support our campus partners in achieving their goals in the I&E space. Notable accomplishments from our partners during the year include the launch of the EnVision maker studio and the Institute for the Global Entrepreneur, both of which provide additional benefit to university entrepreneurs and innovators.

We applaud these, and many other accomplishments over the past year, and look forward to continuing to support them over the coming year. In concert with our campus partners, the OIC also delivered a wide variety of seminars, workshops, and other innovation and entrepreneurship programming for students, staff, and the greater campus community.

We thank our colleagues at the Basement, Design Lab, Jacobs School of Engineering, Moores Cancer Center, Qualcomm Institute, Rady School of Management, School of Global Policy and Strategy, Student Affairs, and von Liebig Entrepreneurism Center for their efforts in this vibrant ecosystem. Collectively, we will continue to boost resources, increase engagement, and seek new partners to join our dynamic community.

UC San Diego has a wealth of talent, expertise, and technology—all of which is crucial to the future economic and social prosperity of our region. I am very excited about that future, and I look forward to continue working with all of our partners across the region, and beyond, to help build that future.

Sincerely,

Paul Roben
Associate Vice Chancellor for Innovation and Commercialization
"Innovation is, at its heart, all about people."
— Paul Roben, Associate Vice Chancellor for Innovation and Commercialization

FUELING INNOVATION FOR A ROBUST ECONOMY

With groundbreaking initiatives created all across campus, fiscal year 2015 was an exceptional year for UC San Diego in innovation and entrepreneurship. The end of the fiscal year also brought the establishment of the Office of Innovation and Commercialization (OIC) within the Office of Research Affairs.

With support from Chancellor Pradeep K. Khosla and Vice Chancellor for Research Sandra A. Brown, the OIC is charged with working with our campus partners and community advocates to help build the entrepreneurial culture on campus to strengthen the innovation ecosystem across campus and the region. Together with all our partners, we are positioning UC San Diego firmly at the core of regional economic and societal development.

The OIC has launched a series of new initiatives, transformed the technology transfer processes from transactional to primarily relationship-building and engagement functions, and hired personnel bringing new perspectives challenging conventional wisdom.

We are focusing on removing barriers for business creation and product development with the introduction of programs such as Open-Flow Innovation, which is a simpler and faster approach to licensing university technology by new start-ups.

We have also invited industry veterans to join us in developing our first Entrepreneur-in-Residence program, which aims to identify and create businesses around promising technologies ready for commercialization, as well as to mentor and support faculty and student innovators.

To broaden access to the resources required for innovation, we held student town hall meetings to pinpoint underserved I&E needs and identify areas to enhance in the existing ecosystem.

Working together across all units on campus, UC San Diego is becoming a recognized national leader in driving innovation and entrepreneurship as a means of driving social and economic prosperity.
MISSION

To promote and facilitate the transfer of UC San Diego innovations for the benefit of the university community and the public.

ESTABLISHING OPEN-FLOW INNOVATION

UC San Diego, with a $1 billion annual research program, is an impressive repository of technologies that form the basis of new companies and products, creating jobs and accelerating economic prosperity in our region and beyond. The university is committed to streamlining the process of putting these technologies into the hands of savvy entrepreneurs who can develop them for the benefit of consumers and society.

The OIC has launched the Open-Flow Innovation program, a new, business-friendly approach to rapidly license technologies to new start-up companies based on financial terms appropriate to the stage of development of these companies.

"The OIC," said Paul Roben, associate vice chancellor for research and head of the OIC, "is establishing an integrated innovation platform that builds a dynamic entrepreneurial culture on campus and supports a vibrant regional ecosystem of people with diverse ideas working to develop new products, create jobs, and enrich the society we live in."

Making it easier for entrepreneurs to access technologies from UC San Diego is a crucial element of that innovation platform.

HELPING INNOVATIONS BENEFIT THE PUBLIC

To derive direct public benefit, we strive to convert the innovations developed at UC San Diego into useful products or services readily available to all. Hence, our mission is to partner with entities that have an interest in developing our inventions, transforming them into viable products or services. In support of this philosophy, the university is diligent in requiring appropriate commercialization steps from the organizations that seek commercial access to our inventions.
FOSTERING A RESEARCHER’S EXPERIENCE

By partnering on the management of the intellectual property (IP) disclosed to us, we enhance the researcher’s experience on campus in many ways, including:

• Leveraging an IP license to secure additional funding for the researcher from the licensee
• Creating opportunities for the researcher to become engaged as an adviser to a company to convert an IP license into a product, or arrange for the licensee to collaborate with the researcher by providing funding that supports further research on campus
• Demonstrating to a researcher how his/her academic research applies to real-life practices
• Providing employment opportunities between a licensee and a number of experts involved in the original research, such as graduate students, postdoctoral fellows, or technicians.

PROMOTING LOCAL ECONOMIC DEVELOPMENT

When appropriate for the technology requiring commercial development, the OIC partners with local companies and entrepreneurs. If a local entity can develop useful products or services from our innovations, it is a preferred customer.

We also focus our discussions with local entrepreneurs planning to establish new companies in the San Diego area. Such new companies attract investment dollars, create new high-wage jobs, attract secondary service-providers, and establish a knowledge-based economy in San Diego. Historically, more than one-third of our licenses are granted to companies in the San Diego area.
“One important role for OIC is to remove any barriers to getting these technologies into the hands of the people who can develop them and start new companies.”

— Paul Roben, Associate Vice Chancellor for Innovation and Commercialization

START-UPS

The formation of new start-ups is a major contributor to the economic development and growth of the San Diego region. Start-ups create new jobs, employ graduates and local talent, and bring money to the region through their financing activities. The university recognizes the importance of start-ups in the innovation and entrepreneurship (I&E) ecosystem and provides resources for students, faculty, and community members to assist them in this endeavor. As part of the I&E ecosystem, the OIC has many programs for entrepreneurs, including educational seminar series, workshops, and the Open-Flow Innovation program that simplifies licensing of university innovations to start-up companies.

Profiled on pages 8–12 is a sample of recent start-ups that licensed university technologies through the OIC.
Driven by clinical necessity, Amydis Diagnostics seeks to provide physicians and pharmaceutical companies alike with a noninvasive, low-cost test to strengthen diagnoses and reduce health-care costs of Alzheimer’s disease and other amyloid-associated diseases.

The current effectiveness of Alzheimer’s diagnostics is not only inhibited by the causal ambiguity of many of the disease’s characteristic symptoms and an inability to directly detect, prior to autopsy, the presence of the aggregated, faulty proteins (amyloids) implicated in Alzheimer’s and a variety of neurodegenerative diseases, but also the cost and invasiveness of the tests. These limitations rule out the presymptomatic detection of Alzheimer’s disease that would identify appropriate patients for clinical trials of experimental disease modifying drug therapies.

To further develop a novel Alzheimer’s diagnostic, the company licensed university technology on amyloid targeting from the laboratory of chemistry and biochemistry professor Jerry Yang, who is also a company founder and chief scientific adviser. His research is focused on the development of small molecules to study amyloid-based diseases, nanoscale sensors to monitor chemical and biochemical reactions, and nanoparticle-based cancer drug delivery systems.

Through its proposed diagnostic test, Amydis has the potential to offer a new component to the entire continuum of health care for affected Alzheimer’s patients and their physicians. In September 2015, the prospective impact of its technology earned Amydis Diagnostics a noteworthy grant award from the National Institute of Aging (NIA), a center of the National Institutes of Health (NIH). The grant award will fund research and development of a novel family of fluorescent probes to be used as diagnostic agents to image neurodegenerative diseases through an innovative ophthalmic approach.
Armed with a novel chemistry platform from the UC San Diego lab of Professor Seth Cohen and David Puerta, Forge Therapeutics began its transformative work in the field of metal-binding chemistry—crafting inventive metalloprotein-inhibitor-based pharmaceutical therapies.

Metalloproteins are of particular interest in pharmaceutical development because of their vast prevalence in living organisms and the reliance of their biological function on the metal ions they contain. Exploiting the metal-binding pharmacophores (MBPs) developed in the Cohen lab, Forge is working to discover functionally unprecedented metalloprotein-inhibitors that will supersede the small cohort of organic functional groups that presently dominate the field. Using these MBPs in the drug design process has helped the company overcome the hurdles that have hampered the development of metalloprotein-inhibitor-based therapeutics.

Most recently, Forge has applied this dynamic method to the targeting of a specific metalloenzyme, LpxC, that is essential to the survival of Gram-negative bacteria—a group that contains many infamous pathogenic bacteria such as \textit{Escherichia coli} (E. coli), \textit{Pseudomonas aeruginosa}, \textit{Acinetobacter baumannii}, and \textit{Klebsiella pneumonia}. Forge's industry-first, nonhydroxamate inhibitor of LpxC has proved to be stable, potent in vitro, as well as efficacious and well-tolerated in animals—yielding a much-needed solution to the problem of multi-drug-resistant super-bugs.

This breakthrough garnered the attention of the biotech community at large, prompting Forge to be invited to several major conferences in 2016 and to be one of twenty start-ups included on the San Diego Venture Group's 2016 list of “Cool Companies.”
MatriSys Bioscience, Inc. is a clinical stage, specialty biopharmaceutical company focused on the $142 billion worldwide dermatology and skin care market. Founded in 2015, the company is developing therapies for the top dermatology and skin care conditions—acne, atopic dermatitis (AD), rosacea, psoriasis, and skin infections.

More than 230 million patients suffer from these skin diseases, which represent a $12.9 billion prescription drug market and a $121 billion over-the-counter skin care market.

MatriSys Bio’s scientific approach is to combine new scientific developments in the dermal microbiome and in the innate immune system to create novel therapies that restore skin homeostasis. The company’s “good bug,” Staphylococcus hominis Sh-A9, is selective and highly potent against the “bad bug” Staphylococcus aureus, which is associated with atopic dermatitis. Unlike antibiotics, S. hominis Sh-A9 does not affect other “good bugs” that live on the skin, and instead leads to natural rebalance of the skin microbiome.

The company’s first product, MSB-01, contains the commensal bacterial strain Sh-A9, a highly selective topical antibacterial therapeutic to treat atopic dermatitis. A microbiome formulation similar to MSB-01 has been tested in clinical trials and found to dramatically decrease S. aureus colonization and to alleviate skin inflammation without killing beneficial commensal bacteria.

These advancements were made possible by the research of UC San Diego dermatology professor Richard Gallo, a world leader in the use of microbes as novel medicines. He is a cofounder and head of MatriSys Bioscience’s scientific advisory board.
StemoniX was formed to establish a new paradigm for drug discovery and personalized medicine via stem cell technology. A brush with Hodgkin’s lymphoma gave founder and CEO Ping Yeh the crucial insight into the shortcomings of personalized treatment therapies, which drove him to start a company dedicated to addressing them.

The technology of StemoniX is centered on efficient and diversified production of human-induced pluripotent stem cells (iPSC) for use as physiological analogs to real patients. Differing from the more well-known of the pluripotent stem cells—the embryonic stem cell—in that they can be generated from adult cells rather than gathered from embryonic blastocysts, iPSCs have proven to be a viable, patient-derived, resource for the modeling of human diseases in vitro.

The company licensed university intellectual property, including several innovations that arose from the laboratory of pediatrics and cellular and molecular medicine professor Alysson Muotri. Two other technologies were also licensed—one from bioengineering professor Adam Engler, who developed a hydrogel on-a-chip that can be used for disease modeling, and the other from medicine professor Farah Sheikh, who developed iPSCs cell lines that can be used for drug screening. StemoniX is developing a new platform using iPSC for less-invasive medical applications.

The company continues to make strides in advancement and growth marked by its recent partnership with Cell Applications that has resulted in the high-volume bio manufacturing of human iPSCs. The speed and availability of iPSCs will enable researchers to save time and money in the early drug discovery process.
SureAdhere is revolutionizing the way treatment adherence monitoring is conducted for tuberculosis (TB). TB programs worldwide are seeking novel ways to securely, accurately, and cost-effectively monitor treatment without sacrificing any of the benefits of in-person, directly observed therapy, which has been shown to improve treatment completion and cure rates.

Nearly nine million cases of TB occur worldwide each year, resulting in 1.4 million deaths annually. Although TB is curable, poor adherence to its long antibiotic regimens leads to ongoing illness, disease transmission, and acquired drug-resistance. The strategy of “directly observed therapy” (DOT)—visually observing patients swallowing each medication dose—has been proven to increase medication adherence rates. However, DOT is costly, labor-intensive, and sometimes logistically not feasible.

In 2009, Richard Garfein’s team at the UC San Diego School of Medicine received a competitive National Institutes of Health grant to develop and evaluate a mobile technology solution called “Video DOT” (VDOT). VDOT allows TB patients using smartphones to record and send videos of themselves ingesting their medications. Health-care workers can then observe and document medication ingestion by viewing videos through a protected website. Research studies at UC San Diego found that most patients using VDOT were more than 90 percent adherent and that VDOT was less expensive compared to in-person DOT in both high- and low-resource settings.

In December 2014, SureAdhere entered into an exclusive licensing agreement with UC San Diego to commercialize the existing VDOT system. SureAdhere since has scaled operations across the United States and has international pilot programs in three countries planned for the second half of 2016 and early 2017.
“I would like UC San Diego to be seen as a world leader in innovation and commercialization by engaging with our surrounding business community and inspiring our students and faculty.”

— Ruben Flores, OIC Director of Commercialization
FOSTERING INNOVATION

A SAMPLE OF EVENTS THAT HIGHLIGHT INNOVATION INITIATIVES

A. Pop-Up Workshop: Tell Your Story Like Pixar

This workshop was led by Greg Horowitt, OIC director of program design, and Josh Anon, an artist and computer scientist, in October 2015. This interactive workshop, centered around pitching ideas and bringing them to life through storytelling, drew a capacity crowd of students and staff.

B. “The Entrepreneur Toolkit—Business Strategies for Intellectual Property in the Knowledge Economy”

This workshop taught essential business strategies to protect intellectual property. It was presented in January 2016 with OIC partner the Basement, a student incubator space on campus, by Greg Horowitt, OIC director of program design; Gary Shuster, an inventor and technology lawyer; and Bill Decker, OIC director of operations.
C. The von Liebig–OIC Entrepreneurism (VOICE) Lunches

These forums launched in February 2016. These events delivered educational seminars on intellectual property, funding, and other innovation and entrepreneurship topics to students and staff.

D. An Evening with an Entrepreneur

During “An Evening with an Entrepreneur” at the Moores Cancer Center in April 2016, Magda Marquet, an accomplished entrepreneur, shared her three decades of experience in the local biotechnology industry with the next generation of innovators at UC San Diego.
“Our culture of risk-taking, collaboration, and innovation builds new economies and industries, making the world a better place.”

— Pradeep K. Khosla, Chancellor

### RESULTS: BY THE NUMBERS

UC San Diego is the leading campus for innovation and commercialization activities in the UC system.

#### 2015 AT A GLANCE

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<td>START-UPS FORMED</td>
<td>ACTIVE LICENSES</td>
<td>INNOVATIONS REPORTED</td>
<td>LICENSES EXECUTED</td>
<td>ISSUED PATENTS</td>
<td>AGREEMENTS EXECUTED</td>
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TOP REVENUE-GENERATING INNOVATIONS FROM UC SAN DIEGO RESEARCH

These inventions listed were ranked in the UC system’s top 25 for fiscal year 2015. Shown are the rankings and the amount of royalty and fee income for the fiscal year. Total revenue for this group was $13,381,000.

### Erbitux®
Cancer Therapy

**$4,943,000**

*EGF Receptor Antibodies*
*Sato, Mendelsohn, invented 1983*

### PROCYSBI®
Nephropathic Cystinosis Treatment

**$4,280,000**

*Dohil, invented 2006*

### Firefly Luciferase

**$2,358,000**

*McElroy, Helsinki, invented 1984*

### Tear Osmometer
For Dry Eye Disease Diagnosis

**$1,139,000**

*Sullivan, invented 2002*
In fiscal year 2015, patent activity continued to increase from previous fiscal periods, with 289 issued patents—ninety-seven US patents and 192 foreign patents. Patent prosecution costs for the same period were $6.2 million, offset by $4.65 million in legal cost reimbursements from our licensees.

Active patents at fiscal year end: 883 US, 1,079 foreign
In fiscal year 2015, 369 innovations were reported by UC San Diego researchers and staff. That included 234 inventions, 109 tangible research materials, and twenty-six copyrights/trademarks.

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<th>Year</th>
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<th>Copyright/Trademark</th>
<th>Tangible Research Materials</th>
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In fiscal year 2015, 689 new agreements were executed, adding to the ten-year average of 714 new agreements per year. The largest category of agreements continues to be material transfers, at 317, followed by confidentiality/secrecy, 178; administrative, ninety-one; licenses, seventy-two; and letter agreements, thirty-one.
In fiscal year 2015, fifteen start-ups were formed with licensed university innovation. More than two-thirds of those start-ups were focused on developing new products or services in the health-care sector, such as therapeutics or medical devices.

In fiscal year 2015, seventy-five new licenses were executed to commercialize UC San Diego innovations: forty-nine invention licenses and twenty-six copyright/trademark licenses. When compared with fiscal year 2014, the number of invention licenses remained the same while copyright licenses increased.

Active licenses at fiscal year end: 468

In fiscal year 2015, fifteen start-ups were formed with licensed university innovation. More than two-thirds of those start-ups were focused on developing new products or services in the health-care sector, such as therapeutics or medical devices.

In fiscal year 2015, seventy-five new licenses were executed to commercialize UC San Diego innovations: forty-nine invention licenses and twenty-six copyright/trademark licenses. When compared with fiscal year 2014, the number of invention licenses remained the same while copyright licenses increased.

Active licenses at fiscal year end: 468
REGIONAL AND WORLDWIDE IMPACT OF 2015 LICENSE AGREEMENTS

LOCAL IMPACT
At year’s end, 219 companies in California, some of which are repeat licensees, have active licenses for UC San Diego technologies. Listed are the California counties and number of licenses to companies in each region.

Alameda 9
Contra Costa 1
Los Angeles 7
Marin 3
Monterey 1
Orange 4
Riverside 5
Sacramento 1
San Diego 146
San Francisco 1
San Mateo 15
Santa Barbara 1
Santa Clara 17
Santa Cruz 6
Ventura 2
GLOBAL REACH: 432 ACTIVE LICENSES WORLDWIDE
AMERICAS: Canada 3, United States 386, ASIA: China 5, Hong Kong 1, Japan 6, South Korea 1, Taiwan 2, Thailand 2, AUSTRALIA: Australia 1, EUROPE: Austria 2, Denmark 3, France 1, Germany 1, Great Britain 6, Ireland 2, Italy 1, Netherlands 4, Switzerland 2, MIDDLE EAST: Israel 3.