

Office of the Vice Chancellor for Research

# Entrepreneurship at UC Berkeley

Report Commissioned by VCR / EVCP Paul Alivisatos

From the Faculty Entrepreneurship Committee:

Ana Claudia Arias  
Tiff Dressen  
Daniela Kaufer  
Rikky Muller  
Niren Murthy  
Yi-Ren Ng  
Ronald Rael  
Michael Rape  
David Schaffer (Chair)  
Scott Shenker  
Toby Stuart  
Paul Waddell  
Peidong Yang

July 20, 2018

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## Introduction and Executive Summary

Research universities serve pivotal roles in our country by educating the next generation of intellectual and productive citizens and by investing public resources towards the creation of knowledge that positively impacts society. Part of the latter mission involves the creation of new inventions, that is, potential products and services that if fully developed can address social, economic, and technological needs within our country and world. However, there is often a gap between promising concepts and impactful products, and entrepreneurship is an endeavor that bridges this divide.

Entrepreneurship can be defined as an effort to develop novel, innovative, and transformative products, processes and services in an environment that involves risk. As such, entrepreneurship is a practice or mindset found in many contexts, from a student or postdoctoral fellow at the computer or lab bench, to a founder in a startup, to an employee within a large, established company. We have heard many success stories where an unrecognized, revolutionary concept is able, after much struggle, to bridge the notorious “valley of death” to propel a company to success (e.g. Amgen, Apple, Genentech, Microsoft). However, there are a greater number of stories where potential goes unrealized. Given the caliber and scale of UC Berkeley as an educational and research institution, it is worth considering the process by which our creative inventions evolve toward successful outcomes and the obstacles they may meet along the way.

Universities occupy a unique and important niche in the entrepreneurial ecosystem. First, our educational mission involves training undergraduates, graduate students, and postdoctoral fellows to become creative and productive citizens; in some cases this includes training to create knowledge, products, and services with value in our society and economy. Second, our research mission entails the advancement of human knowledge, and the translation of this knowledge into innovative and revolutionary products amplifies the university’s societal benefit, and can thus be viewed as a natural extension of our research mission. Finally, in an evolving economy that clearly necessitates the development of new financial models to sustain public universities, which serve critical roles in educating a broad spectrum of our society, entrepreneurship can generate new and sustainable revenue streams, both directly and indirectly. These different missions often require distinct sets of practices, emphases, and expertise that can be distributed across a campus, particularly at a large university such as UC Berkeley.

Given the importance of entrepreneurship to our educational mission, societal impact, and economic sustenance, an examination of our entrepreneurial environment, institutions, policies, and practices is appropriate at this point in time. Accordingly, in Spring 2017, Vice Chancellor for Research Paul Alivisatos commissioned a committee to examine entrepreneurship on our campus. Our committee identified several facets of entrepreneurship for evaluation – specifically our technology licensing and industry alliances office (IPIRA, Intellectual Property and Industry Research Alliances Office), the campus culture and perceptions of entrepreneurship, the campus conflict of interest review process, institutions and mechanisms to support entrepreneurship, and student entrepreneurship – and over the course of the last 12 months developed the present report. In doing so, committee members interviewed close to 150 individuals on our campus, at peer institutions, and in the wider community, in many cases traveling elsewhere for in-person meetings. Based on these investigations, we offer the following analysis and recommendations.

## UC Berkeley Entrepreneurship – Overall Status

By any metric, UC Berkeley is the top-ranked public university in the country, and one of the top-ranked research universities in the world. Commensurate with our rankings for research and education, UC Berkeley’s entrepreneurial successes have also risen over time. The 2017 Pitchbook Universities Report ranks UC Berkeley second nationwide in the number of undergraduate alumni entrepreneurs, i.e., former students who have founded companies actively raising capital (<https://pitchbook.com/news/reports/2017-universities-report>). The report also ranks UCB second in capital raised by the top alumni-founded companies, as well as second in the number of female alumni founders. In 2015, Forbes Magazine named UCB the third most entrepreneurial research university in the country (a ranking that reflects the number of alumni and students who self-identify on LinkedIn as founders and business owners, normalized by student body size). In addition, an August 2016, report by the Bay Area Council Economic Institute found that 260 UCB-affiliated startup companies were formed from 1968-2015 (second among the 10 UC campuses only to UCSD, which had 264); of these, half focused on information technology, 99 of the 260 were still active as of 2015, and 60 current UCB faculty have been involved in starting one or more companies (<http://www.bayareaeconomy.org/files/pdf/UCEntrepreneursStartupsInnovation.pdf>). Recognized companies with a Berkeley origin include Aduro, Affymax, Affymetrix, Alphabet Energy, Amyris, Bolt Threads, Caribou, Exogen, and Zynga, and Berkeley startups that have been successfully acquired include Chiron, Plexxicon, and Tularik.

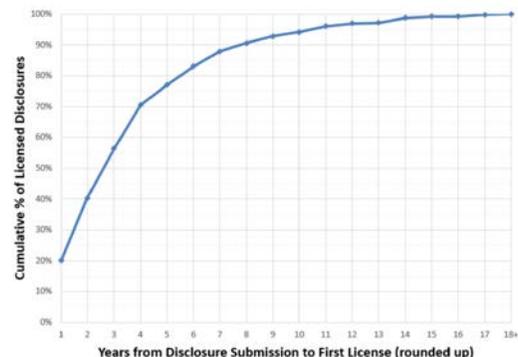
## Organization of the Report

The next natural questions are: what aspects of entrepreneurial culture at Berkeley has led to these outcomes? And how do our entrepreneurial activities and culture compare to those of other universities? This report will address these questions by considering five major topics.

The focus of Chapter 1 will be the process of invention disclosure, patenting, and licensing. At a nationwide level, a 2016 National Academy of Engineering workshop presentation on “Emerging Best Practices in Translating University Research into Innovation” reported that cumulatively from 1999-2014, U.S. universities generated 320,000 invention disclosures, 175,000 patent applications (a 55% conversion rate), and 70,000 patents issued. However, only 1/6 of these inventions become licensed (<https://www.nae.edu/File.aspx?id=152367&v=dd3c7d9f>). In addition, revenue from these licensing deals is broadly distributed across different universities, as data from the 2014 AUTM (Association of University Technology Managers) survey makes evident. Furthermore, the licensing process requires patience: the average interval between a disclosure and license is approximately 2.5 years, and 85% of licensing deals are executed 6 or more years after initial disclosure. As discussed in Chapter 1, many different models and practices for licensing are



Rank-order licensing revenue from 155 universities. Source: 2014 AUTM survey



Rank-order licensing revenue from 155 universities. Source: 2014 AUTM survey and 2016 National Academy of Engineering workshop presentation on “Emerging Best Practices in Translating University Research into Innovation”

available to advance different missions on behalf of the university and society, and may result in different outcomes.

University inventions are generated within the research programs of our faculty, and in some cases faculty and their trainees become directly involved in entrepreneurial activity. Chapter 2 will address Berkeley's culture regarding entrepreneurial activities among the faculty, and whether these should be considered as professional activities for the purposes of review, promotion and tenure. The relationships between faculty and industry give rise to financial conflicts of interest, including when faculty receive sponsored research funding from companies, and Chapter 3 discusses the conflict-of-interest review process and the industry alliances office's role in supporting entrepreneurship.

Should our faculty or students decide to become directly involved in entrepreneurship, a healthy and broad array of entrepreneurship support structures are available on our campus and in the local ecosystem, ranging from incubators, to startup accelerators, to venture funds. These are discussed in Chapter 4.

Finally, as evident in the statistics above in the Overall Status of Berkeley Entrepreneurship, our students are highly entrepreneurial. Chapter 5 will discuss student entrepreneurship opportunities and challenges. Each chapter makes specific recommendations on its topic, and the report ends with a series of overall observations and recommendations.

# **CHAPTER 1: TECHNOLOGY LICENSING OFFICES AND OPERATIONS: ANALYSIS AND RECOMMENDATIONS**

Authors:  
Tiff Dressen  
Daniela Kaufer  
Rikky Muller  
David Schaffer

Additional contributions:  
Toby Stuart



## **Introduction: Missions and Models**

A university's technology licensing office (TLO) may pursue separate but related goals. A primary objective is to increase the impact of inventions by transitioning them to the private sector. Second, an office can support and foster entrepreneurial efforts of the inventors to enhance their capacity to make this transition themselves. Next, universities may seek to maximize the financial returns on intellectual properties to help fund the university. Finally, a licensing office can coordinate with the campus development office to turn successful entrepreneurs into philanthropists. Different TLOs balance these missions in different ways.

To achieve these objectives, various organizational structures or models can be adopted. Most TLOs are part of a university and report to campus leadership. In some cases, a single office with a high-level leader can encompass multiple objectives: patenting and licensing, entrepreneurial support, and, in some cases, industry-sponsored research to support the research of campus inventors. In other cases, given that these activities require distinct skill sets and approaches—patenting and intellectual property protection requires legal training, licensing benefits from a business and legal mindset, fostering entrepreneurship entails a business and risk-taking approach, and industry relations involves outreach and networking – these activities may be distributed across different offices and organizations on a campus. Finally, other universities have adopted a discrete structure for these functions and have created a non-profit corporation (i.e., a 501(c)3), independent of the university.

We examined the TLO structures of several of UC Berkeley's peer universities. Specifically, in addition to in-person or Skype interviews with the directors of each of the university's technology transfer offices, the committee conducted interviews with an additional 42 stakeholders across the 6 campuses, including faculty, staff, and key alumni. The examples below describe how several classes of TLO models at peer institutions operate. In addition, we describe strengths and opportunities for Berkeley's IPIRA, and finish with recommendations of how our campus can potentially benefit from considering some of the best practices of others.

### **Stanford University**

Stanford University's Office of Technology Licensing (OTL), led by executive director Katharine Ku, has a similar overall structure to that of UC Berkeley and other university technology transfer offices around the country. We interviewed the OTL leadership, as well as several entrepreneurial faculty on campus.

#### **Numbers:**

Stanford University's Office of Technology Licensing (OTL) has been stable and successful for decades. In fiscal year 2016, Stanford received \$94.2M in gross royalty revenue, which was divided according to their royalty sharing policy: 15% of gross royalties for OTL's administrative expenses, and the rest (minus direct expenses) was divided almost equally among inventors (\$24M), departments (\$21M), and schools (\$20.8M). Stanford OTL's operating budget and size are considerably larger than UC Berkeley's technology transfer operations: in FY2016 Stanford OTL operated on a budget of \$8.9M, with an additional \$10.2M spent on patent and other legal expenses. Interestingly, Stanford OTL has a higher but somewhat comparable volume of disclosures, filings and licensing agreements to Berkeley's operations: in FY 2016 Stanford's OTL received about 500 disclosures, filed 289 patents, and signed 141 license agreements. The office staff comprises 40 people, 19 of whom are licensing associates and liaisons. The OTL staff, under the directorship of Kathy Ku, shows remarkable stability, with relatively little change in personnel over the last 10 years. Ku's empowering management style was unanimously praised and has

played a role in attracting strong team members, as well as contributing to their unusually high retention rate. The word “autonomy” was mentioned numerous times.

**Mission:**

A very clear sense of OTL’s mission was voiced by both the OTL management team and all faculty members interviewed, as a focus on transferring technology and innovations from the faculty for societal good rather than solely revenue generation. The OTL management team conveyed its sense that Stanford University is committed to supporting this mission of socially responsible licensing even if the office were not generating self-supporting revenue.

**Process:**

The process of vetting a disclosure is different from most other offices we reviewed, as the individual licensing officer has complete autonomy. There are no meetings held to discuss and vote on such decisions, though outside analysis of patentability is obtained, as needed. This “end-to-end responsibility and freedom of working independently” represents the management style of Kathy Ku that is much appreciated by her team and by the inventors.

In-reach to Stanford faculty: By in-reach, we refer to efforts to engage new and junior faculty in the process of technology transfer on campus by holding informational sessions, for example. The Stanford OTL process includes only modest active in-reach to the university’s researchers. The management team believes that while active in-reach to educate and recruit university inventors (for encouraging more quality disclosures) may be helpful, at this stage, the need for invention disclosures is sufficiently well-known that most groups know how to find OTL when needed.

Marketing: In contrast, the group invests in proactive marketing, maintains close relationships with industry and relevant Silicon Valley parties, and supports commercialization through licensing. Separately from OTL, entrepreneurship support is also provided by such programs as Catalyst, SPARK, Start-X and Stanford Technology Ventures Program.

Licensing agreements: In order to simplify and accelerate the licensing effort and process, Stanford OTL makes approximately 6 template licensing agreements available online. Additionally, the General Council is not typically involved in legal review of the process, which they believe can accelerate the licensing process.

**Noteworthy Points:**

- The OTL management team and the PIs interviewed mentioned that a particular strength is their good relationships with inventors. The OTL team surveys the faculty at all stages of invention and licensing. Try to keep open and “live” communication with the faculty.
- Another strength that came up in multiple conversations was the quality of the licensing people – all of the licensing professionals in the office have strong backgrounds and ties to industry.
- The recipe to success as the OTL management team sees it includes: the freedom to say “yes” to as many inventors as they deem appropriate (meaning filing as many provisional applications), without considering year-to-year budget constraints; reduced administrative barriers (e.g., much autonomy for patenting and licensing decisions lies within the OTL); attracting the best licensing agents; lack of the requirement to answer to a board; and proximity to Silicon Valley.
- OTL staff work closely with Stanford’s Office of Sponsored Research and Development.
- About 60-70% of the licensed inventions are medical-related.

- As part of the proactive marketing process and Stanford’s rigorous interpretation of the Bay–Dole Act, OTL maintains a 3-month window when it markets an invention to outside companies before it is able to license to the inventors. OTL will try to choose the company it believes is best able to develop the technology, which will often be the faculty start-up.
- Faculty feedback is very positive: “OTL is fair, knowledgeable, efficient and professional.” “Very fortunate to have OTL that understands both inventors and investors.”

### **Internal Notes/Suggestions:**

The major differences from UCB’s operations are in the level of support OTL receives from Stanford. Otherwise, the success apparently lies in the people – their level of motivation and autonomy, their networks of industry contacts, and their continuous outreach for marketing – rather than specifics of the model. The cohesive view of the societally-responsible licensing mission across OTL and faculty was impressive.

The Stanford OTL management team mentioned they meet informally with Bay Area colleagues from UCSF, Stanford, Davis, and LBNL, and that Berkeley people often do not attend these events.

### **Massachusetts Institute of Technology**

The MIT Technology Licensing Office (TLO) has a similar overall structure to that of UC Berkeley, Stanford, and other university technology transfer offices around the country. The unit reports to MIT’s Associate Provost (though formerly to the Vice President for Research) and is led by a Director, Lesley Millar-Nicholson, recruited a little over a year ago from a much smaller technology transfer office at the University of Illinois, Urbana-Champaign. We interviewed the OTL leadership, as well as several entrepreneurial faculty on campus.

### **Numbers:**

Perhaps the most evident and significant difference between MIT and UC Berkeley’s technology transfer operations is size, in all respects. Currently, the MIT TLO has a staff of 42 that includes 10 senior licensing officers, 3 Associate Technology Licensing Officers, and 7 Technology Licensing Associates. On average, the team recovers between \$10.5-12.5M in patent reimbursements per year. The office receives and reviews approximately 800 invention disclosures per year, corresponding to a rate of approximately 15-20 per week.

### **Mission:**

The mission statement of MIT’s TLO, as stated on their website and reiterated in conversations with its Director, is simple and direct: “Our mission is to move innovations and discoveries from the lab to the marketplace for the benefit of the public and to amplify MIT’s global impact. We cultivate an inclusive environment of scientific and entrepreneurial excellence, and bridge connections from MIT’s research community to industry and startups, by strategically evaluating, protecting, and licensing technology.”

### **Process:**

Due to the very high volume of invention disclosures, the Director claims “we don’t have time to do anything except the very pure technology transfer.” Therefore, TLO focuses its efforts on the receipt, evaluation, protection, marketing, licensing and negotiation of IP. This focused, stripped down approach to technology transfer is also reflected in the disclosure review process and marketing. For the review process, the staff meet weekly to decide “go” or “no go” on whether to file for provisional applications for all invention disclosures received that week.

In-reach to MIT faculty: Much like Stanford, MIT does not actively in-reach to faculty. Also, akin to Stanford, MIT appears to have evolved a culture of entrepreneurship such that faculty know where to go and whom to talk to should they have potentially translatable research. MIT faculty interviewed for this report cited “great experiences” and “good relationships” with TLO. Overall, MIT’s TLO and MIT, in general, is known by faculty and students for cultivating an atmosphere encouraging to startups and entrepreneurs. The office intends to do more active in-reach to faculty in the coming years, and it is currently recruiting a Communications and Marketing Officer to support these efforts.

Marketing: MIT’s TLO relies very heavily (and, it would appear, very successfully) on its internal connections for marketing technologies to third parties. These connections to industry come from the faculty themselves as well as the broad and deep networks each Senior Licensing Officer brings to the TLO position. Additionally, both the Martin Trust Center for MIT Entrepreneurship and the Deshpande Center for Technological Innovation serve as important points of connectivity for the TLO and their faculty and student entrepreneurs. Lastly, MIT has the unique advantage of being situated adjacent to the flourishing Kendall Square and in close proximity to Boston, hotbeds of biotechnology and pharmaceutical development. Several Fortune 500 companies are within walking distance of the TLO (e.g., Google, J&J, Novartis). Its Director believes they receive repeat business from these larger companies.

Licensing Agreements: In an effort to create greater consistency and transparency in licensing terms, MIT’s TLO is creating a library of agreements covering “every conceivable” arrangement in order to begin a standardization process and ensure they have a uniform starting point for everyone. This also allows the SLOs to focus on the complex agreements that require greater effort and attention.

#### **Noteworthy Points:**

- TLO is allowed to take 15% off the top of the royalty revenue to help pay for operations.
- TLO is allowed to “make themselves whole” before distributing any royalties back to the rest of campus. This ensures that the office is able to cover its patent and operating costs in any given year. Historically, due to the consistently high royalty revenue generation, for example \$46M in 2015 and \$62M in 2016, inclusive of patent cost reimbursements, it has been able to return money back to campus.
- Of the 800 invention disclosures received each year, provisional applications are filed on approximately 280, corresponding to a 35% filing rate. This figure does not include subsequent parent/child applications.
- TLO has a strict rule on foreign filings, and unless a technology is in the biology space, it will not file foreign patents unless a licensee will to cover the costs.
- The office hires only very experienced Senior Licensing Officers. Viable candidates must have at least 10 years of industry experience. They are looking for individuals who can bring their deep industry knowledge and connections to MIT.
- The focus is not on creating the greatest number of startups but on helping to create (and support) startups that will thrive over time. In the words of Director Millar-Nicholson, often a startup is the right entity to take a given technology to fruition, “but it has to be the right startup.”
- They have a new approach to doing business. Instead of saying “we can’t do that because of IRS rules,” they ask the question: “How much can we do without putting our not-for-profit status into jeopardy?”
- Director Millar-Nicholson believes that one of the main reasons for the success of the TLO is the support they receive from across campus, including from the Provost and the President.

**Internal Notes/Suggestions:**

Much like Stanford's OTL, MIT's TLO thrives in an environment where there is ample, stable funding for its operations as well as support from campus leadership. The high volume of invention disclosures it receives compels the TLO to focus on the core IP processes, which serves to clarify and simplify their mission. It recruits and attracts Senior Licensing Officers with deep industry experience who bring their industry networks and relationships to MIT—this facilitates the process of finding suitable industry licensees for their technologies.

**University of California, San Francisco**

UCSF recently restructured its Office of Innovation, Technology & Alliances (ITA), now rebranded and reorganized as Innovation Ventures, in an effort to bring its life science inventions to market with higher value as well as to elevate the role of entrepreneurship across the campus. A new position was created – the Vice Chancellor for Business Development, Innovation and Partnerships – and reports directly to UCSF Executive Vice Chancellor and Provost Daniel Lowenstein. Following an 18-month search, UCSF recently hired Harold E. “Barry” Selick, PhD, as the first vice chancellor in this role. Selick is a former pharmaceutical company CEO with broad biotech experience, deep industry knowledge, and longstanding ties to UCSF, where he was a postdoctoral scholar. Selick seeks out and keeps up to date on proof-of-concept studies of promising UCSF life science inventions – which encompass drug molecules, device prototypes, digital health applications, and more – to gather evidence on which inventions are most likely to help patients as new therapies, diagnostics, or software.

His role also includes leading the efforts of UCSF's new Innovation Ventures, comprising four teams: the Office of Technology Management (OTM), Strategic Alliances, the Catalyst Program, and the Entrepreneurship Center. Selick defines the goal of this restructuring: “One aim is to keep inventions from languishing on companies' shelves, which often occurs when firms license early-stage inventions but do not invest the necessary resources to develop them. Another is to increase the licensing revenues earned by UCSF inventions: companies are likely to pay more for innovations with more proven value. It's high-risk, high-reward, but we're going to bias the odds of success in our favor by working with the smartest people in the world: scientists from UCSF and, on our advisory board, some of the most accomplished investors from Silicon Valley, who will be helping us cherry-pick the most promising programs. With this strategy, UCSF can begin to invest more fully in itself and develop even more technologies to benefit patients.”

**Numbers:**

In 2016 UCSF's former Office of Innovation, Technology & Alliances (ITA) became Innovation Ventures. Funding comes primarily through the Dean of the School of Medicine, and unlike Stanford or MIT, there is no connection (e.g., percentage) between revenue generated by Innovation Ventures and the operating budget. UCSF's OTM receives approximately 250-270 disclosures per year (comparable to Berkeley, though more concentrated in life sciences) and files approximately 40% of them initially as a provisional and then a full patent. The Innovation Ventures Group, overseen by Vice Chancellor Selick, is also guided by the four following group leaders: Peter Kotsonis (who oversees Strategic Alliances), Karin Immergluck (who directs the Office of Technology Management), Stephanie Marrus (who leads Entrepreneurship Center), and Cathy Tralau-Stewart (who heads the Catalyst Program that provides proof-of-concept mentoring to help researchers translate their early-stage ideas into valuable and commercially viable products). The office staff comprises approximately 40 people, 13 of whom are licensing associates and liaisons. As in UCLA (see below), the Innovation Ventures Group also has an intern program

(licensing fellow) for UCSF post-docs and PhD students. This program takes 6 students at a time as an unpaid position to help with marketing, look at company landscapes, and seek industry contacts.

**Mission:**

The stated goal of Innovation Ventures is “to facilitate translation of UCSF research and innovations for societal benefit.” In our conversation with the directors of the technology management office and Strategic Alliances teams, they see their mission as public benefit rather than revenue generation, and receive a clear message from UCSF leadership that their objective is to translate UCSF generated IP into the marketplace where it will have greatest impact.

**Process:**

The decision process for provisional filing occurs by group discussion, which includes the office directors and the faculty inventor(s). Critical factors considered include licensing potential and interest in the marketplace, faculty interest in starting a company, publishing timeline, and prior art. The critical decision point is filing the provisional. Once a provisional is filed, they will most likely convert to a full patent application. There is no set or restricted budget for patent costs. Today, based on directives of the new Executive Vice Chancellor, they try to take more risk than previously, in order to support the conversion of early stage discoveries.

In-reach to UCSF Faculty: Another direction set by the new Vice Chancellor is systematically interviewing faculty, attending faculty lunches and seminars, and proactively seeking “good stories” with which to engage potential future collaborators and funders, especially in industry. This activity is done by Selick himself, the Innovation Ventures directors, and a group of post-doctoral “scouts.” Impressive efforts in their office are invested in identifying key interests and needs of strategic industry and VC partners, and then organizing faculty groups that may be able to address such a mega-project. This approach, which includes organizing day-long workshops for faculty and potential partners, helps to break down siloes between research disciplines and build bridges to enable big collaborative projects that would likely not happen spontaneously. This effort integrates in-reach with strong outreach, including attending and networking at conferences (for example, the annual meeting of BIO, the Biology Innovation Organization) to identify what the “world” wants.

Marketing: The marketing approach is also very proactive and relies upon and leverages the strong industry connections of both the staff and the faculty. The marketing director came from industry, and his team brought strong professional networks with them. The office staff emphasizes attending conferences, heavy networking, and presenting the UCSF “brand.” The office has a group dedicated to strategic alliance management that actively conducts matchmaking. For example, if Pfizer indicates a particular focus area, his team will go to UCSF faculty to identify and even assemble teams that are appropriate matches.

Mentoring: UCSF’s Innovation Ventures seems to offer a unique approach to mentoring that provides considerable guidance to faculty on the path to commercialization. Examples include panel discussions with industry to provide faculty with feedback on market trends, connection to small molecule screen centers, etc. A central part of Vice Chancellor Selick’s new position is to raise a \$50 million fund to take promising inventions and build an accelerator that functions as a virtual company around them in order to increase the technology’s value, including hiring a general team with preclinical pharmaceuticals, medicinal chemistry, regulatory, and process development / manufacturing expertise. In addition, the Catalyst program and the Clinical and Translational Science Institute at UCSF as a whole are widely viewed by faculty as key elements of their innovation landscape.

Licensing agreements: Innovation Ventures uses a quick-start agreement to help facilitate the licensing process. Some faculty are very well connected, but when not, Innovation Ventures provides marketing, as well as engagement with pharma networks, and encouraging competition among multiple VC syndicates. Managing and approving the equity process has moved from UCOP to each campus, and the UCSF Chancellor is now in charge of reviewing whether the campus should accept equity. The UCSF team feels this has dramatically improved and accelerated decision-making in the licensing process.

**Noteworthy Points:**

- While the office restructuring is fairly recent (Spring 2017), and it will take time to assess its effect on campus and success in achieving the stated goals, the Innovation Ventures group leaders already indicated some noticeable improvements:
  - Selick’s position has added more coordination across the different groups and programs associated with UCSF (for example: QB3, the Catalyst program).
  - Selick’s position has added visibility to entrepreneurship efforts and activities. For example, the Chancellor and Chief campus counsel now meet monthly with the Innovation Ventures group leaders and Selick has almost daily meetings with faculty, department chairs, and senior administrators within the university.
  - Selick’s position added a dimension of strategic planning that was previously missing.
  - The new position elevated the profile of the office, by adding direct access to the Chancellor and forming a strategic mission plan, where before it was much more about execution of the work.

**Internal Notes/Suggestions:**

The decision to recruit a higher-level Vice Chancellor position to head a newly-organized and branded office has led to internal momentum. While both the Strategic Alliances and the Technology Management teams previously focused considerably on networking – both externally and internally – this focus has recently been expanded and increased.

**Wisconsin Alumni Research Foundation (WARF)**

WARF is a 501(c)(3) corporation affiliated with the University of Wisconsin, Madison but fully independent in its governance. Its role is to serve as steward of all patents based on IP generated at UW, in order to maximize the financial returns to support research activities at the university. WARF is led by Managing Director Erik Iverson, as well as Chief Operating Officer and General Counsel Michael Falk (who leads the Intellectual Property team), Chief Technology Commercialization Officer Leigh Cagan (who leads the Technology Commercialization team), and Chief Investment Officer Carrie Thome (who leads the Investments team). We interviewed Erik, Michael and Leigh, and spoke to several faculty entrepreneurs on campus.

**Numbers:**

Established in the 1920s, WARF was capitalized initially by revenue from patents for vitamin D by irradiation and the anticoagulant drug warfarin (named after WARF). WARF’s endowment has since swelled to \$2.7B, aided largely over the past decade by revenue from a vitamin D-derivatives patent licensed by Abbott. They actively invest these funds by four mechanisms (discussed below under Mission) and each year provide support to the university, through grants and in-kind technology transfer services, in amounts between \$120-150M. These expenditures and distributions includes an annual grant to the university (between \$55-60M, to support graduate student fellowships and other programs), a grant to the Morgridge Institute for Research (housed in the middle of campus), investments in an accelerator

program to enhance the value of promising university technologies, spending on patent prosecution and commercialization, and distribution of patent income (20% to the inventors, 15% to the inventors' department). Over its history, WARF has distributed >\$1B to the university.

WARF has just over 70 employees, including 6 licensing managers and 6 licensing associates (i.e., the Technology Commercialization team), 7 legal and professional employees who work on intellectual property, a communications team that works on outreach and educational efforts, an investment department to help manage the endowment, and accounting personnel (since WARF is an independent entity). The Foundation receives approximately 400 disclosures from UW Madison each year, of which it typically files <50% as provisional or regular utility patent applications. In 2016, it signed 72 new licensing and options agreements, and holds approximately 500 active commercial licenses.

**Mission:**

WARF actively debates its primary mission. Although one motivation is to foster and commercialize university technologies with promising social impact, the primary mandate from the board is to make large grants to support research at the university, made possible through revenue generated from the commercialization activities.

One major feature that they believe enables this mission is independence from the university: “complete independence is the secret sauce.” For example, Foundation leaders believe an intermediate or hybrid structure in which OTL employees remain university employees would not lead to long-term success. Congruent with this belief, the chancellor is the only university employee to serve on the board, and WARF employees are not employed by the university. As a separate, private corporation, it is not subject to regulations or state laws that affect the university, even including Freedom of Information Act provisions. One stated advantage is that the Foundation can act with an independent, long-term view for the good of the university rather than for short term benefit. There are recurring tensions between WARF and the university; historically, WARF has been pressured by the university and the State of Wisconsin to provide more funds to the university in a given year, but due to its independent organizational structure, it can maintain focus and pursue a long-term mission, without yielding to internal pressures from the university. Naturally, this type of arrangement requires ongoing trust, since the university has ceded control over all federally funded inventions and resulting revenue to WARF.

WARF actively manages and invests \$2.7B, most of it being WARF-controlled funds, through a sophisticated “risk parity” investment strategy, which incorporates a number of mechanisms including: a balanced and professionally managed stock and bond portfolio, a leveraged investment and hedge fund portfolio, private equity (i.e., investing in external VC funds as a LP), and an internal seed and venture fund to invest in university startups. This last category is the smallest (\$3-5M/year over the past 7-9 years). WARF’s investment team consists of 6 individuals who manage all investment activities, whether directly or through a diverse set of external funds and money managers.

**Process:**

In-reach to Wisconsin faculty: WARF invests considerable time in reaching into the university for educational purposes. It conducts extensive, ongoing programming to educate the university faculty, students, and leadership on patenting processes and laws, IP and startup companies, and corporate sponsorship as a potential revenue stream to support research. It believes this encourages quality disclosures.

Disclosures: A contractual relationship with the university specifies that inventions should be disclosed to WARF and governs WARF’s role in distributing departmental and inventor shares. Once a disclosure

arrives, the Foundation initiates a process with a deadline of informing the inventor of a go / no go decision on whether they will patent the technology within 29 days. First, an IP manager and a licensing manager meet with and interview the inventors to learn more about the invention. They then write a report, and all new disclosures are subsequently discussed at a monthly internal meeting in which personnel with expertise in business, law, and technical areas participate. Here, a decision is made on whether to file a provisional application. The stated focus is to make crisp decisions to advance the process and not get “bogged down in decision-making.” They believe that UW faculty are experts who know when new IP is inventive, and the focus instead is to analyze whether it can be commercialized. For certain areas, such as pharmaceuticals, it is more straightforward to analyze whether there is an unmet market need. They decide to file on <50% of disclosures, with slightly more than half of these first filed as provisional applications and later converted to full applications. That is, once they decide to accept a disclosure, they commit to fully pursuing the patent since they believe it is almost impossible for tech transfer to know within the first year whether a technology will succeed commercially. For most patents, the value is not immediately recognized and licensed within the first year. They believe that universities that file most disclosures as provisional applications do so as a way to placate faculty.

If a decision is a no-go, sometimes the inventors ask to make another pitch, and WARF can be swayed if the inventors are excited and make a more compelling argument. If a decision remains a no-go, the rights generally revert to the inventor (with the Bayh-Dole caveat). WARF recognizes that some inventions they decline may ultimately succeed commercially, and they “make no apologies” for not being 100% correct in their decisions. They prioritize making efficient decisions, and the outcome will be statistical.

Marketing: When WARF decides to patent, the IP goes to the commercialization team to decide where it best fits, e.g., an established company or a startup. The commercialization team is organized by area (regenerative medicine, medical devices, agriculture, information technology, etc.). Many of the staff have PhDs in their respective fields and have good knowledge of and contacts within these industries, and they establish marketing plans to foster awareness, networking and collaboration. They also field inbound interest from industry generated by faculty publications or talks.

If an incoming disclosure is promising but not yet sufficiently mature for commercialization, it can become part of the WARF accelerator program. The inventors are asked to apply to this program, initially a phase I (\$50-70k) and sometimes a phase II (\$100-200k) award, to generate data that gives the WARF commercialization team stronger assets to market. Applications are by invitation only and are evaluated by outside experts and advisory boards in each area (pharmaceuticals, medical devices, information technology, clean technology, and agriculture). Since launching in 2009, this program has resulted in over 10 startups and 22 commercial licenses.

Licensing agreements: WARF has the capacity to negotiate the licenses internally without outside review or approval. In general, the top 10-15 deals generate 80% of the income.

### **Noteworthy Points:**

- WARF is the exemplary 501(c)(3) OTL in the field. The major challenge for launching a similar model would be how to capitalize a new organization to take on the high yearly operation expenses. The Foundation’s internal joke is: “If you want to be a WARF, begin 90 years ago and get lucky.”
- Since WARF is independent of the university, it can hire people at competitive salaries. One recent hire had 30 years of industry experience.

- WARF places a strong emphasis on picking technologies to patent and then filing quality patents. University of Wisconsin is among the top 10 universities in disclosures, only the top 30% in applications filed, but 5<sup>th</sup> in the U.S. in the number of patents granted. Feedback from the financing world is that investors are more comfortable investing when they know the WARF IP team is supporting the invention.
- WARF has an active board of directors that meets three times a year and is composed entirely of university alumni. Board members are chosen because they are highly successful in their fields, as entrepreneurs, executives in large companies, or senior policy makers in public sector. As the board turns over, the leadership conducts a gap analysis to ensure balanced technical, commercialization, and investment expertise.
- WARF's mission is to return investment on university IP assets, in comparison to the mission of the university Foundation in philanthropic development. The organizations view their missions as complementary, helping the university in different ways, and the two communicate regularly to coordinate these missions.

### **Internal Notes/Suggestions:**

WARF offers a very distinct model from the majority of UC campuses and others (though note UCLA below), and one that would be challenging to initiate given the degree of capitalization involved and the challenges with ensuring compatibility with UC governance. Its mission is broad, and its staff has distinct expertise and teams that focus on licensing, marketing and commercialization, education and outreach, entrepreneurial support through its accelerator program, and active endowment financial management. Even if one weren't considering emulating the full model, there is much to be learned in considering how each team/function operates.

### **University of California, Los Angeles**

In an effort to improve the flow of its licensing activities and optimize financial returns on University intellectual property, UCLA established an independent 501(c)(3), nonprofit entity outside of the University. The UCLA Technology Development Corporation (TDC) endeavors to adopt a business mindset and operate on the cycle of business as opposed to an academic one. While the primary goal of TDC is to improve licensing activity, the organization is also committed to helping create an environment where scientific research and engineering projects with commercial promise will flourish, and this includes support for faculty and their startup efforts. Furthermore, the TDC's fifteen-member Advisory Board offers the organization a continual source of expertise and guidance to help the entity advance its mission. Planning for this new entity commenced approximately 7 years ago and took nearly 5 years to implement.

### **Numbers:**

Prior to monetization of the Xtandi patent (a drug for treatment of prostate cancer), UCLA's annual licensing revenue averaged around \$30M. Sales of the drug's royalty rights in 2015 provided the University with a \$500M lump sum as well as steady stream (beginning in FY17) of at least \$65M per year for the next twelve years. With the addition of other licensing revenues, UCLA will exceed \$100M for FY18. TDC has opted to keep its operating and patent budgets confidential. Currently, the organization has 9 Senior Technology Licensing Officers who are primarily focused on executing pure technology transfer. In addition, it has 3 marketing personnel, 2 business development people, and 4 licensing support personnel. The number of invention disclosures received most resemble WARF's, with 401 in 2015 and 371 in 2016. Approximately 59% of its disclosures are filed as provisional applications, and of these about 63% are converted to full patents.

**Mission:**

A new mission statement has been drafted and includes the creation of “economic value to support UCLA’s scholarly and educational missions and the State of California.”

**Process:**

While UCLA is still in the process of restructuring, a number of important changes have already been implemented:

**Leadership:** The creation of the UCLA TDC allowed UCLA to appoint an independent board and to hire a strong CEO, someone who would be strategic and evaluate opportunities aggressively. After a nearly 1.5-year search, Amir Naiberg was hired as Associate Vice Chancellor and CEO & President of UCLA TDC in August 2016. Mr. Naiberg has significant experience in industry as well as with the technology transfer company of the Weizmann Institute in Israel, which receives \$400M/year in licensing revenue. Mr. Naiberg has a dual reporting structure to both the Vice Chancellor for Research and the Board of TDC; however, his primary appointment and salary come from UCLA since the TDC receives its budget from the University.

**External Board:** The board comprises impartial individuals without significant ties to the University, such as alumni or significant donors and, by design, there is a balance between different competencies. The current TDC Board is responsible for strategic efforts such as setting expectations at the level of performance improvement, the monetization of specific assets, and litigation of valuable patents. While Board members are not involved in TDC’s daily operations, they are often sought out by staff for their expert advice. TDC’s CEO Amir Naiberg has noted a shift in culture; whereas once TDC staff were reluctant to seek the guidance of Board members, now staff actively engage the Board for advice. Naiberg also remarked upon the great value the Board offers the organization; it offers advice cannot be gained from University administration or faculty. As mentioned above, the Board recently analyzed and led a monetization effort, which resulted in a stable revenue stream of at least \$65M per year for the next twelve years. It is worth noting that the majority of this revenue resulted from pharmaceutical patents filed by TDC on research done at the School of Medicine. Also, as required by the UC and unlike WARF, the patents are still assigned to the Regents of the University, and patent income is distributed per UC policy.

**Patenting:** Licensing officers have a discussion with the PIs to evaluate the technology and decide which disclosures to file as patents, and they file approximately 60%. They subsequently do a deeper dive to decide which fraction to file as international patents (PCTs), which requires input and approval of the CEO.

**Marketing:** A year ago, non-confidential marketing disclosures were written for only 35% of disclosures; this number is now up to 85%. Marketing efforts once relied heavily on PIs, but TDC has built a marketing group in charge of sending information on IP to their networks. This activity has benefitted from new software, used to maintain a centralized and continuously updated contact list for the industry network.

**Portfolio management:** UCLA has restructured the portfolios of its licensing officers into focal areas of expertise.

**Noteworthy Points:**

- IT and software infrastructure was updated. Software is now used for increased efficiency in invention intake, leads, marketing, and tracking negotiations as well as milestones and measured goals. This notable accomplishment has streamlined and organized personnel effort.
- The creation and transition to the 510(c)(3) structure resulted in staff turnover. New staff members have been hired, although the headcount remains constant at around 45. A focus on experience outside of academia together with the willingness and experience to undertake active marketing has been the focus of these new hires.
- Similar to Stanford, UCLA has a student internship program with approximately 10 interns who assist with scientific input and market analysis.
- Currently, most employees of TDC are university personnel, operating expenses are on the university ledger, patent expenses are on the university ledger, and patent income is distributed following UC policy. The formation of the 510(c)(3) did enable the formation of an advisory board and the hiring of a business-oriented CEO/Associate Vice Chancellor.

**Internal Notes/Suggestions:**

Mr. Naiberg's appointment two years ago has led to many changes within the office that have been building momentum. For the purposes of Berkeley, it is conceivable that analogous changes could be catalyzed by hiring a new Vice Chancellor (with a similar business mindset and motivation) within the existing university structure rather than via the creation of a 501(c)(3).

**University of California, Berkeley**

UC Berkeley's technology transfer office, IPIRA (Intellectual Property & Industry Research Alliances) was established in 2004 with the aim of improving Berkeley's relationships with industry. In the words of IPIRA Director Carol Mimura, "Its mission is to create multifaceted relationships and new modes of interaction with industry, to diversify research funding sources, support economic development through technology and knowledge transfer, including entrepreneurship – and was tasked with an initial goal of doubling corporate sponsored research, which was around \$10M per year at the time." In establishing IPIRA, UC Berkeley created a new office, the Industry Alliances Office (IAO), to work side-by-side with the pre-existing OTL. In comparison to its peer offices – especially Stanford's TLO, which was established in 1970 and MIT's TLO, also decades old – Berkeley's IPIRA is a relatively young enterprise.

As described by IPIRA Director Carol Mimura, "the IAO and the OTL engage in a 'pull and push' mechanism, bringing in corporate reagents, funding, collaborations, etc. to fund research that often goes beyond the types of projects that federal grants can fund." That is, in addition to licensing rights to companies, IPIRA also brings in resources from companies. Director Mimura describes the synergistic relationship between corporate sponsored research and licensing: "Increased corporate sponsored research results in more mature inventions that companies are likely to want to license, compared to early-stage inventions that are far from being a commercial product. Both units in IPIRA work collaboratively in pursuit of its mission which also embraces a relationship model with companies and a long-term view of technology transfer." Please see Chapter 3 for more detail on Berkeley's Industry Alliances Office.

In overall structure, IPIRA is most similar to Stanford's OTL in that both include an industry outreach component: Berkeley's IAO and Stanford's Industry Contracts Office. In contrast, MIT's corporate sponsored research is handled by its Office of Sponsored Research Programs. However, all three university technology transfer offices are led by Directors who report to a senior leadership individual. For IPIRA, this is the Vice Chancellor for Research.

**Numbers:**

UC Berkeley's raw numbers are lower across the board compared to Stanford, MIT, UCSF, and WARF. In terms of licensing revenue, UC Berkeley's IPIRA generated \$7.8M in FY15 and \$9.9M in FY16. We do however note that revenue would have been \$43.8M and \$18.4M in FY15 and FY16, respectively, had the Yervoy™ (by immunology researcher Jim Allison) patent royalties *not* been accelerated to 2011 – in the form of a lump-sum monetization payment (\$87.5M) – and had instead been received over time. Revenues from that windfall benefited the inventors and Berkeley's research infrastructure. In light of opportunities for more monetary windfalls such as Yervoy™, a reexamination of the budgeting process for IPIRA is recommended by this committee. Please see end of chapter for more detail.

For the last two years, IPIRA had employed 7 senior licensing officers, but current staffing has been reduced to 6. Overall, the total office staff is substantially smaller than at peer institutions: the OTL is at 10 total, the IAO at 6 total, plus 4 additional employees, including the director and one marketing specialist, who serve both offices. By comparison, Stanford's OTL has a total of 51 employees, MIT a total of 42, and WARF 70 (albeit including some accounting and communication functions). With respect to invention disclosures, IPIRA received a total of 218 in FY15 and 203 in FY16; of these, 68% and 75% were filed as provisional patents, relatively high percentages compared to the 5 other universities interviewed. Director Mimura states that Berkeley's higher rate of provisional application filing is linked to IPIRA's mandate to boost industry sponsored research, which has grown 8-fold since IPIRA was established in 2004. On average, ~15-20% of new invention disclosures are sponsored by companies who want a license to the IP and, therefore, are on board to pay the costs associated with IP protections.

**Mission:**

The following is OTL's self-described mission: UC Berkeley's Office of Technology Licensing catalyzes commercial and non-commercial applications of the University's innovations through progressive stewardship of the University's intellectual property (IP). OTL spurs the commercialization of Berkeley innovations by establishing IP agreements with companies. These agreements improve those companies' ability to obtain the risky investments and resources needed to commercialize the innovations. Likewise, the OTL supports the non-commercial development of innovations at Berkeley by establishing material transfer agreements and the IP provisions of collaborative research agreements with companies and other research sponsors. The OTL also promotes entrepreneurialism on the Berkeley campus by advising faculty, researchers and students on IP-oriented matters related to research collaboration, technology licensing, faculty consulting and start-up formation.

**Process:**

OTL staff at IPIRA primarily decides as a group whether to pursue invention disclosures as provisional patents. Director Mimura and the Senior Licensing Officer (SLO) team meet regularly to evaluate invention disclosures received. Regarding their approach to IP negotiations, Michael Alvarez Cohen, Berkeley Director for Innovation Ecosystem Development, states, "Our objective is to establish relationships and agreements that get the University's technologies out fast and broadly, for the benefit of society, to fund research and education, as well as to reward the researchers for their ingenuity." Overall, OTL seems dedicated to helping Berkeley startups and entrepreneurs however possible.

Faculty interviews yielded several concerns regarding process, namely, the desire for greater communication and transparency, especially with regard to IP valuation during the marketing and licensing negotiation processes. In other instances, faculty cited dismay regarding "rush jobs." One example came from a faculty member told for weeks that everything was in order for a provisional

application, and then was asked to provide substantial last minute *prior art*. In sum, faculty voiced their desire to be given a clear set of expectations at the very beginning of the process.

In-reach to Berkeley faculty: At present, IPIRA does not actively hold larger, more in-depth informational or educational sessions for new and junior faculty. Such sessions were held in the past but were discontinued. However, they do participate in a general, new faculty orientation event each year that provides incoming faculty with introductions to IPIRA staff and a brief overview of IP and licensing.

Marketing: IPIRA has one marketing FTE (the Director of Marketing) who functions across the two units, IAO and OTL, and is also shared with Berkeley's startup accelerator SkyDeck. Marketing efforts include posting non-confidential descriptions online to IPIRA's technology database, and direct marketing by the Marketing Director and Licensing Officers. Additionally, the SLOs rely heavily on industry connections of faculty inventors for leads on potential licensees. In particular, one section of the invention disclosure form invites inventors to suggest companies as possible licensees; however, in conversations with faculty, it was indicated that it is not very clear to them how important it was (or is) to provide solid leads on companies who may be good candidates for commercialization of IP. We recommend OTL add language to the invention disclosure form that emphasizes the importance of providing this information, as it may serve as key information for guiding SLOs.

Licensing agreements: UC has a standard agreement called a "quick start," which IPIRA can accept. In general, however, licensing agreements are negotiated on a case-by-case basis. IPIRA notes that universities advertising "express licenses" often end up being subject to negotiations anyway. For negotiations on legal terms within licensing agreements, IPIRA at times must refer questions to UCOP General Counsel, which adds time to negotiations. For financial terms, the office gets comparables from 110 universities through Osage Ventures (which has a partnership with the university), and from internal experience. Addendum: the OTL following discussions with the VCR has very recently begun to post additional template agreements for potential licensees to utilize.

### **Noteworthy Points:**

- In addition their technology transfer activities, IPIRA's Senior Licensing Officers perform many other activities outside the bailiwick of the typical SLO (at least in the context of the 5 other universities interviewed). Some of these activities include: cultivation of corporate research collaborations and corporate gifts; assisting with formation and administration of industry affiliate programs; assisting the Sponsored Projects Office with foundation awards; assisting new private capital funds and incubators to form and become integrated into the innovation ecosystem, helping administer gift vs. grant distinctions, personal consulting/advice to UC employees and companies; support for freedom-of-information requests; work on foreign initiatives including research institutes abroad in Singapore, the Philippines, China either in formation and/or initial exploration; and hosting visiting delegations. Such delegations include universities, companies (including those based overseas), foreign consulate-arranged visits with government representatives in economic development, venture capitalists, startups, foreign patent offices (most recently the European patent office), IP-related services and student groups (innovation fellows). While these activities help support the overall mission of IPIRA and the university, they also result in less time being available for SLOs to pursue technology transfer.
- While UC Berkeley's numbers for invention disclosures are lower than the peer institutions surveyed here, there is additional nuance to be considered in tracking Berkeley faculty inventions. UC Berkeley and Lawrence Berkeley National Laboratory share over 200 joint appointments, which means that UC Berkeley faculty who also have faculty scientist appointments with LBNL

may choose to disclose their IP to LBNL's Intellectual Property Office. There are several factors that can determine to which office a faculty discloses an invention. These include: which office they are most familiar with and/or the office that manages other similar IP in order to keep the portfolio together; facilities utilized in creating the IP; and/or the percentage of DOE funding that was used to create the new IP. Typically, Berkeley and LBNL offices work together to decide which office should manage and license the new IP, and Berkeley inventions managed by LBNL's IPO are not counted in this report.

- Berkeley's IPIRA has been on the leading edge for pioneering new ways of deploying the university's intellectual property. One salient example is the creation of socially responsible licensing, an IP management strategy pioneered by IPIRA Director Carol Mimura that both stimulates support of the University's research and maximizes societal impact of discoveries from the University's research. At Berkeley, this strategy has been employed to translate several innovations for the people who need them most. Examples include the innovative malaria therapy developed in Jay Keasling's lab, the nutritionally-fortified sorghum developed by Bob Buchanan and Peggy Lemaux, and new drug targets for TB from Carolyn Bertozzi's lab. Also, Berkeley's IPIRA has successfully navigated a number of complex negotiations to enable broad agreements with industry, which enabled, for example, the formation of the Energy Biosciences Institute, the first of several industry-sponsored institutes at Berkeley. As mentioned above, OTL at Berkeley is engaged in many other activities that ultimately enhance and help drive the entrepreneurship ecosystem on campus. For example, IPIRA facilitated the creation of an under-represented minority postdoctoral fellow program that is also a quasi-industrial postdoctoral experience. Additionally, Associate Director for OTL Michael Cohen also serves as Director for Innovation Ecosystem Development, and has co-founded several important campus innovation and entrepreneurship resources including SkyDeck, one of UC Berkeley's startup accelerators; the Berkeley Startup Cluster; and the QB3 East Bay Innovation Center, a wet lab start up incubator for bioscience companies in West Berkeley. More recently, Cohen has developed two pilot programs, the Visiting Entrepreneur Fellows (VEF) and Shared Special User Facility for Innovation & Entrepreneurship (SSUFIE), based on models employed at Berkeley Lab's Cyclotron Road. These two programs aim to leverage UCB's faculty expertise, research facilities and entrepreneurial platforms, as well as enhance the university's education, research and service missions to extend the impact of Berkeley's innovation and entrepreneurship ecosystem.

## Overall Recommendations

After examining best practices at IPIRA and other campuses in depth, we offer a series of recommendations.

1. Increase IPIRA's operating budget: With the valuable input of our peer institutions' TLOs, we have analyzed the number of staff members – such as senior or associate licensing officers – in each office (see charts below). Berkeley licensing revenue is lower than at the institutions interviewed, with the caveat that revenue would have been higher if the Yervoy™ patent income were distributed over time. However, there is also a significant gap in office size and number of personnel. Even normalizing for the annual number of disclosures submitted to TLOs on each campus, and taking into account support staff who assist licensing officers, Berkeley's IPIRA office is under-resourced. Adding personnel could improve functions and activities that are best practices among other TLOs, including greater specialization of technical areas among licensing officers, increased communication with faculty, additional investment of time to build business networks, all of which could yield increased revenue from licensing and sponsored research.

2. Create professional focus areas for TLO personnel and reduce non-specialized workloads:
  - a. Even with the limited staff currently at IPIRA, personnel take on a number of roles and responsibilities that analogous personnel at other campus TLOs do not perform (note that we specifically asked them whether they conducted these functions). These include, as mentioned in the Berkeley summary, cultivation of corporate research collaborations, hosting visiting delegations, helping to develop industry affiliate programs, consulting on matters related to foundation awards from Sponsored Projects Office, work related to gifts and distinctions of gifts vs. grants, personal consulting/advice to UC employees and companies, support for freedom-of-information requests, and development of research initiatives abroad.
  - b. We recommend that Berkeley's OTL refocus evaluating invention disclosures, filing, licensing, and marketing in the models adopted by Stanford, MIT, and UCSF. Indeed some TLOs offer a full marketing team (e.g., WARF), compared to a single marketing staff member at Berkeley.
  - c. IPIRA files a significantly higher percentage of disclosures as provisional patents than other TLOs, though this is in part enabled by patent cost coverage from companies that have sponsored the underlying research. This may also be due to concerns over pressure from faculty, perceived and/or real, to act upon disclosures. We recommend establishing a transparent process for analyzing and vetting disclosures. This process may offer multiple advantages. First, it could enable the office to focus its marketing efforts on key filings. Second, since many seminal, early-stage technologies developed at Berkeley are "ahead of their time" and only later find a strong market in industry, investing in protecting key inventions for the long term would enable them to reach potential. Currently the median age of a patent that has been filed but is then abandoned at Berkeley is reportedly seven years, and continuing and expanding a policy of focusing marketing efforts on key inventions with significant IP protection will enhance translation to industry. Third, this would provide faculty with an early no-go decision in the event they would like to assume ownership of the technology and pursue protection themselves.

Still, there is risk associated with fewer provisional filings. If faculty did not have confidence in the vetting process, it could harm their relationship with IPIRA and the university. Therefore, the process must be carefully designed and communicated within the campus, and a clear rationale and transparent decisions communicated to the faculty personally would be a must. A well-designed process is possible and desirable, based on the experiences of other TLOs.

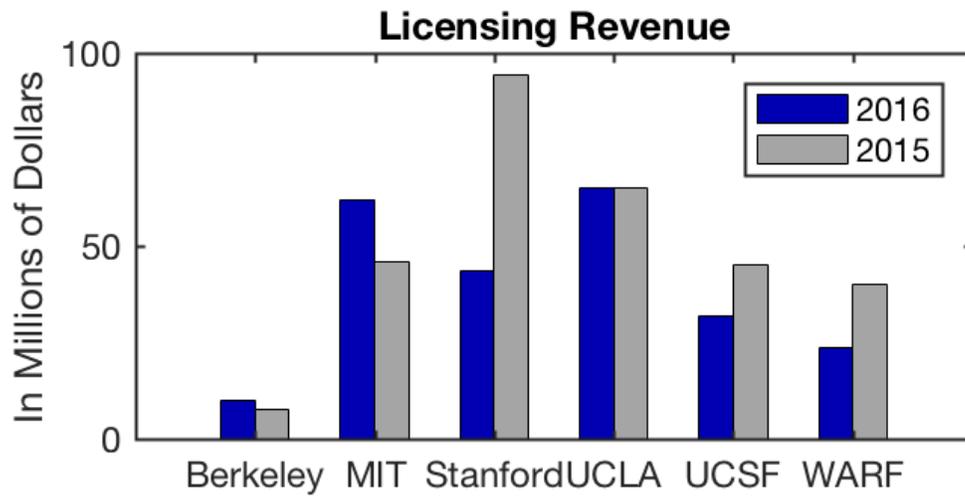
3. Create a high-level office for entrepreneurship: Licensing is a critical activity for any campus, and Berkeley has shown strong innovation in multiple ways (more below). As an alternative model, other campuses have established offices larger in scope than IPIRA that encompass licensing, industry relations, strategic partnerships and fostering of entrepreneurship. IPIRA is working hard to play many of these roles, but an expanded office such as at UCSF, that appoints a high-level leader for entrepreneurship at the level of Associate Vice Chancellor or Vice Chancellor, could accomplish multiple objectives.
  - a. The proposed Associate Vice Chancellor or Vice Chancellor for Entrepreneurship should be empowered with executive, decision-making capacity to navigate the complex

- operations structures at UC Berkeley and UCOP and identify new, creative solutions to foster entrepreneurship.
- b. The role should have a greater focus on business-oriented, outward looking, and networking practices than currently exists. The experience and business contacts of this person, combined with a mandate for the role, should focus on raising funds to support entrepreneurial activity at Berkeley (more information in Chapter 4). We note that the new Vice Chancellor position at UCSF has been tasked with considerable fundraising responsibilities.
  - c. Based on comparisons with peer institutions, the person would ideally have deep industry knowledge (e.g., at least ten years of experience).
  - d. We recommend that a separate office devoted to developing Berkeley's innovation and entrepreneurship ecosystem be created. This office would report directly to (and work closely with) the proposed AVC or VC for Entrepreneurship. This office could serve as the "hub" for entrepreneurship on campus that would interface with and help support the many entrepreneurship "spokes" on campus such as SkyDeck, the CITRIS Foundry, Sutardja Center for Entrepreneurship & Technology, the proposed BioEngenuity Hub etc., as well as cultivate relationships and new initiatives with key partners including QB3, Cyclotron Road, and the City of Berkeley.
4. Expand opportunities for efficiency and transparency: Other TLOs have prioritized and invested in improving their operations in different ways, and we can learn from these efforts.
- a. Updated software packages for disclosing, tracking, and marketing can significantly enhance efficiency. UCLA in particular emphasized how upgrading software changed the workflow in its office, enabling a streamlined system for timelines and reminders, offering tools for quantitative analysis of workflow, and establishing an online database of industry contacts (accessible to all officers and maintained even during personnel turnover). IPIRA has taken initial steps in this direction by recently launching an online disclosure process ([artemis.berkeley.edu](http://artemis.berkeley.edu)), which has the potential to simplify disclosures. Taking additional steps to integrate this process seamlessly with other critical functions (patenting and licensing workflow, industry contact databases, licensing agreement precedents and templates, etc.) has considerable potential to improve efficiency and save time.
  - b. Communication and transparency with faculty. In discussions with faculty inventors across a number of departments, there was dissatisfaction in some cases in their interactions with IPIRA; however, we note that some of these concerns arise from misunderstandings in policy. Some licensing officers foster personal relationships with faculty, which faculty appreciate. In general, however, additional personnel resources and restructuring of efforts would enable closer communication with faculty. Clear communication of what is and is not possible due to legal considerations and campus governance would foster a deeper understanding of IPIRA decisions by faculty. In some cases, IPIRA's reputation on campus is adversely affected by constraints beyond their control. For example, Bayh-Dole requires that technologies be broadly marketed rather than channeled, for example, directly to faculty startups. Stanford rigorously interprets this provision by requiring a 90-day window of outside marketing before making a technology available to faculty-initiated startups. IPIRA is very open to the possibility of licensing technology to campus startups, and educating faculty more about Bayh-Dole regulations could foster a deeper understanding of IPIRA. We also note that faculty should, and often do, designate a startup company representative to negotiate a license, in order to avoid a financial conflict of interest.

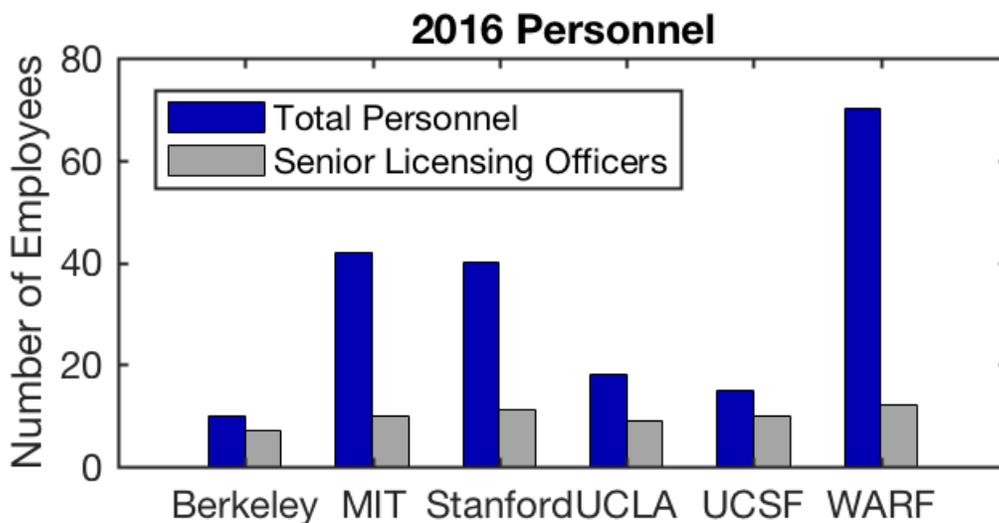
- As another example, faculty should be consulted about whether they have information that could aid in the valuation of the technology. While faculty have a clear financial conflict of interest in such discussions, another point that could be conveyed at the beginning of the invention disclosure process, including faculty in such discussions may be consistent with the State and UC's conflict of interest policies as it would broaden the number of people who provide information for a decision. In other cases, decisions that are within their control could be more clearly communicated to faculty, for example a preliminary decision not to file a provisional patent (or foreign filings) due to perceived lack of a clear commercial path, or the lack of licensing interest from companies XYZ. In this regard, Stanford polls its faculty to find out how they would like such decisions to be conveyed to them (e.g., email, phone, or in person). In general, closer communication between IPIRA and faculty to *manage faculty expectations* would foster additional understanding and enhance relationships.
- c. Generating template licensing agreements could streamline and accelerate negotiations, and a number of peer institutions do so. While IPIRA operates in a different governance environment from, say, Stanford's OTL, which does not have to consult General Counsel when negotiating legal terms of an agreement, keeping track of precedents and templates (including provisions previously vetted by UCOP General Counsel) could reduce licensing officer workload and accelerate time to agreement. Addendum: the OTL following discussions with the VCR has very recently begun to post additional template agreements for potential licensees to utilize.
  - d. IPIRA should examine internship programs of institutions such as UCSF and UCLA. Bringing on PhD, MBA, and law student interns pro bono has resulted in a positive return on investment for these institutions in conducting research on potential licensee companies. Such a program would be challenging to manage at IPIRA, however, with the current staff size.
5. Opportunities for rebranding: Should any elements of the aforementioned recommendation strategy be adopted, we believe this would also be an opportune time to engage in rebranding and vitalizing Berkeley's outreach effort. UCSF's recent rebranding efforts could serve as a model for Berkeley. For example, a new AVC or VC for Entrepreneurship could devote a significant amount of time during the first several months of his/her appointment cultivating relationships on campus—getting to know faculty, their research and its commercial potential, as well understanding how the many innovation and entrepreneurship programs across campus enhance Berkeley's entrepreneurship culture. Another key element to be considered in such a rebranding effort would be the coordination and packaging of all resources offered across campus to faculty and student entrepreneurs.

In summary, Berkeley is making steady progress in expanding the entrepreneurial impact of campus personnel and inventions, and IPIRA innovations such as socially responsible licensing and Berkeley-flavored accelerator programs (e.g., SkyDeck, discussed in greater depth in Chapter 4) are amplifying this potential. To further build upon this momentum, we offer a series of recommendations (which we note do not necessitate the challenging and initially disruptive undertaking of creating an independent 501(c)(3) IP management entity). Providing additional resources to enable greater external networking, and improve marketing efforts and internal communication could – based on examples from peer institutions – enhance licensing volume, speed, and revenue. In addition, elevating the leadership scope, the title, and potentially the fundraising mandate of a new AVC or VC position could further increase the profile and role of entrepreneurship on campus. Finally, there are opportunities to further streamline operations including

database and tracking software, disclosure screening processes, and communication with faculty. We believe the talents of our leadership, staff, and researchers are up to the challenge.

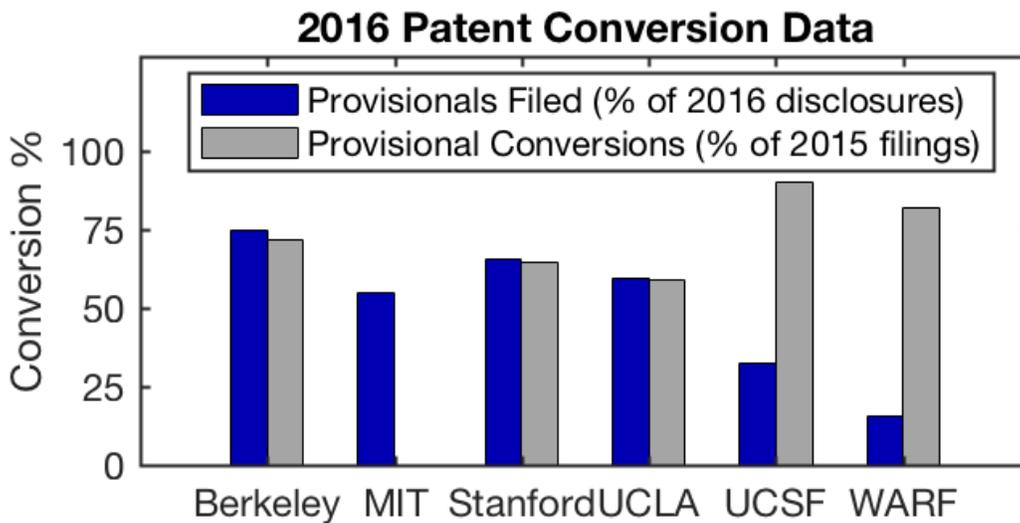
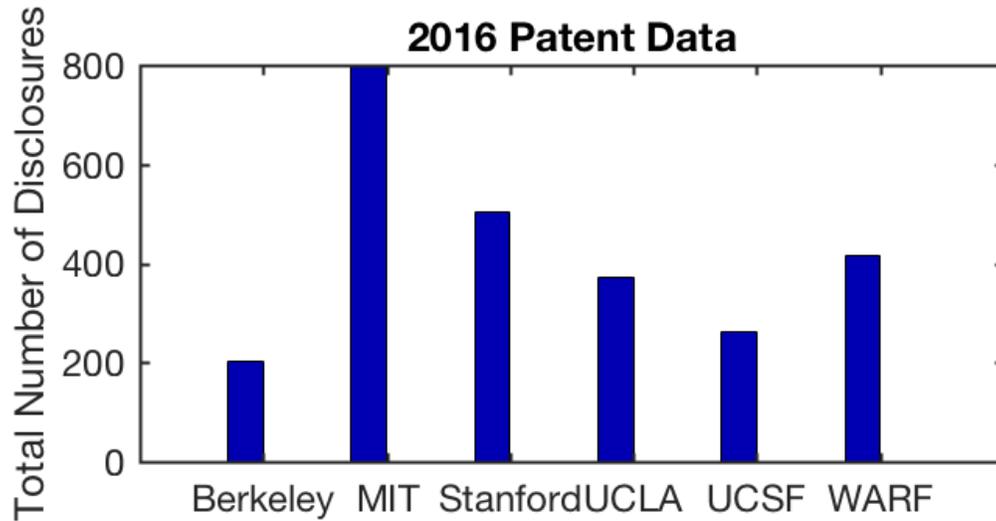


Note: Berkeley has lower revenue, though several factors should be considered. First, one clear theme from our analysis is that licensing revenue is driven by a small number of lucrative patents. Berkeley’s licensing revenue would have been higher in 2015 and 2016 (by \$36M and \$8.5M, respectively) without the lump-sum agreement on the Yervoy™ patent in 2011. Likewise, Stanford is currently benefitting from proceeds on a recombinant DNA technology patent that will soon expire. Furthermore, Stanford, UCLA, and WARF benefit from their medical schools, and patents related to biotechnology and pharmaceuticals as a whole garner higher revenues than those based, for example, on information technology. We also note that Berkeley licensing revenue is either higher than (including Yervoy™) or similar to the budget of IPIRA (see below), so there are opportunities to invest more and streamline operations to increase opportunities and chances for lucrative licensing agreements.



Note: These data do not capture the overall size of each campus OTL office. For instance, in addition to their Senior Licensing Officers, Stanford, MIT, and UCLA have a number of staff playing supporting roles. Stanford employs 9 licensing assistants; MIT has 3 Associate Technology Licensing Officers and 7 Technology Licensing Associates;

and UCLA has 3 marketing personnel, 2 business development people, and 4 licensing support personnel. In contrast, UC Berkeley's OTL has 3 Licensing Assistants and 1 Marketing individual shared between OTL, IAO, and SkyDeck. Furthermore, as discussed above (UC Berkeley section), IPIRA conducts numerous roles that other TLOs currently do not.



## **CHAPTER 2: CAMPUS CLIMATE FOR ENTREPRENEURSHIP: ANALYSIS AND RECOMMENDATIONS**

Author:  
Scott Shenker

Additional contribution:  
David Schaffer

## Introduction

Universities have unique cultures, shaped by their histories, missions, geography, and constituents. Likewise, a given campus's approach to entrepreneurship – not only through the official policies of overall university leadership and administrative offices such as the OTL, but also via the perceptions and cultures of individual faculty and departments – can vary broadly across universities and even within a single university. Chapter 1 discussed the roles, structures, and practices of OTLs in supporting entrepreneurship. In this chapter, we will first consider the impact of campus culture and processes on entrepreneurial activities, and then discuss the effects of those activities on campus culture. We also note that although we collected qualitative feedback from deans and department chairs from Chemistry, Engineering, and Letters and Arts; members of the budget committee; and individual faculty, we did not conduct rigorous polling. As a result, the chapter is intended to convey common themes and trends rather than statistical outcomes.

## Analysis and Discussion

In our discussions with deans and departmental chairs, they reflected on three perspectives on entrepreneurship among faculty: 1) startups are a logical extension of scholarly work and contribute to society and help generate wealth, goals commensurate with the university's mission, 2) entrepreneurial activities are not consistent with scholarship and are associated with a profit motive that should be distinct from a university's mission, and 3) entrepreneurial activity detracts from time that faculty could devote to department service, which is not a moral judgment but a pragmatic observation. While we did not conduct a statistical poll of faculty perceptions, the chairs and deans we interviewed, as well as the members of this committee, believe the first of these opinions to be predominant on campus, especially as time has progressed over the past 15 years.

Chairs also noted that income from patent licensing flows into units at a rate that is meaningful but not transformative – with major exceptions such as the Allison/Yervoy™ patent. However, such revenue can contribute to meeting departmental needs, such as startup packages. This is an additional possible benefit of elevating the role of entrepreneurship at Berkeley. Chairs also noted that it would be helpful for departments to receive a more detailed breakdown of the contributions of different patents to the lump sum they receive every year, which would enhance their ability to anticipate and plan based on this revenue stream. That is, some patents generate one-time income, while others generate a longer-term revenue stream, and receiving a yearly statement of how much of each category contributed to the income (and how many years remain for yearly income streams) would greatly help chairs' ability to plan ahead.

We also asked chairs about their perceptions of faculty conducting sabbaticals at companies; most chairs were generally open to industry sabbaticals, as they likely have the same favorable impact on professors' scientific development and innovation as other sabbaticals. This point mirrors one we have heard from numerous faculty: that entrepreneurship and interaction with industry feeds back to enhance their academic mission. Specifically, knowledge of cutting-edge problems faced in the transition of basic research into practical products and services can shape or even “rejuvenate” the choice of basic research problems to address in an academic program, such that the downstream outcomes may have broader practical relevance as well as enrich the experiences of students and postdoctoral fellows. This topic has also been broadly discussed in a campus blog (<http://www.cchem.berkeley.edu/pagrp/entrepreneurship.html>).

We also discussed the question of whether entrepreneurial activities should be considered in promotion cases. The Academic Personnel Manual (APM) explicitly allows for consideration of the “advancement of professional practice” in tenure and promotion cases:

APM 210-1(d)(2):

"contributions by faculty members to ... the advancement of professional practice ... should be judged creative work when they present new ideas or original scholarly research"

APM 210-1(d)(3):

**Professional Competence and Activity** — In certain positions in the professional schools and colleges, such as architecture, business administration, dentistry, engineering, law, medicine, etc., a demonstrated distinction in the special competencies appropriate to the field and its characteristic activities should be recognized as a criterion for appointment or promotion. The candidate's professional activities should be scrutinized for evidence of achievement and leadership in the field and of demonstrated progressiveness in the development or utilization of new approaches and techniques for the solution of professional problems, including those that specifically address the professional advancement of individuals in underrepresented groups in the candidate's field. It is responsibility of the department chair to provide evidence that the position in question is of the type described above and that the candidate is qualified to fill it."

Certain entrepreneurial activities, such as startups developing novel technical solutions to longstanding problems, would seem to qualify under the APM language as demonstrating “distinction in the special competencies appropriate to the field.” However, in our conversations with various deans and department chairs from three colleges, as well as members of the budget committee, we found that startups played very little role in the promotion and appointment cases in departments outside of architecture and the clinical law faculty. More specifically, entrepreneurial activities were rarely part of the formal case put forward by a department chair, and thus played no role in the eventual decisions.

Among the various campus parties with whom we spoke, none expressed dissatisfaction with this state-of-affairs. The prevailing view seems to be that the university should compensate professors for their university activities, and companies should compensate them for their commercial activities, and the two need not be inextricably linked. However, we did not canvas faculty members to inquire whether there were situations where individuals under consideration for promotion had wished that their entrepreneurial activities played more of a role in the eventual appointment or promotion decision.

While there does not seem to be a groundswell of complaints about the current situation, the campus should consider what role startup activities should optimally have on promotion and appointment cases. The issue is subtle because, on the one hand, successful startups based on ideas developed in academic research can test an idea's impact in the wider world. On the other hand, commercial success does not automatically constitute evidence of an idea's intellectual depth, merely whether it can be turned into a successful product or service. Thus, the question of whether a successful startup should factor into an individual promotion or advancement case requires careful evaluation. The external letters included in such cases are free to mention such entrepreneurial activities as might be deemed relevant to support the assessment of a candidate, and perhaps this indirect path to affecting promotion cases already provides an avenue for consideration of these activities, particularly if it were communicated to faculty that they may include evidence of entrepreneurial activities among the documents distributed to letter writers.

We also considered the impact of entrepreneurial activities on the campus culture. No single perspective emerged, given the many different “micro-climates” within a campus as large as Berkeley. In certain departments startups are essentially irrelevant to the discipline and have no discernable impact, except perhaps as a possible career choice for graduates.

In other departments many if not most of the faculty have founded startups. As discussed above, these activities can compete for the time and attention of the individuals involved, leading to less energy going toward campus. This tension is covered neither by the classic conflict-of-interest considerations, nor limitations on compensated activities, though it can potentially be reflected in the service, teaching, or research sections of tenure and promotion case materials. Most faculty members devote an extraordinary level of effort to their work activities, and as entrepreneurial activities become a natural part of their life, their presence (both mental and physical) on campus is inevitably reduced. While not a widespread problem, this phenomenon should be carefully considered before the campus exhorts more faculty to follow the entrepreneurial path.

## **Recommendations**

Entrepreneurship can also have a broad impact on faculty research groups and, more broadly, on undergraduates at Berkeley. In the introduction to Chapter 5, we briefly discuss a more holistic definition of entrepreneurship that embraces a set of entrepreneurial behaviors that can be applied broadly to students’ personal and professional lives, whether they choose to pursue for-profit ventures or non-profit social enterprises or any other ennobling pathways that challenge them to take risks, become leaders, and pursue bigger, bolder visions for the betterment of humanity. We likewise recommend campus support and encouragement for faculty to do the same.

In summary, we believe the climate of entrepreneurship has evolved significantly over the past 15 years, and such activities have gradually gained acceptance as worthy scholarly pursuits. Chairs and departments are open to faculty investing their “excess” time, including sabbaticals, in this endeavor. However, entrepreneurship is not currently considered in tenure and promotion cases, and the committee recommends that the units and budget committee be open to consider it as a scholarly activity – akin to textbook writing or society service. We also recommend that the campus designate an impartial ombudsperson whom faculty can approach to convey concerns with the nature and extent to which entrepreneurship has been considered in a promotion or tenure case. This person can advise the faculty member and can in turn convey concerns to the Vice Chancellor for Research for potential further analysis.

**CHAPTER 3: PART A: INDUSTRY ALLIANCES OFFICE  
PART B: CONFLICT OF INTEREST**

Authors Part A:  
Tiff Dressen  
Niren Murthy

Author Part B:  
Michael Rape

## Part A: Industry Alliances Office at UC Berkeley

### Background and Introduction

This section of the report is not intended to be a *full* evaluation of UC Berkeley Industry Alliances Office's (IAO) ability to successfully foster industry-university research collaborations. Such an endeavor would require numerous interviews with stakeholders including faculty across the disciplines as well as Berkeley's corporate research partners. Rather, keeping in mind the overall aim of this report, we focus here on *IAO's contributions to entrepreneurship* at UC Berkeley. However, since IAO leadership and staff devote much of their efforts to pursuing corporate research agreements, the bread and butter of their office, as well as cultivating long term relationships with industry, we provide background on the office's mission, how it has evolved over time including its growing portfolio, and recommendations for strengthening the office.

### Establishment of IAO

IAO was established in 2004 to focus on promoting campus research, education, and public service through contracted research relationships with industry. One primary goal was to double revenue from corporate sponsored research, which was approximately \$10M at the time. IAO was created to work in parallel with the Office of Technology Licensing (OTL), to form a new unit called Intellectual Property and Industry Research Alliances (IPIRA). IAO has a strong historic culture of technology transfer. In collaboration with OTL, IAO practices a bi-directional view of technology transfer – one that approaches industry-sponsored research with an eye toward IP and licensing, and works with OTL to cultivate follow-on sponsored research with licensees to further develop existing IP. IAO handles incoming sponsored research transactions with industry plus all related research agreements from federal, state and non-profit sponsors for data, software, and materials, as well as confidential information. IAO also plays an integral role in cultivating long-term relationships with industry to increase sponsored research and develop and manage strategic alliances with industry partners.

### IAO Portfolio

While negotiating and executing industry research contracts is the primary activity of the IAO, the office is also responsible for negotiating and executing the University's incoming material transfer agreements (MTAs), non-disclosure agreements (NDAs), data use agreements (DUAs), and Small Business Innovation (SBIR) and Small Business Technology Transfer (STTR) subawards from small businesses, which are often UC Berkeley startup companies. Additionally, IAO staff work with colleges, schools, institutes, and centers across the campus to help design and establish contract-based industry affiliate programs which includes drafting and negotiating membership agreements. In addition, they develop IP management plans for federally funded research proposals that increasingly involve industry partnerships. As seen in Table 1 (in the Appendix below), the numbers of all types of agreements negotiated and executed have risen in the last seven years.

One important aspect to note about IAO revenue generation is that while research contracts bring funding *directly* to campus, MTAs, NDAs, and DUAs (in and of themselves) do not. However, these latter types of agreements are necessary for facilitating research at the University, and their value and complexity is ever-evolving. For instance, what is the value of an NDA or DUA, especially if it is attached to a high-value federal grant proposal or a gift from an industry partner? Additionally, efficient negotiation and processing of MTAs may be critical to securing federal funding awards and to the success of research projects.

In terms of data use agreements, IAO Director Eric Giegerich commented that such DUAs were once straightforward and simple. However, in recent years, because of big data and data repositories, and new laws pertaining to data privacy in the European Union, DUAs now have increased commercial value and require increased risk management. IAO must determine what kinds of IP rights can be granted in data use agreements, especially when associated with gifts. At present, IAO is working toward a set of best practices for DUAs. While the norm is to protect against risk, there is also opportunity in optimizing the asset value of the data. Striking the right balance between these two poles will be key. In sum, IAO aims to build a new model for handling data use agreements – one that will “look at DUAs in a fresh, new way without alienating our industry partners or faculty.”

At the end of Part A, we present a few key examples where execution of such non-funded agreements were critical to competing for and/or securing funding.

In the academic world, offices that focus solely on negotiation and execution of industry contracts are often referred to as “contract shops.” In contrast, IAO could be appropriately called a “relationship shop.” In addition to the time and resources spent negotiating and executing contracts for the University, IAO devotes the time necessary to cultivating relationships with both faculty and companies. Oftentimes, a partnership with a company can involve a lengthy conversation and process to determine whether the company wishes to fund research via gift or contract/grant, and how it wants to structure the engagement. If the company decides to take the gift route, IAO will perform a hand-off to their development office counterparts in what they refer to as “chaperoning a relationship,” while keeping the discussion open for future research project funding.

IAO emphasizes cultivating relationships with faculty and companies for the long-term – well after the contracts have been executed and while the research projects are underway. In addition, it offers coaching and advising to faculty interested in creating a new research center. By contrast, Stanford’s Industrial Contracts Office (which sits within their OTL) has been in operation for twenty-one years, is mostly a contract shop and is currently on a trajectory to build up to an office of ten (including leadership plus one administrative staff member). The Stanford office does not engage in active outreach to industry but works closely with the campus’s development office to facilitate the initial stages of relationships with companies. Stanford’s development office appears to provide most of the business development and relationship management for Stanford’s industry partnerships. Interestingly, MIT has separated the functions of contracts and relationships. They have a 5-6 person team (within their sponsored projects office) whose members serve as contract leads to negotiate and execute non-federal awards and large collaboration agreements. In a separate office, the Industrial Liaison Program (ILP), which started in 1948, employs 54 account managers, each of whom cultivate a portfolio of companies for a combined ILP portfolio of about 250 active industry partners. ILP serves a marketing and sales function for MIT; each participating company pays \$75K per year in exchange for a set of services that include access to MIT conferences and KnowledgeBase (ILP’s private web-based database of faculty/research staff expertise). In addition, each company’s account manager serves as the company’s navigator—helping to define a company’s needs and objectives with MIT, guiding them through MIT’s vast ecosystem and arranging meetings with faculty and experts of interest. This fee-for-service model allows ILP to be self-sustaining. IAO at Berkeley is a one-stop shop for all things related to industry funding and partnerships. However, the high-touch culture it has fostered does not appear to be sustainable given current staffing levels.

In a small set of interviews conducted with faculty from the departments of Nutrition, Bioengineering, Integrative Biology, and Molecular and Cell Biology, faculty indicated some dissatisfaction in working with IAO. The chief complaints focus mainly on the speed at which contracts and agreements are executed,

and that faculty must exert pressure on IAO staff to ensure that negotiations with industry partners move forward in a timely manner. That said, we believe that in order to fully assess both faculty satisfaction and dissatisfaction with IAO, a much larger survey of faculty and their interactions with the office is needed. Likewise, such an assessment would also include a survey of industry partners to gauge their satisfaction with IAO as well as response times of both parties to negotiations.

## **Innovation and Entrepreneurship**

IAO's portfolio has continued to expand over the last several years. In 2014, the office took the lead in managing the SBIR/STTR (small business) grant portfolio from the Sponsored Projects Office. In many ways shifting this workload to industry alliances makes sense; IAO has experience working with companies of all sizes and levels of sophistication and is well positioned to address any background and foreground IP matters. IAO leadership has indicated their desire to increase the SBIR/STTR portfolio for the campus. However, such a commitment will involve substantial outreach—to regional small businesses, federal agencies, and the entire SBIR/STTR community of consultants. Universities with small business grant programs typically have 1-2 staff dedicated to outreach and handling grants. Currently, IAO does not have the staffing bandwidth to do this. We will discuss a plan for staffing in the recommendations below.

IAO, as a division of IPIRA, has created a new type of agreement called “Innovation Services” that currently includes several signature items such as the SkyDeck corporate affiliate program, CITRIS Foundry memberships, and the Shared Special User Facility for Innovation and Entrepreneurship (SSUFIE) pilot program (along with its companion Visiting Entrepreneurial Fellows program).

The new SSUFIE pilot program is of particular interest to this report because it represents a new mode of bolstering innovation and entrepreneurship on campus. The program enables UCB-affiliated startups to conduct new product R&D in faculty labs – *but only under certain conditions*. This radical program is the first of its kind for Berkeley and for the UC system. Developing the program was a collaborative effort involving OTL, IAO, and other UCB stakeholders along with UCOP's office for Research Policy Analysis and Coordination to address a host of issues and objectives as highlighted in the overview found here: <http://ipira.berkeley.edu/ssufie>. For example, the SSUFIE pilot program has unique IP provisions (approved by UCOP as an exception to UC IP policy) that allow startups and UC to jointly own any resulting IP, though the University forbears from commercial licensing (as long as the startup is operational). Furthermore, participating startups are required to pay market rates for the (tightly defined and time-limited) use of faculty lab facilities.

IAO obtained a new campus policy establishing a 20% indirect cost rate for the SSUFIE program as an “other” sponsored project, with the justification that the campus is supporting the I&E ecosystem. Proceeds from this program will support research and education in the SSUFIE faculty labs and corresponding departments. The core provisions of the SSUFIE agreement are non-negotiable. However, each agreement requires careful consideration which includes conflict of interest concerns, market rate determination as well as a set of necessary approvals. Also important to note, due to the program's novelty (and possible controversial capabilities), each SSUFIE agreement requires an educational process with all parties involved. Currently, IAO is working closely with OTL's Mike Cohen to ramp-up the program, educate the UCB I&E community about this new capability, and complete each SSUFIE agreement. As of May 31, 2018, IPIRA has received SSUFIE inquiries from about 30 startups. Three startups have been on-boarded into the program and three additional startups are nearing execution of their SSUFIE agreements. IPIRA envisions that the SSUFIE program will contribute to what we hope will become a supercritical mass of innovation and entrepreneurial activity within and adjacent to the Berkeley campus.

## IAO Staffing and Recommendations

The Industry Alliance Office has eight positions, six of which are negotiator roles. Two negotiators have left Berkeley to take industry positions, which translates into a loss of one third of its contract-negotiating capabilities. Currently, due to budget restrictions, IAO is prohibited from rehiring these two positions. Given the expansion of its portfolio, the high-touch nature of the office, and the prominence and importance of industry relationships and industry-sponsored research to the Berkeley campus, we believe the campus should consider IAO as a strategic investment. At the very least, we recommend it be permitted to recruit and hire two contract negotiators to ensure an adequate level of service to the campus – re-establishing full staffing level should help alleviate faculty concerns related to sluggish contract execution. IAO also shares two positions with OTL – an Assistant Director of Marketing and Technology Analysis, and an Information Systems lead, both of which play supportive roles to IAO’s larger, strategic approach to cultivating long-term relationships. With budget cuts, these roles are difficult to sustain, the possible effect being that IAO reduces its role to a mostly transactional focus. Additionally, we understand that recruitment and retention of highly qualified industry alliances professionals at UC Berkeley has been challenging and that desirable candidates often make, and expect, higher salaries than Berkeley is able to offer. We understand that both IAO recruitment and retention have been affected – with numerous IAO staff leaving for better pay at other campuses or in industry. In light of this, our second recommendation is for an analysis of the salary range(s) for negotiator positions, which should also consider whether current staff negotiators should be considered for reclassification. We recommend this to be undertaken in collaboration with IAO leadership. Given the evolving nature of IAO’s portfolio and growing engagement with entrepreneurship on campus, our final recommendation is that VCRO and IPIRA leadership undergo a semester-long strategic planning process to determine how best IAO can serve campus in the next ten to 15 years, and what kind of team composition is needed to meet these goals. For example, such a reimagined IAO team could include 1-2 staff dedicated to entrepreneurship – focusing on expanding the SBIR/STTR portfolio and helping to ensure smooth-running of the VEF/SSUFIE programs, and perhaps another 1-2 staff focused on strategic alliances and management, with continued support for the shared IPIRA functions of marketing and business development including an Information Systems expert. Ultimately, while we recommend IAO expand its sphere of activity and influence in the entrepreneurship space, we do not believe it should do so at the expense of time and energy given to research contracts and agreements.

### **Examples of key non-funded agreements.**

#### *Non-Disclosure Agreements (NDA):*

In Fall 2017, IAO worked with the Berkeley Research Development Office (BRDO) to negotiate and sign several last-minute NDAs with supercomputer companies in support of Berkeley's \$60M NSF proposal to build a supercomputer center, entitled, "Towards a Leadership-Class Computing Facility: A National Center for User-Focused High Performance Computations."

IAO negotiated an NDA between UC Berkeley and Noblis, a Washington, D.C.-based aerospace non-profit research institute which will now allow UC to partner on a \$300M NASA grant proposal.

### *Material Transfer Agreements (MTA):*

In 2016-17, IAO negotiated a complex data- and materials-sharing agreement among eleven parties from all sectors of the research community (public and private universities, non-profit research institutions and medical schools, and the drug industry) required for the management of a \$12M NIH PO grant on dengue fever for Professor Eva Harris. This effort required IAO knowledge of NIH policies on data sharing. IAO also mediated between researchers and institutions with different financial motivations pertaining to the use of their potentially licensable technologies. In addition, the activity required that IAO work with Eva Harris's lab to help the team articulate the various roles of the parties, since the proposed project had three different but conjoined research thrusts and the roles of the 11 parties varied by activity.

### *Data Use Agreements (DUA):*

IAO drafted *de novo* and negotiated 13 complex DUAs with California state, country or city agencies that supported an Arnold Foundation grant for \$2,675,000. The DUAs were originals and required consultation with UC Office of the President.

## **Part B: Conflict of Interest**

### **Current status:**

Every researcher at UC Berkeley who founds a company or works closely with a commercial entity must submit conflict of interest forms to the University. Through these statements, the researcher declares any potential financial conflict of interest and allows for its review to ensure that any consequences could be managed according to guidelines provided by major funding sources, such as the National Science Foundation or the National Institutes of Health. The actual content of conflict of interest declarations is specified by the actual funding agency (NIH, NSF, etc.), and the University must comply with these requirements. It is important to note that the University only monitors financial conflict of interest, but not other, non-financial, types of conflict. All conflict-of-interest forms submitted to the University are reviewed by a standing committee that includes administrators as well as faculty members. This committee either determines the absence of financial conflict of interest, or proposes a management plan to ensure that an existing conflict of interest does not compromise the independence of any other work by the respective faculty member. This process is an important mechanism to establish transparency in the public eye and to ensure academic freedom at our University.

To assess the impact of this procedure on entrepreneurial students, postdoctoral researchers, or faculty members, we interviewed Jyl Baldwin, Associate Director in the Sponsored Projects Office, Coordinator of the Conflict of Interest committee and its administrative lead; David Graves, the Lam Research Distinguished Professor in Semiconductor Processing and faculty chair of the Conflict of Interest committee; and, more informally, multiple faculty members. One of us (MR) is also a standing member of the Conflict of Interest committee.

### **Strengths:**

The conflict of interest procedure has been improved significantly over the last year with the introduction of weekly reviews for straightforward or recurrent applications, such as non-competitive renewals of a faculty member's grants or postdoctoral fellowships coming from a faculty member's laboratory. This

weekly online review is not limited by monthly meetings of the Conflict of Interest committee and has thus significantly reduced turnaround times for non-problematic applications.

Both the administrative lead, Jyl Baldwin, as well as the faculty chair of the committee, David Graves, are very experienced and able to review each case efficiently. It is our impression that this committee actively seeks to find solutions to potential problems for conflict of interest, often in collaboration with the investigator as well as the respective funding agency.

### **Weaknesses:**

The principal investigator (typically a faculty member, but also students or postdoctoral fellows) of any grant application submitted to the National Science Foundation or the National Institutes of Health must declare her/his potential financial conflicts of interest to the University and the funding agency. In addition, conflict of interest statements must be submitted for every grant or fellowship application of every student or postdoctoral researcher in the group of a faculty member that previously had declared a financial conflict of interest. For UC Berkeley, a significant number of disclosures are submitted: between July 1, 2015, and June 30, 2016, 350 positive financial disclosures were submitted to the conflict of interest committee (for detailed numbers, see Table 1). Importantly, with an increased interest in founding companies and increased reliance on non-federal funding, we expect these numbers to increase significantly. Indeed, as of May 8, 2017, 214 financial disclosures had been submitted already during that year alone. ***This creates a major burden for the University, as well as for each faculty member involved with a commercial entity either as founder or collaborator.***

Funding can only be initiated after the conflict of interest committee has reviewed each case and decided whether a financial conflict of interest exists; in case of a positive financial disclosure, a management plan must be implemented before funding commences. If forms are incomplete, or information included in the forms is insufficient to properly inform the committee, forms must be resubmitted and reviewed at a later committee meeting. As the COI committee meets monthly, this can result in significant delays or even loss of funding. Both the administrative lead and the faculty chair of the conflict of interest committee noted that insufficient staff education accounts for most delays (i.e., administrative staff or faculty are often unaware of what information should be included in forms). While the introduction of weekly online reviews for non-problematic conflict of interest forms accelerated approval, and reduced the burden for the committee, ***the large number of new applications that require review by the University's committee can still create notable delays.***

If financial conflict of interest has been determined, the conflict of interest committee demands that a management plan is implemented to ensure academic freedom and independence among student researchers in the PI's research group. Such management plans are specific for UC Berkeley. Typically, this requires that a student meets annually with an oversight committee composed of three faculty members, who in turn determine that the student's research was not influenced by the commercial interests of her/his advisor. Particularly in divisions that have been rich in entrepreneurs and, in light of the increase in the number of cases of positive financial disclosures, ***these management plans generate a significant administrative burden for faculty members, even if they themselves are not engaged in entrepreneurship.***

While we do not expect that these weaknesses will ultimately prevent a University-affiliated entrepreneur from founding a company, we emphasize that they create a complicated and sometimes burdensome environment for entrepreneurs. With an increase in the number of companies founded with links to the

University, this can negatively affect the University’s ability to recruit entrepreneur-minded students, postdoctoral fellows, and faculty members.

**Table 1: Disclosures for potential financial conflict of interest between 7/1/2014-5/17/2017 (source: Jyl Baldwin)**

Form	Financial disclosures	Individual disclosures	Management plans
700-U	133	88	13
PHS	514	105	25
NSF	17	13	10
Campus*			33

\*Financial interest did not rise to the level of financial conflict of interest, but a campus-management plan seemed prudent

## Opportunities

### To reduce the administrative load for the University and its Conflict of Interest Committee:

**We propose that the University fund the development of an electronic database for disclosure and management of financial conflict of interest.** Every faculty member and entrepreneurial student should be required to update her/his potential conflict of interests on an annual basis (similar to our existing APM-025 forms, which could be automatically linked to this database). Such an annual certification process is already implemented at UC Irvine and UCLA. This database could be connected to existing databases for grant management (i.e., Phoebe), allowing an applicant for state or federal funding to declare potential conflicts of interest at the time of grant submission. Notably, an electronic database could be programmed in a way that a form can only be submitted if all questions have been addressed, thus limiting the submission of incomplete forms that generate delays in approval, and consequently, funding. We predict that such an investment would significantly reduce the administrative burden for the University (which would not need to collect forms for every independent grant application), the Conflict of Interest Committee (which would not need to deal with incomplete forms), and the entrepreneurial students or faculty members (who would not need to submit forms for every grant application and would not experience funding delays due to incomplete and initially rejected disclosures). The resulting efficiencies in managing conflicts of interest would create a more positive atmosphere with regard to University-affiliated entrepreneurship.

### To reduce the work load for faculty unaffiliated with startups:

Management plans tend to create work for faculty members who have not started companies, as they need to meet with and advise students in an entrepreneur’s group. As the number of management plans increase, this can create resentment toward entrepreneurial faculty. Most departments, however, require graduate students to meet annually with a group of faculty members to review progress of the student’s research. Most of these thesis committees contain a section in which the student meets with his committee in the absence of the advisor. **We propose that this part of the thesis committee meeting should also be used to briefly review the academic progress in light of declared financial conflicts of interest by the advisor.** This could supplement meetings by a management plan committee and thus reduce the work load for colleagues of a faculty entrepreneur.

**To improve communication and staff training:**

**We propose the development of an online resource to educate faculty and their administrators about what information should be included in disclosures of financial conflict of interest.** This online resource could be linked to the electronic conflict of interest database and appear, for example, as a pop-up window during the annual certification of potential conflicts of interest. Combined with “required fields” regarding conflict of interest during annual certification or at a Phoebe interface during grant submission, this simple measure could significantly reduce the number of incomplete disclosures, thereby accelerating approval and reducing the risk of lost or delayed funding.

**Appendix**

**Table 1. IAO’s Total Agreement Volume**

Agreement Types	UC FY Counts							
	2011	2012	2013	2014	2015	2016	2017	2018
Research Signed, Industry	113	118	95	99	111	119	154	149
Research Signed, Bus Non Profit	58	75	61	68	50	74	69	43
Memberships Signed	20	41	33	31	37	34	39	44
<b>Active Intl., Budget Period</b>	<b>148</b>	<b>180</b>	<b>205</b>	<b>175</b>	<b>199</b>	<b>179</b>	<b>341</b>	<b>289</b>
<b>Active Research, Budget Period</b>	<b>418</b>	<b>457</b>	<b>469</b>	<b>510</b>	<b>437</b>	<b>438</b>	<b>669</b>	<b>682</b>
<b>Active Memberships, Budget Period</b>	<b>131</b>	<b>209</b>	<b>272</b>	<b>338</b>	<b>324</b>	<b>247</b>	<b>413</b>	<b>271</b>
<b>Total Budget Period</b>	<b>549</b>	<b>666</b>	<b>741</b>	<b>848</b>	<b>761</b>	<b>685</b>	<b>1,082</b>	<b>953</b>
<b>Active Intl., Project Period</b>	<b>219</b>	<b>238</b>	<b>206</b>	<b>172</b>	<b>165</b>	<b>182</b>	<b>288</b>	<b>284</b>
<b>Active Research, Project Period</b>	<b>673</b>	<b>665</b>	<b>512</b>	<b>603</b>	<b>511</b>	<b>587</b>	<b>771</b>	<b>748</b>
<b>Active Memberships, Project Period</b>	<b>169</b>	<b>266</b>	<b>299</b>	<b>273</b>	<b>163</b>	<b>147</b>	<b>198</b>	<b>154</b>
<b>Total Project Period</b>	<b>842</b>	<b>931</b>	<b>811</b>	<b>876</b>	<b>674</b>	<b>734</b>	<b>969</b>	<b>902</b>

<b>MTA Requests</b>	291	347	355	399	425	536	505	512
<b>MTA (executed)</b>	252	252	296	241	233	192	277	359
<b>NDA</b> s	<b>30</b>	<b>36</b>	<b>41</b>	<b>46</b>	<b>62</b>	<b>67</b>	<b>39</b>	<b>91</b>

Table 1 provides figures from 2011 to 2018, and demonstrates that while IAO’s total agreement count varies, including its unfunded agreements (MTAs and NDAs), the overall trend is increasing volume. Numbers are based on Phoebe, Tableau, IPIRA’s Salesforce database Artemis, and an older, retired IAO database in Filemaker. IAO is in a period of database transition beginning in 2016.

**Table 2 IAO Revenue from funded agreements**

Agreement Types	UC FY Amounts in Millions							
	2011	2012	2013	2014	2015	2016	2017	2018*
<b>Active Research, Budget Period</b>	\$69.1	\$78.0	\$76.2	\$71.1	\$79.4	\$56.5	\$52.0	\$39.5
<b>Active Memberships, Budget Period</b>	\$3.7	\$3.9	\$6.8	\$6.7	\$13.8	\$20.5	\$18.2	\$14.3
<b>Total Budget Period</b>	<b>\$72.8</b>	<b>\$81.9</b>	<b>\$83.0</b>	<b>\$77.8</b>	<b>\$93.2</b>	<b>\$77.0</b>	<b>\$70.2</b>	<b>\$53.8</b>
<b>Active Research, Project Period</b>	\$38.8	\$41.4	\$61.9	\$22.0	\$37.5	\$49.5	\$75.4	\$49.2
<b>Active Memberships, Project Period</b>	\$7.3	\$4.9	\$12.4	\$4.1	\$8.9	\$16.2	\$14.6	\$13.5
<b>Total Project Period</b>	<b>\$46.1</b>	<b>\$46.3</b>	<b>\$74.3</b>	<b>\$26.1</b>	<b>\$46.4</b>	<b>\$65.7</b>	<b>\$90.0</b>	<b>\$62.7</b>

**Table 2**

\*Reporting as of June 8, 2018.

Notes on numbers: These numbers are based on Tableau, broken out by an IAO filter or IAO sponsor hierarchy (showing IAO’s actual awards, including some trade associations, agricultural marketing boards, and foundations), as opposed to the industry category typically used in Tableau and attributed to IAO. For example, in FY17, by the industry category alone, IAO brought in \$68M, while using the IAO filter, IAO brought in \$90M. IAO is working to refine the reporting of IAO numbers. The drop of BP funding for the EBI in 2016 should be considered when viewing sponsored research dollars brought in through IAO.

## **CHAPTER 4: MODELS AND MECHANISMS TO SUPPORT ENTREPRENEURSHIP**

Authors:  
Tiff Dressen  
David Schaffer

Additional contributions:  
Peidong Yang  
Toby Stuart

## Introduction: Models and Mechanisms to Support Entrepreneurship

Startup founders and funders frequently discuss the “valley of death,” the gap between an early promising invention and a successful company, in the process of converting that technology into a marketable product. Many universities have directly and indirectly supported programs and institutions that foster entrepreneurship, and in this regard Berkeley is certainly no exception, as there is a broad and vibrant range of such activities on and around our campus. They can be broadly categorized into several classes: (1) educational programs, (2) educational and funding mechanisms for individual entrepreneurial faculty and fellows, (3) startup accelerator programs, (4) university-affiliated venture funds, and (5) local programs independent of UCB.

The goal of this chapter is not to offer a complete and exhaustive compendium of such programs; indeed, recent efforts have begun to assemble a roadmap to navigate these activities (<http://begin.berkeley.edu>). Instead, we offer illustrative examples in each category, and end with recommendations and future opportunities.

### Berkeley M.E.T. Program

The newly launched Berkeley M.E.T. program (Management, Entrepreneurship, and Technology) is the marriage of two degrees, the BS in Business and the BS in Engineering, into one four-year degree with entrepreneurship as a connecting theme. Originally inspired (and subsequently supported) by a Berkeley donor, the concept for the program was embraced by the Deans of both Engineering and Business. The program addresses a sweet spot and gap in Berkeley’s entrepreneurship education at the interface of technology and commercialization. The confluence of Berkeley’s highly ranked, competitive engineering *and* business programs, UCB’s proximity to Silicon Valley, a donor champion, critical support from College leadership, and students’ desire and demand to immerse themselves in the complementary fields of engineering and business to better prepare themselves to become tomorrow’s entrepreneurs, leaders, and innovators make for the perfect and timely creation of the Berkeley M.E.T. It is also worth noting that the only other analogous, competitive program offered in the country is The Jerome Fisher Program in Management and Technology at the University of Pennsylvania.

Even in its first year, the Berkeley M.E.T. program is highly selective and will contribute to UC Berkeley’s efforts to attract the most ambitious and talented students. Program Manager Dawn Kramer commented that many applicants either have ideas for a product brewing or are in the process of beginning their own enterprises, but realize they need to become knowledgeable in such key areas as product marketing and finance. Also, the M.E.T. program leadership has noticed that corporate demand for students with skill sets combining technical competency and business savvy is on the rise. For example, Berkeley’s M.E.T. has already caught the eye of Kleiner Perkins, a Bay Area VC heavyweight. Andy Chen, who leads Kleiner Perkins’ Fellows Program, has indicated interest in interviewing every incoming freshman in the program. He elaborates on the importance of having dual capabilities: “You tend to find that the engineer that just doesn’t understand life beyond code is operating at 50% capacity. To have a broader understanding of the business is super important, especially when you’re the founder of a company or you’re an early employee at a company.” [1]

The Fall 2017 inaugural cohort of 40 students will pursue Engineering degrees in EECS (Electrical Engineering and Computer Science) or IEOR (Industrial Engineering and Operations Research) in addition to the business administration degree. The program will expand its Engineering offerings to add Mechanical Engineering coursework for Fall 2018, and add Bioengineering and Civil Engineering curriculum in Fall 2019. The program aims to reach a steady state of 200 students.

It will be exciting to see how the M.E.T program evolves over the next several years, and to track the successes of its graduates and how they enrich the Berkeley entrepreneurship ecosystem. In other chapters of this report, we describe how the College of Engineering continues to advance the frontiers of entrepreneurship and innovation at Berkeley, the M.E.T. program being a recent example. UC Berkeley is entering a renaissance for blended science + business programs. Recently, the College of Chemistry, in partnership with the Haas School of Business, announced that it will offer students the opportunity to pursue a simultaneous degree in chemistry, chemical biology, or chemical engineering and business. Similarly, in the Biological Sciences, a new dual major degree program called the “B2” for Biology and Business will begin in the spring of 2019 with 20-30 students.

### **Sutardja Center for Entrepreneurship and Technology (SCET)**

The Sutardja Center for Entrepreneurship (SCET) was founded in 2005 through an endowment gift from Pantas and Ting Sutardja to the College of Engineering to create a teaching center for entrepreneurship on the Berkeley campus. Over the last twelve years, SCET’s courses and programs have touched and influenced many Berkeley students. By the numbers, SCET has provided entrepreneurship education to over 5,000 students, developed over 100 new ventures, worked with 500 Silicon Valley executives, and collaborated with ten partner universities around the world.

At present, SCET engages – through such offerings as courses, bootcamps, and hackathons – between 1,700-1,800 students annually at Berkeley, approximately 50% of whom are in the College of Engineering with the rest coming from other disciplines across campus. Ikhlaz Sidhu, founder and faculty director, describes the shift of SCET’s teaching methodology from analyzing Harvard Business School case studies to highlighting the dynamic individual entrepreneurs who have created successful companies and transformed industries. This shift has brought many influential speakers, including: Alan Amron, entrepreneur and inventor of press-on memo, today known as the Post-it note by 3M; former Yahoo CEO and longtime Google executive Marissa Mayer; John Doerr, Partner at Kleiner Perkins; and Vinod Dham, “Father of the Pentium Chip.” In Sidhu’s words, “The people bring reality immediately into the classroom, and what makes them interesting? Their point of view, mindsets and behaviors.” Understanding that company culture is infused with the personality of its leaders, SCET created the “Berkeley Method of Entrepreneurship” with the aim of helping to transfer the mindset and behaviors of successful entrepreneurs in a situation-based format. The “Berkeley Method of Entrepreneurship” is based on the idea that while the rest of the University curriculum teaches domain-specific knowledge and skills, students must also be able to explore how their mindset compares with that of entrepreneurs. Such mindset characteristics include behaviors like paying it forward, seeking fairness, learning to trust, planning to fail, diversifying your networks, and storytelling (the ability to communicate your new ideas in the language of your audience). Students are introduced to these behaviors through an inductive game-based approach that encourages not only examination of the behaviors, but allows students to practice and improve. [2]

In addition to an emphasis on mindset and behavior, SCET offers courses to help students hone their technical skills. For example, the class on Applied Data Science with Ventures Applications requires the programming language Python and statistics as prerequisites, covers math theory and computer science elements, and includes a project addressing a real-life challenge. One student team developed a process for determining whether a given news article is real or fake.

Lastly, SCET places a high value on project selection. Per Sidhu, “Our projects are selected because they have the potential to change an entire industry. Whether that is related to chatbots, self-driving policies,

Internet 3 with Privacy, blockchain 2, or meat alternatives, in each case the project is the beginning of enabling an industry for greater potential and/or social good.”

In sum, SCET functions as an Innovation Collider where mindset/behavior education and practice, technical depth and careful selection of emerging industry combine with key players: undergraduates, graduate students, venture capitalists, entrepreneurs, global partners etc. to create new connections and teams to solve challenging problems.

## **Bakar Fellows**

The Bakar Fellows program began in 2012 with a gift from Barbara and Gerson Bakar to support UC Berkeley faculty working on technologies with high potential for commercialization and positive, practical benefits to society. Bakar Fellows come from a variety of disciplinary backgrounds including Physics, Plant and Microbial Biology, Environmental Science, Policy and Management, Mechanical Engineering, Architecture, Bioengineering, Materials Science, and Urban Design with a further concentration of faculty from Electrical Engineering & Computer Sciences, Chemistry, and Molecular and Cell Biology. To date, the program has selected six faculty cohorts for a total of 31 faculty supported — resulting in seven startups.

Highly selective and competitive, the Bakar Fellows program provided each awardee with \$75K in discretionary funding per year for five years total. This long-term, flexible funding stream has been critical in helping faculty mature their ideas, whether they are at an earlier stage — in the process of creating and/or refining their prototype — or at a later stage — poised to launch a company and/or license their technology. In addition to funding, Bakar Fellows receive benefit from a mentoring program, access to networks beyond UC Berkeley, and the Bakar Fellows community itself, a growing peer group whose population now includes several experienced faculty-founders. These benefits also flow to Berkeley’s entrepreneurial-minded students who seek faculty mentors. The program guides its faculty entrepreneurs to appropriate campus resources. Many Bakar Fellows have cited the advantages of SkyDeck (Bakar Fellows receive automatic admission to “Hot-Desk” at SkyDeck), QB3’s Startup-in-a-Box, the I-Corps program at Haas, IPIRA, and Sutardja Center’s Management of Technology Innovation program, to name a few. SkyDeck and QB3 are discussed below.

Among the challenges encountered, Fellows have indicated needing advice on *how* to negotiate with VCs, as well as an overall lack of coordinated access to VCs across the Berkeley campus. This last issue has emerged as a pain point in a number of conversations with faculty, staff, and students. Those individuals who have been able to receive (either by luck, strategy, or a bit of both) introductions to vetted VCs have benefited tremendously. Others have suggested that further attention and assistance be placed on making strategic connections to industry and cite such partnerships as a more viable pathway for their particular technologies. Another comment, which resonates with interviews this committee has conducted for other chapters in this report, is that faculty need guidance in understanding IP rules and developing strategy around what is legal/ethical/smart to patent, what IP should be licensed, and what IP their startup should develop to sell as a product. Given that these challenges transcend the Bakar Fellows and touch many faculty entrepreneurs on campus, we recommend Berkeley develop a holistic strategy to help faculty solve these challenges in finding mentorship and strategic advice.

The Bakar Fellows program continues to advance and evolve. In 2017, it appointed its first Faculty Director, Amy Herr, Professor of Bioengineering and former Bakar Fellow. As a member of the inaugural cohort of Bakar Fellows, she launched her startup, Zephyrus Biosciences, a company that provides research tools to enable protein analysis at the single cell level. Zephyrus Biosciences was successfully

acquired by Bio-Techne in March 2016, and was integrated into the Protein Platforms Division of Bio-Techne. Having a successful faculty entrepreneur who has learned by doing has helped energize and further focus the program. Under Herr's leadership the Bakar Fellows program has added new elements, the first of which is the creation of the Bakar Innovation Fellows. This program aims to empower select graduate students and postdoctoral fellows in the labs of Bakar Fellow faculty to gain deeper knowledge and know-how about IP strategy, licensing, marketing, etc. This is particularly important since graduate students and postdoctoral fellows often end up driving the startup ship, serving as founders or co-founders or playing another significant role. The roles of these early employees are often critical since faculty frequently comment that they have too many other time commitments to commercialize their inventions without the collaboration of skilled and dedicated partners. For instance, it is unlikely that a faculty member would be available to fully participate in the intensive I-Corps program at Haas.

A second addition to the Bakar program is the creation of the SPARK fund, which represents a shift in the funding model to incentivize faculty to "go hard" during the first two years of their Fellowship. Beginning with the 2017-2018 cohort, each Fellow receives \$75K per year, for two years. Fellows who have successfully achieved translational milestones during the first two years will be eligible to apply for an Innovation Incentive Prize, which provides an additional \$300K to help accelerate commercialization of their technology and to help Faculty Fellows expand their laboratory research into new areas of opportunity.

## Cyclotron Road

How does one support the world's top researchers working on solutions to the 21<sup>st</sup> century's biggest challenges in energy, water, food, and health when neither academia nor industry is willing (or able) to provide support to mature their ideas into commercially viable products? Described by Founder and Executive Director Ilan Gur as a "long-term experiment," Cyclotron Road was created at the Lawrence Berkeley Lab in 2014 to address this critical gap in the U.S. research ecosystem and "create a new institutional home for application-driven research." [3] Similar in spirit to the Miller Fellows Program model, Cyclotron Road's formula is to recruit top innovators from around the world and provide them with two-year fellowships that require 100% commitment to their projects. The fellowships thereby function as a deadline to motivate awardees to make rapid progress. The selected innovators are immersed in the Berkeley Lab milieu and receive access to facilities, equipment, and expertise. Additionally, Fellows receive education and mentorship tailored to meet their needs as innovators working on projects in the physical sciences and engineering domains. This training includes understanding the manufacturing costs for their product, recruiting staff, and learning how best to engage with a formal advisory board (Fellows are required to hold quarterly advisory board meetings), and "the opportunity to evaluate the strengths and limits of their technology and explore market applications *before* committing to a costly development plan." [3]

The Cyclotron Road program, as Ilan Gur explains, offers a new modality for Berkeley entrepreneurship, one focused on developing "complementary and symbiotic relationships." It's worth noting that Cyclotron Road, first and foremost, champions innovators. That is, the program selects for and supports *individuals* as opposed to particular technologies or startup teams.

In 2017, Cyclotron Road graduated Cohort One, a group of nine innovators supported through funding from the U.S. DOE Advanced Manufacturing Office. Cohort One made great strides during its two-year term. Six companies emerged and have resulted in the addition of 30 high tech manufacturing jobs. Particularly remarkable is that all six teams have crossed the science-to-product bridge, having either developed their first prototype or acquired sufficient funding to do so. In sum, Cohort One raised over

\$15M to develop their projects, with \$5M coming from a variety of private sources – angel investors, Silicon Valley VCs, philanthropists, and industry-backed strategic investors.

While Cyclotron Road has been primarily (to date) based at Lawrence Berkeley Lab, many benefits have flowed to campus and thereby enriched the overall Berkeley ecosystem. For example, Cyclotron Road Cohort teams recruit top talent from UC Berkeley’s graduate student and postdoctoral populations, which has the added benefit of keeping some of Berkeley’s best and brightest connected to campus after graduation. Berkeley’s undergraduates benefit too. As interns with innovator teams, they have the rare, opportunity to work in a hybrid discovery culture, one that is neither purely academic nor purely startup but contains elements of both. Gur has witnessed how this experience has informed their future pathways. Additionally, while the Cyclotron Road program is open to innovators from around the world, UC Berkeley graduate students and postdoctoral fellows are often top contenders for these prized fellowships.

In the two and a half years since its inception, Cyclotron Road has supported 3 cohorts of innovators (21 teams in total) and is now poised to expand into campus. As mentioned in Chapter 1, UC Berkeley’s IPIRA, in collaboration with Cyclotron Road, has developed two pilot programs – the Visiting Entrepreneur Fellows (VEF) and Shared Special User Facility for Innovation & Entrepreneurship (SSUFIE) – to bring innovator teams to campus with the aim of continuing, in Ilan Gur’s words, to “seed an epicenter to radically advance science.”

### **QB3**

The California Institute for Quantitative Biosciences (QB3) was established in 2000 as one of California Governor Gray Davis’s four Institutes for Science and Innovation, and it bridges UCB, UCSC, and UCSF to foster and support quantitative bioscience research. In seeking revenue sources for expansion, QB3 Director Regis Kelly noted that large companies could be attracted to QB3 to gain access to highly innovative and inventive university startup companies, but at that time there was a paucity of structures to support university startups. To help build ties between the university and industry, foster new employment avenues for university graduates, and explore potential revenue streams for the university, QB3 began to focus on supporting entrepreneurship at the three campuses.

Today, QB3 offers a range of services and capabilities for new companies. The Startup-in-a-Box program helps companies to incorporate, and connects them with lawyers who can provide free or deferred-payment legal services. QB3 also operates a range of incubator facilities both on campus (e.g., Mission Bay and Stanley Hall) and off (QB3@953 in Dogpatch, and two facilities in Berkeley). These highly successful facilities are in considerable demand, as they receive 5 inquiries per week from life sciences companies. In addition, Mission Bay Capital (MBC) has raised two funds (the second, \$25M fund is nearly fully invested), whose investment decisions are aided by an advisory board of successful venture capitalists and entrepreneurs. Both the incubators and MBC generate revenue for QB3. Finally, QB3 has been building an industrial partnership program to help startup companies explore partnerships with large pharma and biotech companies.

### **Berkeley Catalyst Fund**

The Berkeley Catalyst Fund (BCF) is a venture fund affiliated with the College of Chemistry, initiated under the leadership of former Dean Richard Mathies and current Dean Doug Clark. BCF is managed by Founding Partners and college alumni Ted Hou and Laura A. Smoliar, along with Founding Partner Drew Lanza who has extensive venture capital experience in Silicon Valley. The fund emerged after 2.5 years spent navigating the university and UCOP governance structure to arrive at a creative structure compatible

with the university's guidelines and non-profit status. Briefly, the overall fund is composed of two affiliated funds, an external BCF funded by limited partners and run by general partners, as well as a parallel BCF philanthropic fund affiliated with the UC Berkeley Foundation. The two make a parallel investment in a startup, and all of the resulting BCF philanthropic fund carry is donated to the College of Chemistry while 10% of the external BCF fund is donated to the College. This structure enables the College to benefit from supporting university startups, and offers a model that can be replicated by other, newly-emerging campus funds.

The first fund was recently closed, and BCF is now making investments. In addition, one of the limited partners, Fosun Pharmaceuticals, will in some cases match the BCF investment level, thereby increasing the capital available to portfolio companies.

## **SkyDeck**

Berkeley SkyDeck was established in 2012 as a partnership among the Haas School of Business, the College of Engineering, and the Office of the Vice Chancellor for Research, with major input and leadership from IPIRA, Michael Cohen in particular. Since its inception, SkyDeck has mentored and accelerated over 130 teams that have included UCB faculty, students, and alumni. SkyDeck offers two programs: The Hot-Desk track enables teams to engage with SkyDeck on an informal basis, ranging from access to open areas in the office, to attending all workshops and events, to networking with other SkyDeck companies. Cohort teams enroll in the 6-month Berkeley Acceleration Method (BAM) program, in which they receive a Lead Advisor, personal coaching on fundraising and team development, a suite of free technology resources, and legal and financial expertise. Mentorship is contributed by a community of over 90 SkyAdvisors (including faculty advisors) and industry partners (including Ford Motors, Adobe, and Amazon Web Services), which make significant financial contributions to access the program.

SkyDeck has experienced a surge of interest from startup companies. In its most recent cycle, it received double the number of applications over the previous application cycle: 425 applications were received, of which 15 were selected for the next Cohort, an acceptance rate of 3.5%.

The program made several significant advances in 2017:

First, it announced the development of a venture fund, with strong support from campus leadership. Under the leadership of Managing Partner Chon Tang, the Berkeley SkyDeck Fund successfully met its \$20M target (now oversubscribed), of which \$100k will be invested (as a \$2MM cap SAFE mechanism) in each of the 40 companies per year that go through the 6-month BAM program. The fund will also ask for 10% participation rights in the first institutional round of financing. The fund's top-tier investors include Sequoia Capital, Mayfield, Canvas Ventures, Sierra Ventures, Softbank China, and Photon VC. In addition to VC's, over 20 faculty and SkyDeck Advisors have invested in the fund. Importantly, the fund will share the carry 50-50 with UC Berkeley.

In partnership with the Sutardja Center for Entrepreneurship and Technology, SkyDeck launched the Global Founders Program, an academic research program that accepts founders from around the world who come to UC Berkeley to study entrepreneurship at the Sutardja Center while their startup goes through the SkyDeck program. They have accepted their Global Founders into the Spring 2018 Cohort.

SkyDeck has also created the Faculty-in-Residence Program with ten Berkeley faculty. These faculty are both top in their field and have experience as an entrepreneur or investor. These faculty will assist SkyDeck in evaluating applications and providing expertise on technical and scientific issues relevant to SkyDeck startups.

The Berkeley Postdoctoral Entrepreneurship Program (BPEP) is now officially housed at SkyDeck, and the program will be expanded to support SkyDeck startups with scientific and technical expertise. BPEP is assisting SkyDeck with the application review process and is launching a Chief Scientific Officer-in-training program to help postdoctoral fellows learn about this role in a startup, as part of educational training for Berkeley postdoctoral fellows.

Led by a first-year MBA, the Haas Startup Squad provides MBAs and other Haas students with project-based work experience by collaborating with SkyDeck teams. Eight projects are already underway with more planned for the next Cohort beginning in December 2018. The Haas Startup Squad coordinates its efforts with the Berkeley Haas Entrepreneurship Program.

Lastly, in 2018, SkyDeck doubled its space, adding an additional floor to now occupy the Penthouse floor and the third floor in the SkyDeck building. The floors host SkyDeck Cohort and HotDesk teams, and offer space for events and networking. SkyDeck launched a Biotrack in partnership with QB3.

### **CITRIS Foundry**

The CITRIS Foundry is an accelerator for deep technology startup companies—those founded on scientific discovery and/or meaningful, hard-to-reproduce technological innovation with the potential to transform society. Embedded in the Berkeley campus in Sutardja Dai Hall, the Foundry began in 2013 with a cohort of startup companies that included Correlia Biosystems, Cortera Neurotechnologies, Dash Robotics and Lion Semiconductor.

The Foundry's accelerator program offers startup teams a variety of valuable resources that include flexible maker space, access to the Marvel Nanofabrication Laboratory, wet lab space in the QB3 Stanley Hall Garage and MBC Biolabs (previously QB3@953) in the Dogpatch neighborhood of San Francisco. The Foundry pays for the startup teams' use of space for the 12-month program. The Foundry also features a thoughtfully and carefully vetted network of mentors appropriately matched for the startup teams. As an example of the critical role that such mentors can play in the commercialization process, Foundry Partner Peter Minor recalls how having a mentor embedded in the negotiating process enabled Dash Robotics to secure a contract with industry partner Mattel to create and distribute its first product. Dash Robotics has been on the rise ever since. Most recently, Dash Robotics is in the news for its success in raising \$2.7M and the big-box store debut of its first product (in partnership with Mattel and Kamigami Robots) over the 2017 holiday season.

Over the last five years the Foundry has expanded its portfolio from predominantly IT-focused startups to teams working at the frontiers of gene editing, artificial intelligence, biomedical technologies, programmable hardware and energy systems. Thus far, the Foundry has supported 42 teams, the vast majority of which (79%) are driven by graduate students. Minor sees the Foundry playing a critical role in helping startup teams generate the type of metrics that VCs need to see by the time they graduate from the Foundry. In fact, 68% of CITRIS Foundry teams receive funding by graduation. In total, the teams have raised over \$40M.

In a spirit similar to the Berkeley Catalyst Fund and SkyDeck's SkyFund, the CITRIS Foundry is raising a VC fund which aims to close somewhere between \$10M-\$15M. The idea is that each startup team entering the Foundry program will receive \$50K-100K from the fund. Additionally, should a team be successful in securing seed funding, the Foundry will match at 10%, *and possibly* match (10%) a series A round of funding.

Through its Foundry Fellows program, the CITRIS Foundry has created greater connections for innovation and entrepreneurship around the Berkeley campus. The Foundry Fellows, a select group of UC Berkeley MBA and engineering students as well as members of the Berkeley Postdoctoral Entrepreneur Program (BPEP), spend 10 weeks working closely with Foundry startup teams on their critical business, engineering, and science challenges, including everything from product development to cloud analytics to experimental data analysis.

## **Berkeley Founders Pledge**

The Berkeley Founders Pledge is a way of engaging and encouraging entrepreneurial faculty, alumni, and friends to give back to Berkeley when the time is right for them. This nonbinding pledge allows donors the freedom to decide when, how much, and destination(s) of their eventual gift(s) to UC Berkeley. To date, over 325 Berkeley alumni and faculty entrepreneurs have pledged to give back philanthropically to UC Berkeley – totaling in over \$30M in gifts. The Founders Pledge is supported by University Development and Alumni Relations' (UDAR) Innovators Platform: (<https://innovators.berkeley.edu/about>), a vehicle for facilitating alumni entrepreneur connections to Berkeley. Additionally, UDAR's Bay Area regional team ("Berkeley Innovators") hosts 3-4 networking opportunities around the Bay Area each year with plans to expand to New York City and Los Angeles. This team connects the Founders Pledge members and interested others into speaking, mentoring and lecture opportunities across campus.

## **The House**

The House (<http://thehouse.build>) is a startup accelerator (The House Residency) and affiliated venture fund (The House Fund), fully independent of the university and located on Bancroft Avenue across the street from the main campus. It focuses on supporting startup companies formed by UC Berkeley faculty, alumni, and students. The 7,000-square-foot space serves as offices for staff, hoteling for companies, and event space. Successful applicants to The House Residency are offered investment from The House Fund (currently up to \$120k), mentorship from experienced founders, potential additional investment from The House Fund, connections with venture capital firms for subsequent funding, and access to a growing network of large companies in tech and pharma (which often visit The House) to discuss partnerships. In the years since its inception, The House has helped more than 50 startup companies in the Berkeley community that have raised over \$500M in aggregate venture capital. Its activities are gaining recognition, and The House was featured in the *Wall Street Journal*, *TechCrunch*, *LA Times*, *Forbes*, *Fortune*, and other national press in 2016 and 2017. The House founder Cameron Baradar says his overall goal is to "enable the next generation of industry-defining companies that will come out of the UC Berkeley ecosystem. We aim to maximize the amount of innovation that can come out of a University ecosystem by translating a University's new leaders and research into societal and economic impact via startup creation."

## **Recommendations**

This chapter does not provide a compendium of entrepreneurial support mechanisms in the Berkeley ecosystem, but instead provides an overview of different categories of organizations; the authors apologize in advance for omitting additional productive and promising endeavors. However, this analysis demonstrates that the campus offers a vibrant constellation of offices and institutions to educate, fund, and support new ventures. As time progresses, this ecosystem will undoubtedly grow, both through centralized campus efforts as well as grassroots activities.

In addition, there are distinct opportunities to further build upon and leverage these efforts to meet additional needs in our entrepreneurial environment. One need is the potential for increased coordination. While grassroots efforts have always been a hallmark of Berkeley's progressive culture of innovation, and have in this case resulted in a range of resources available to new companies, some level of coordination could benefit entrepreneurs in at least two ways. First, a single website that maintains a "live" list of resources and their organization on campus could serve as an asset for new entrepreneurs: a "one-stop shop" or roadmap to enable them to seek matches that optimally serve their needs (e.g., formal education, funding, networking, incubator space, etc.). We are encouraged that the **Berkeley Gateway to Innovation** (BEGIN, [begin.berkeley.edu](http://begin.berkeley.edu)), funded in part by the State of California Assembly Bill 2664 for entrepreneurship and innovation expansion, is a major step in this direction, and we recommend that resources be allocated to maintain and expand this site. Another level of coordination could be an office that encourages communication among the various entities on campus to ensure complementarity, minimize overlap, and thereby optimally serve the needs of our community. We have proposed in Chapter 1 that new leadership in campus entrepreneurship (at the AVC or VC level) could take on this mission. A final opportunity for coordination could be, for example, a speaker series, analogous to the Stanford Entrepreneurial Thought Leadership series that brings in leaders from Bay Area businesses, here with a focus on Berkeley alumni, and thereby provide a common venue for campus entrepreneurs to learn, network, and build community. SCET has taken important steps in this direction through course offerings discussed above.

A second opportunity for enhancing our ecosystem is increased networking opportunities for our entrepreneurs, a point raised earlier in this chapter. Entrepreneurs at various stages of technology development need access to mentors for advice on technology valuation, market analysis, negotiation, and overall business strategy; access to a pool of consultants who can serve more formal roles in representing the company in negotiations; and networking with other entrepreneurs with experience that complements that of our campus founders, including potential CEOs/CBOs/CFOs/COOs. In addition to gaining access to individuals who can advise or even join a company, new companies need access to capital. Campus funds (e.g., Berkeley Catalyst, SkyDeck) can provide seed funding in a way that can financially benefit our campus, but as companies grow, *it is important who they take money from*. A series A round from blue-chip VCs, versus reputable but less well known firms, can better situate a company for future funding. Mission Bay Capital can offer access to premier venture capital firms, but our entrepreneurs could benefit from additional connections to VCs, which also have far deeper pockets than campus seed funds. Furthermore, in some cases partnerships with larger companies can be the optimal route to technology development and growth, and contacts with industry are important in order to get in the door. One concept under discussion is that of Innovation Hubs, organizations on campus that build connections and networks of entrepreneurs, advisors, funders, and offer other resources, such as space. This committee strongly encourages further exploring and developing this concept, as it addresses critical, unmet needs in our community.

A third opportunity is to further develop biotechnology entrepreneurship on campus. There are many examples of successful biotech startups, some of which are mentioned in the Introduction, but in general the ecosystem and support structures are more developed for technology and information technology. The growth of support structures for tech and IT should be further encouraged, but biotech also offers substantial upside for growth, especially considering that 60-70% of income generated by OTLs is in the life sciences. It is often noted that our campus does not have a medical school; however, the benefits of a medical school for biotechnology innovation can be overstated. While not as numerous as at a typical medical school, many faculty in Bioengineering, Molecular and Cell Biology, Integrative Biology, Electrical Engineering and Computer Sciences, and other programs are generating highly creative

technologies with potential to address major societal needs. In addition, our campus lies in close proximity to three medical schools, multiple hospitals, and the geographical birthplace of the biotech industry, such that faculty are not limited from accessing medical expertise if needed.

In summary, while the campus infrastructure for supporting entrepreneurship is relatively young, it is highly active and vibrant. Efforts to foster coordination and communication among these many organizations and programs have the potential to lead to a highly innovative ecosystem that will benefit our campus educationally, economically, and reputationally.

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## **CHAPTER 5: WHAT WE CAN DO NOW TO IMPROVE STUDENT ENTREPRENEURSHIP AT BERKELEY**

Author:  
Ren Ng

Additional contributions:

Tiff Dressen  
David Schaffer  
Toby Stuart  
Paul Waddell

## Chapter 5: What We Can Do Now to Improve Student Entrepreneurship at Berkeley

### Introduction

Student entrepreneurs at Berkeley are generally happy with the resources, support, and culture of the campus entrepreneurial ecosystem, though they request further coordination and communication. That said, these entrepreneurial students appear to be a small minority, and the big opportunity to elevate the level of student entrepreneurship at Cal is to engage with the remaining majority of the student population. For the context of this report, and hopefully beyond it, we would like to offer a broader definition of entrepreneur—those who embark upon the startup founder path *as well as* those who embrace a set of entrepreneurial behaviors that steer them toward having greater positive impact in both their personal and professional lives. For example, the latter could take the form of creating or joining a for-profit or non-profit social enterprise or choosing to work for a small startup company versus a large, well established corporation as an employee, consultant, or intern. Even given this broad definition, many Cal students (especially those outside engineering and business disciplines) seem to have an arms-length attitude to entrepreneurship – “It isn’t for me” – and do not venture into Berkeley’s entrepreneurial ecosystem. Causes of this reluctance include: full or overly-full academic workloads; family background; insufficient exposure to ideas that demystify entrepreneurship; lack of entrepreneurial “evangelists,” role models, and mentors; and “common case” tracks that lead to employment at established companies. This report calls on university leadership to consider new strategic goals: to encourage every Cal student who has the desire and drive to be an entrepreneur to believe, “I *can* be an entrepreneur,” to encourage every student (regardless of desire to pursue entrepreneurship) to be open to adopting an entrepreneurial, problem-solving mindset, and to bring entrepreneur alumni back to campus *en masse* to help revitalize the campus culture in this area. This report includes recommendations for actions we can take now; further strategic planning is necessary.

### Background and Process

This chapter is grounded in the perspective that increasing entrepreneurship is a desirable goal and beneficial for the individual, for innovation, for research, for society, and for the university [Teece, 1]. The focus here is on ways to increase and improve student entrepreneurship. The content in this chapter reflects interviews with students, alumni, faculty, and staff. The interviews included a series of hour-long discussions with recent student alumni who are founders and CEOs of companies, individual and group discussions with around 200 undergraduate students regarding career and entrepreneurial inclinations (or lack thereof), interviews with staff in organizations such as IPIRA and Startup @ Berkeley Law, discussions with faculty who are former and current entrepreneurs, and conversations with venture capitalists.

### Current Strengths and Weaknesses

#### Strengths

- The entrepreneurial ecosystem on campus is young but strong and healthy. A vibrant, diverse, and extensive set of resources is available on and near campus to entrepreneurs who are students or recent alumni (see Chapter 4). Students describe positive experiences of learning, inspiration, mentorship, as well as support for various stages of starting their own ventures. Commonly referenced resources include the list below. Please note this is not an exhaustive list; for fuller descriptions of these and similar campus resources, please refer to Chapter 4.

- Sutardja Center for Entrepreneurship & Technology (SCET) in the College of Engineering. SCET is UC Berkeley's center for the study and practice of tech-centric entrepreneurship and innovation. SCET offers courses and programs that include the A. Richard Newton Lecture Series, a weekly series that features innovators, entrepreneurs and executives; finance for entrepreneurs; the Berkeley Method of Entrepreneurship, taught in a 5-day intensive boot camp; and Challenge Lab, a course where students build startup teams to develop solutions to solve big problems and bring them to market (<http://scet.berkeley.edu>).
- LAUNCH, based in the Haas School of Business, is a startup accelerator and competition designed to transform early-stage startups into fundable companies (<http://launch.berkeley.edu/>).
- Lean Launchpad, a course offered by Berkeley-Haas Entrepreneurship, teaches students an [entrepreneurship methodology](http://entrepreneurship.berkeley.edu/courses/) for testing and developing business models based on querying and learning from customers (<http://entrepreneurship.berkeley.edu/courses/>).
- SkyDeck, one of UC Berkeley's startup accelerators (<http://skydeck.berkeley.edu/>).
- The Lester Center for Entrepreneurship, now known as Berkeley Haas Entrepreneurship, offers students a wide variety of resources including mentoring hours, courses such as Lean Launchpad mentioned above, startup seed funding, and competitions such as LAUNCH and the Venture Capital Investment Competition (<http://entrepreneurship.berkeley.edu>).
- The Founder's Fund is a San Francisco-based VC firm investing in companies building disruptive technologies across a wide variety of sectors, including aerospace, artificial intelligence, advanced computing, energy, health, and the consumer Internet (<https://foundersfund.com/>).
- The House, a startup institute adjacent to campus founded by UC Berkeley alumni, created to support UC Berkeley founders (<http://thehouse.build/>).
- Big Ideas, an early-stage university-based innovation competition for students that fosters creative solutions to pressing social challenges, often serves as a gateway for students into the UC Berkeley entrepreneurship ecosystem. Each year Big Ideas supports approximately 800 students over 300 projects. Since it began in 2006, Big Ideas has grown into one of the largest and most diverse university-based social innovation competitions in the country with over 5,000 students participating, from 85 different majors, collaborating on over 2,000 proposals (<http://bigideas.berkeley.edu/>).
- Bay Area NSF I-Corps (which resides at Berkeley) provides early-stage startup teams who have a fundamental technology, engineering, or business model innovation learn how search for a scalable business model through a rigorous Customer Discovery process. For example, in the six week program each team is encouraged to conduct 100 one-on-one interviews with potential customers for their technology/product/idea. At the end of the course, teams are expected to reach a go/no go decision on their current product development pathway. I-Corps is open to faculty, students, staff and post docs. (<https://bayicorps.com/bay-area-nsf-i-corps/about/>) and testimonial (<http://ecomusing.com/nsf-i-corps-closing-note>).
- Cleantech to Market (C2M), a cross-disciplinary program run out of the Energy Institute at the Haas School of Business, trains graduate students in entrepreneurship, provides 1,000 hours of free market research to early stage clean tech startups, and engages the business community in both those activities. Founded in 2008 by the student led BERCC (Berkeley Energy and Resources Collaborative) along with Berkeley Lab, C2M provides graduate students the opportunity to experience and explore entrepreneurship before

embarking on the riskier path of bringing their own inventions to market. Students apply a rigorous commercialization model to cutting-edge clean tech and spend 1,000 hours researching technology characteristics & value propositions, market selection and market sizing, value chain components and competitors, minimum viable products, techno-economic modeling, revenue projections, sources of capital and next steps.

[\(http://ei.haas.berkeley.edu/education/c2m/\)](http://ei.haas.berkeley.edu/education/c2m/).

### Weaknesses

- Student entrepreneurs uniformly found the ecosystem to be disorganized and time-consuming to map and filter for relevance. Students described being “intimidated” by all the choices, “stumbling” into relevant programs, and being “unaware” of program deadlines until it is too late.
- A more important finding is that most students do not consider themselves inclined to entrepreneurship or an entrepreneurial mindset, and exhibit low curiosity about it. Rather, the most common college pathways appear to lead to employment at established companies, described as “stable” and “safe.” Discussions with these students often show that they have to be cajoled into examining the pros and cons of joining a small company (though they value the discussions afterwards). Many of these students cite the stress of class overload leaving little energy to pursue “non-traditional” college paths such as entrepreneurship. Furthermore, after “surviving” Cal, students often feel “drained” with little appetite for “risky” small companies. Further study of these cultural and systemic factors would be helpful.
- Despite providing strong opportunities, the university is in danger of alienating alumni entrepreneurs through bureaucratic diffidence. A quintessential example is the recent experience of Gradescope, a Berkeley student startup with a SAAS (software-as-a-service) offering to streamline grading. It was “bittersweet” for them that after years of offering free licensing, Berkeley was the second contract they signed (the first was with Stanford). Furthermore, upon signing the contract, the university forced the startup to remove the Berkeley logo that they proudly displayed as a sign of the company’s origins. This kind of incident undermines alumni goodwill that is an ingredient for lifelong campus engagement.

### **Mechanism Analysis: Awakening Entrepreneurial Behavior in Students**

When and how does a person start becoming an entrepreneur? This is a crucial question to answer in attempting to awaken entrepreneurial thinking and behavior in a larger fraction of the student population. Some entrepreneurs are born into families with businesses. For example, in the case of AxleHire, a Berkeley student startup focused on last-mile delivery logistics (the last leg of delivery service to final destination), the founder had parents who owned their own delivery business. However, for many new entrepreneurs, the process begins with a chance exposure to entrepreneurship. In the case of eCalCharge, the founders participated in an Oakland hackathon on a whim, because "of course we had to try a hackathon -- we're in Silicon Valley!" (they won). The author's own tipping point into entrepreneurship was largely due to chance: meeting a serial entrepreneur in the office next door during grad school, who cajoled, seed-funded, and closely mentored the author – for a full year – until the author agreed to start a company to commercialize his Ph.D. research. Even the most successful entrepreneurs often have humble beginnings. Steve Job's adoptive parents had a business: "Paul Jobs was a high school dropout who, when fixing up cars, knew how to turn a tidy profit by striking the right deal on parts." [5] Jobs leveraged that childhood knowledge in his first venture with Berkeley alum Steve Wozniak. They chanced upon the tech for Blue Box devices that enabled (illegal) long distance calls for free, and prototyped and productized the technology. Jobs decided the pricing – \$150 at 60%

margin – and they sold 100 units. Many current Berkeley students are engaged in similar entrepreneurial attempts to bootstrap their companies.

So what happens to the majority of Berkeley students who do not begin acting entrepreneurially during school? Should they, and could they have made the transition into entrepreneurship? This report takes the position that yes, many of these students could learn more and have higher impact by investing their careers in small ventures; and yes, many could succeed if they consider this career option seriously.

Many constituents from students to faculty to VCs agree: the key ingredient to begin thinking and acting entrepreneurially is an environment that fosters the belief, "Yes, we can do it!" In trying to improve the Berkeley environment, three main factors can help. The most highly cited request by students is to dramatically increase the quantity and quality of interaction between students and successful entrepreneurs who can evangelize, role-model, and mentor students to become entrepreneurial. A second main factor is improving the campus culture toward commercialization, which has at least historically been biased negatively. As Chwierut aptly describes, "Some students with ambitions to be entrepreneurs feel out of place, almost mavericks in their departments. This is the student's lived reality of the broader UC Berkeley culture against commercialization." [6] The third main factor is the majority student culture where peer pressure focuses on grades and getting internships in "good companies like Google, Facebook, Apple, Goldman Sachs." In many peer groups, "nobody is looking at 200- or 50-person companies let alone raw startups." The university can potentially transform student entrepreneurship for the better by attacking these three aspects of the campus environment.

## **Opportunities: Recommendations for what we can do now to improve student entrepreneurship**

### **A. Clarifying Metrics and Brand for Berkeley Student Entrepreneurship**

- As K. Keutzer argues [2], we need clear and easily accessible metrics for improving entrepreneurship that include statistics such as 1) the number of Berkeley graduates who become entrepreneurs, 2) the number of Berkeley alumni entrepreneurs who speak, mentor, or donate resources, and 3) the total market cap of new Berkeley venture.
- We need to define Berkeley's brand of entrepreneurship. To quote Keutzer, we need a brand that captures our public-facing mission as well as one we can feel good about, such as, for example, "Berkeley Entrepreneurship: Doing Well by Doing Good." Furthermore, in moving to engage the full student population in the broadest definition of entrepreneurship, a possible signature phrase could be "Yes, I Can Be an Entrepreneur" and could be effective in helping to make the transition.

### **B. Improving Effectiveness of Existing Entrepreneurial Ecosystem Resources**

- We need to create, maintain, and promote a centralized website and forum (for example, building from [begin.berkeley.edu](http://begin.berkeley.edu)) that curates ecosystem resources. This will serve to lower the barrier for fledgling entrepreneurs. (For further details on this recommendation, refer to the appendix at the end of this chapter, "Helping our students navigate a rich, but often complex and confusing landscape.")
- We need greater coordination among campus ecosystem participants to ensure full coverage, reduce duplication of effort, avoid calendar conflicts, etc. [2].
- We should "package up" complete resources on how to start a company (furthering efforts such as the free incorporation provided by Startup @ Berkeley Law, and SkyDeck's office hours).

- We need to focus on creating legal resources for Berkeley’s foreign student entrepreneurs. Students in this category suffer high stress and uncertainty, major barriers to taking the plunge into entrepreneurship.

#### C. Drawing Alumni Entrepreneurs Back to Build a Sustaining Cycle of New Entrepreneurs

- We should consider creating a top-line alumni speaker series, “How I Became an Entrepreneur,” featuring a diverse slate of business icons and recent first-time successes. This could go a long way in demystifying entrepreneurship to our students and providing them with role models.
- We should encourage empowering university liaisons to embrace and support all student ventures, and thereby build good will with this critical alumni pool. The Gradescope story is an example of a recent miss.
- We need to nurture and spotlight top student entrepreneurs (who sometimes hold refreshing and idealistic viewpoints and support worthwhile causes) as authentic catalysts in new programs targeting alumni engagement, mentorship, and philanthropy.

#### D. Drawing All Students into Personal Entrepreneurial Thinking

- We encourage campus to promote an *inclusive view* of entrepreneurship: from founders, to early employees in new ventures, to those who take personal career “risks” to work on worthy causes that could include starting nonprofits and social impact organizations.
- Campus should work toward infecting the student body with the idea, "Yes, I can be an entrepreneur," to counterbalance the more common practice of winning a job at a top, established company.
- We need to support startup recruiting by elevating startup job fairs in the spring, and promoting them in the fall when established companies typically sign up top students. [Kumar, 3]
- We recommend a dedicated campus space in a student center for entrepreneurship, open to all. This would complement resources such as SkyDeck, The House, etc. This could take the role of an Innovation Hub.
- We should build on-ramps for fledgling student entrepreneurs to begin behaving entrepreneurially. One possibility could be a “Semester of Entrepreneurship” for every student, similar in concept to a semester abroad.

#### E. Creating a New Development Program focused on student entrepreneurship: “Raise \$1 Billion for Berkeley Student Entrepreneurship”

- We should consider engaging alumni in a new Cal movement: “*Raise \$1 Billion for Berkeley Student Entrepreneurship.*” A comparative effort is the “Stanford Challenge” that initially aimed to raise \$1B for undergraduate education and went on to raise \$6.2B from 2006-2012. [4] Such an effort at Berkeley would involve a broad recruitment and mobilization of alumni leadership (and entrepreneurs) to engage the full breadth of the alumni population to join university efforts to define, support and grow a fresh vision for the future. We believe this would require a fundamental re-examination of the relationship between the university and alumni. In short, this would be a major, extended undertaking, and require strategic planning and leadership at the highest levels of the university. Funds raised could broadly revitalize the undergraduate and graduate programs. VC and accelerator funds could comprise a portion of this fund, while new lines of courses, hiring, speakers series, entrepreneurship programs, small-format classes, engagement with the broader ecosystem would comprise the bulk of funding. One way to approach this audacious goal is to include entrepreneurship programs as a giving opportunity

across schools and departments in the campus' current strategic planning effort, perhaps most suitably positioned under the "Creating a transformative student experience" theme.

- Another idea is to engage and empower alumni to design and build comprehensive fundraising systems based on student-alumni engagement, mentorship and financial support.

In summary, our campus has graduated a large number of highly successful entrepreneurs (see Chapter 1). However, the campus still holds major potential to offer students additional opportunities, including educational programs and access to entrepreneurial resources (see Chapter 4). Doing so would entail promoting coordination and communication among campus organizations and programs to offer clear paths for new ventures to proceed, fostering networking with successful entrepreneurs, and offering positive examples and role models to our students to enhance their willingness and confidence to take the risk of becoming an entrepreneur.

## References

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## Additional note:

The primary author of this chapter joined the EECS faculty a little over two years ago and was an entrepreneur for 9 years before that, founding a company and serving as CEO for 6 years.

## Appendix: Helping our students navigate a rich, but often complex and confusing landscape.

### 1. A Centralized Source of Information.

To address the ever-present need for a central source of information for entrepreneurship, [begin.berkeley.edu](http://begin.berkeley.edu) was created and launched in late August 2017. The BEGIN website was developed to be the single port of entry for students, faculty, and staff interested in learning more about resources available to aspiring and committed entrepreneurs on the Berkeley campus. The landing page provides a simplified roadmap for these resources, divided into four major categories: Berkeley Campus Life, New Venture Education, Acceleration, and Funding. The BEGIN home page also includes a directory that features resources for Commercialization, Competitions, Labs & Prototyping, Alumni Networks, and Student Groups. Additionally, BEGIN has a concierge service for those unable to find what they are looking for easily on the site, and a regularly updated calendar of events. The BEGIN site was funded, in part, by the State of California Assembly Bill 2664 for entrepreneurship and innovation expansion at the University of California. BEGIN was developed (and will be maintained) by SCET in the College of Engineering. The site's success will depend largely on attracting a critical mass of users; therefore, publicity of the site will be key, as will be feedback from users to improve the site as it is refined over

time. Since its launch last month, the site has seen 1,000 unique visitors and a total of 1,400 visits. A noticeable spike in visits occurred after student orientation sessions described below.

## **2. New Student Orientation Sessions for Entrepreneurship.**

For the first time on campus, in Fall 2017 introductions to entrepreneurship at Cal became a part of the Golden Bear student orientation week for incoming Letters & Science freshmen and transfer students. The two (optional) sessions drew approximately 275 students across campus where they had opportunity to learn about course offerings, seminars, boot camps, internships, and competitions they could access early in their careers at Berkeley. Leadership from IPIRA, SCET, Haas Entrepreneurship, BEAR FOUNDERS, The Foundry, and SkyDeck were on hand to describe their respective programs, answer questions, and provide students with tangible possibilities for how they can become involved in entrepreneurial activities during their first year on campus. The sessions also featured special guest, Jeremy Bellet (Class of 2014), co-founder of the Berkeley medical device startup Eko Devices, who told the inspiring story of his company's journey from idea to startup in the Berkeley ecosystem. While these inaugural sessions were a good start, there is room for improvement for future sessions. For example, of the students who attended, approximately 72% indicated their intended majors to be computing sciences, business/economics, or some combination thereof. While such a strong representation of the populations traditionally engaged in entrepreneurship on campus is unsurprising, more work must be done to reach out to undergraduate populations typically underrepresented in entrepreneurship such as biological sciences, mathematics, physics, statistics, the arts & humanities, and the broader social sciences etc. Also, there was a striking absence of students representing the life sciences. Ideally, such intro-to-entrepreneurship sessions should be fully integrated and campus-wide. While L&S represents approximately 75-80% of incoming freshman, coordinating future sessions to include students entering the Colleges of Engineering, Chemistry, Natural Resources, Environmental Design, and the Schools of Public Health and Social Welfare would help to reach student populations typically underrepresented in our entrepreneurial ecosystem.

## Conclusion

As one tool to translate the results of basic research to achieve broader societal benefit, entrepreneurship is increasingly central to the mission of universities. That is, universities that foster entrepreneurship have the potential to broaden their impact in many ways: achieving financial returns that enable other university missions, creating philanthropically minded alumni and faculty, offering society applications of basic research that can influence public perception of universities, and providing educations that prepare students for the workforce in new ways.

This committee interviewed approximately 150 stakeholders in entrepreneurship, including university administrators and leaders, faculty and staff, office of technology licensing personnel, students and alumni, and entrepreneurs. Based on the extensive associated analysis, we have arrived at several major recommendations, which are discussed in greater detail along with numerous recommendations in the preceding chapters.

The major recommendation of Chapter 1, which examined university OTLs, is to recruit an Associate Vice Chancellor or Vice Chancellor for Entrepreneurship to elevate the role of entrepreneurship on campus, further streamline OTL operations, and coordinate and amplify educational, accelerator, and funding mechanisms across Berkeley. Chapter 2 examined the campus climate for entrepreneurship, and the committee recommends that campus committees and departmental chairs consider entrepreneurship as one among many professional activities in tenure and promotion cases along with other professional activities such as service to professional societies and textbook writing. In addition to demonstrating the impact of a body of research, it is an activity that can feed back and enhance the intellectual innovation of university research.

Chapter 3 examined one slice of the campus office that supports industry alliances, specifically the ways in which this office's activities interface with entrepreneurship. More broadly, we recommend that the university compare the resourcing of this office compared to peer institutions to ensure it can continue to function competitively. Chapter 4 examined other institutions on campus that foster and support entrepreneurship, from education programs to accelerators to new campus-associated venture funds. The committee was highly encouraged by the breadth of programs that have arisen, especially in recent years, and we recommend that the campus and perhaps a new AVC for Entrepreneurship develop and maintain a roadmap of these institutions to guide entrepreneurs – in a given area of research, with any given level of prior experience and network in the field, and at any stage of development in their new venture – toward the resources that can best aid them in this rich and increasingly complex landscape. Finally, in Chapter 5 we recommend the campus provide additional opportunities and forums for student entrepreneurs to network – including with faculty, fellow students, and alumni – perhaps with the aid of an embedded entrepreneur in residence to coordinate such activities.

Berkeley has always been a leader in basic research, and it is at a turning point where even modest investments in entrepreneurial activity can have a significant and lasting impact for students, faculty, and society at large. Our committee recommends that the university take steps to advance this opportunity.