

University of California

Report of the Working Group on Technology Transfer

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Executive Summary

At the January 2012 meeting of the Board of Regents, Chair Lansing established, at the President's recommendation, the Working Group on Technology Transfer (Working Group) with a charge to examine the University's technology transfer function to ensure it commercializes a greater number of inventions and technologies while receiving a fair share of revenues or equity. The Working Group was chaired by Regent Makarechian and included Regents Varner, De La Peña, Mendelson and Regent Emeritus Hallett.

After interviewing a wide range of stakeholders - including University researchers, technology transfer directors from UC and both public and private peer institutions, and selected UC chancellors¹— the Working Group identified best practices and associated strategies to enhance patents and licensing to maximize revenue potential from technology transfer activities. Based on those best practices, the Working Group presents the following four recommendations for consideration by the Board of Regents:

- ***Invest in Technology Transfer*** - *To maximize revenue potential, UC must invest resources. Increased funding for all elements of technology commercialization including operations, patents, translational research and early-stage investment in UC start-ups will enhance the revenue potential of inventions developed by UC's research enterprise.*
- ***Orient Campus Operations for Client Service*** - *Campuses should review and ensure that their technology commercialization operations function as high performing service-oriented departments which support a culture of entrepreneurship and innovation within the research enterprise.*
- ***Establish Local Advisory Boards*** - *Campuses should consider establishing local advisory boards of experienced faculty, alumni and business leaders who can help educate and mentor faculty and student entrepreneurs, and when appropriate advise local technology transfer offices on commercial potential of new disclosures.*
- ***Establish a Regents Ad Hoc Committee on Technology Transfer*** - *The Regents should establish an Ad Hoc Committee on Technology Transfer to monitor systemwide efforts to enhance technology commercialization.*

In summary, the Working Group recognizes that achieving more effective technology commercialization requires UC to invest in technology transfer in conjunction with creating an institutional culture that supports the entrepreneurial aspirations of faculty and students. Doing so will allow UC to further its public service mission, create a stimulating environment for our faculty and students, and unleash the full revenue potential of inventions created by UC's preeminent research programs.

¹ See Appendix 1 for a full list of experts interviewed by the Working Group.

Background

Increasing revenue from technology transfer operations is a notoriously unpredictable and lengthy process. Nationwide in 2011, the top ten revenue-generating universities accounted for 60% of the total royalty income of all U.S. universities. Revenue from licensing is dominated by a small fraction of disclosures. Similar to other academic technology transfer operations, at UC less than 0.2 percent of disclosures accounts for 80 percent of revenues. Furthermore, revenue generation lags disclosure by approximately ten years. For every 1000 invention disclosures at UC, approximately 400 are patented. Of these 400, roughly 170 are licensed. Of those licensed, only 40 result in products that generate royalty income. Of these, only one will generate more than \$1 million dollars in total revenue during the entire life of the patent.

UC as a system is consistently among the top five royalty income-generating universities in the nation. From fiscal year (FY) 2010 to FY 2011, the University of California's portfolio of active inventions increased by 4.6% to 10,341, the number of U.S. patents increased by 2.6% to 3,900, the number of active license agreements increased by 6.1% to 2,104 and the number of inventions newly covered by a utility license, option, or letter of intent (including new inventions added to existing agreements) increased by 8.4% to 757. Total income available (net of legal settlements) from technology transfer for distribution to inventors and the University reached a record level of \$164.6 million, an increase of \$71.8 million over FY 2010. In addition, 58 start-up companies were founded on UC technologies, including 44 companies based in California.²

However, given the size of the total research expenditure at the University of California, the Working Group concluded there is significant potential for increased revenue. Comparison to our peer institutions makes the point forcefully. The University of California's total license income per \$10 million dollars of annual average research expenditure was 2.45%. By contrast, Stanford's was 9.01%, MIT's 5.30% and Michigan's 4.28%. Similarly, UC filed 0.70 patents in FY 2012 per \$10 million of total research expenditure, compared to 1.04 for Columbia, 1.32 for MIT and 2.48 for Stanford. UC had 3.67 disclosures per \$10 million total research expenditures during FY 2010. Stanford had 6.55, Columbia 5.56 and MIT 4.36.³

But technology transfer revenue is neither a panacea for the current fiscal crisis nor a substitute for adequate funding from the State of California. Increased revenue that may result from the following recommendations will not be available to address the \$1.5 billion dollar or more shortfall the University will face in the next five years. The event horizon in technology transfer is long, tortuous and uncertain. Analysis of UC data shows that for licenses earning more than \$1 million in royalty income, it takes at least nine years to achieve the first \$1 million dollars in aggregate income. In fact, rather than producing immediate revenue to address UC's chronic underfunding by the State of California, these recommendations are dependent on the

² A full accounting of UC's current technology transfer achievements is available in the 2011 Technology Transfer Annual Report available at: <http://www.ucop.edu/ott/genresources/documents/IASRptFY11.pdf>

³ See Appendix 2 for additional information regarding UC's performance against its peer institutions.

investment of revenue whose source is not yet identified. They are not short-term solutions; rather they are long-term opportunities designed to foster a culture of entrepreneurship at the University of California that will generate increased technology commercialization activity.

While the recommendations are designed to maximize the revenue potential of UC inventions, the Working Group believes that they will also enhance the education, research and public service missions of the University. Recruiting and retaining top faculty in science and engineering is increasingly dependent on being able to demonstrate a highly effective technology commercialization program. Relationships with industry help faculty pursue research activities, enhance educational opportunities for both graduate and undergraduate students, and create a channel for moving University of California technology into the marketplace.

California is dotted with companies born out of UC technology. UC has spun off over fifty companies in each of the last three years. The University has long served as an economic engine for the State of California. The biotechnology industry, one of the leading employers in California, owes its genesis to research carried on at UC. UC has a rich history in industry collaboration - chief among them the Governor Gray Davis Institutes for Science and Innovation, whose purpose is to foster interdisciplinary and collaborative research with industry to enhance technology transfer and commercialization. However, the impact of UC's technology commercialization activities is global in nature. In health care, advances such as vaccines against Hepatitis B, the Nicotine Patch to help people quit smoking, and treatments for brain aneurisms improve the quality of life. In agriculture, new plant varieties and practices improve rural economies; for example, UC's strawberries have contributed to strong regional agriculture economies not only in California but in Southern Europe, South Africa, South America and most recently in China.

Notwithstanding the enormous potential of universities as innovation engines that drive economic development and enterprise creation, optimizing that potential requires a focus on culture as well as execution. The Working Group concluded that more direct engagement of the Board of Regents will highlight technology transfer as a University priority, affirm the Board's commitment to driving economic growth through technology transfer, and strengthen UC technology commercialization activities.

Best Practices Findings

Over the course of the spring and summer of 2012, the Working Group spoke with UC researchers, technology transfer directors from UC and both public and private peer institutions, and selected UC chancellors to identify successful strategies to increase revenue. The interviewees echoed two themes repeatedly. First, to increase revenue, the University must increase the volume of high-quality disclosures and thus the opportunities for licensing. To use the sports metaphor several interviewees employed, you must increase the number of shots on goal. The bulk of revenue is earned on a very small number of blockbuster inventions and, unfortunately, it is extremely difficult to predict which inventions have blockbuster potential at the time of disclosure. Thus, to increase revenue you must increase the volume of high-quality disclosures.

Second, the Working Group repeatedly heard that the University must create a culture of entrepreneurship and innovation. In the words of one of the researchers interviewed, “You must nurture innovative research, you can’t just bet on the outcome.” Academic researchers must be engaged in a dialogue with the commercial world.

Based on these discussions, the Working Group identified three “best practices” where opportunities exist to enhance UC’s technology commercialization program.

1. Strengthen faculty engagement, education, outreach and client service

Establishing and maintaining strong relationships with faculty who are educated about technology commercialization has been reported by leading programs as a key to long-term success. Such engagement builds a culture of entrepreneurship on a campus and reinforces the message that technology commercialization is an important way in which the University meets its public service mission. Enhancing and sustaining a culture of entrepreneurship and technology commercialization requires ongoing commitment from University leadership combined with appropriate incentives that align the interests of all stakeholders. Entrepreneurial cultures at institutions such as Stanford and MIT have evolved over many generations of faculty and are often described as an “organic” element of the campus culture.

2. Invest in the scope and quality of the patent portfolio

Successful technology transfer programs rely on creating and maintaining a portfolio of licensable patents for a long enough time for the market to evaluate their commercial relevance. Because of the market lag, it may take at least 10 years for a patent’s true value to be recognized. Because patents are granted for 20 years from application, technology with a value that is recognized long after the initial disclosure and the issue of the patent can result in licenses that return significant value to the University. Creating a strong patent portfolio requires significant and ongoing financial investment. The changes to patent law encompassed by the America Invents Act of 2011 will likely increase the cost of protecting and maintaining UC’s patent portfolio because of the need to file more complete patent applications sooner to preserve their value. Increasing globalization of business also requires that for important discoveries, UC file more at-risk filings internationally, which dramatically increases patent costs.

3. Invest in university-created business to develop and support technology-based economic development

The current funding and investment climate creates challenges in translating early-stage inventions generated by university researchers into commercially valuable products and services. Investments beyond the scope of federal and other traditional research funding agencies are needed to mature technologies and create sustainable business to exploit them to create public benefit and economic value. Private funding for pre-seed and seed-stage investments, even in California, is insufficient to support the translation of many new ideas into businesses that generate economic prosperity for California and the nation. Creating funding for translational and early-stage development programs is of increasing importance to the way universities support economic development in their local and regional economies.

Appendix 3 provides specific implementation strategies to achieve these best practices.

Recommendations of the Working Group

Based on the identified best practices, the Working Group concluded that achieving more effective technology commercialization that will unleash the full revenue potential of inventions created by UC's preeminent research programs requires an investment in technology transfer in conjunction with the establishment of an institutional culture that supports the entrepreneurial aspirations of faculty and students. It will also require commitment and accountability at the campus, Presidential and Board levels. To achieve this goal, the Working Group makes the following four recommendations:

Recommendation 1:

Increase funding for all elements of technology commercialization including operations, patents, translational research and seed- and early-stage investment in UC start-ups to enhance the revenue potential of inventions developed by UC's research enterprise.

UC must be willing to invest in the process of commercializing its research and have the patience to build a market for its commercial products in collaboration with the private sector.

UC should consider funding patent costs centrally with funds allocated to campuses based on the volume of their research expenditures.⁴ Central funding should include a reserve for special needs such as foreign filing, enforcement and other extraordinary patenting needs. The President should establish criteria for access to the funds, guide the appropriate use of patent funds, and develop metrics to monitor campus technology transfer operations' performance. Local campus autonomy must not be impaired by the central funding model. Campuses must be encouraged to design technology transfer operations to suit local conditions and opportunities.

In FY 2011, UC spent \$26.5 million in patent expenses and received approximately \$20 million in reimbursements from licensees. If UC were to invest in patents at 1% of current total research expenditures, a rate commensurate with other leading institutions, costs would be approximately \$50 million annually. Thus, funding UC's technology transfer operations on this model with a 50% reimbursement rate would require an additional \$20 million dollars annually.

Available funding for Proof of Concept should be expanded to fund more proposals or larger amounts per proposal. Increasing Proof of Concept funding increases the likelihood that technologies will attract the interest of businesses and investors. The President should determine the scope and definition of the program and the metrics for performance. The Working Group concluded that current funding levels are insufficient; substantially more investment will be necessary to adequately nurture promising proposals.

⁴ See Appendix 4 for information on current funding for campus technology transfer operations.

Funding for early stage UC start-up companies, either as debt or equity, should be provided to qualified companies that can demonstrate commercial potential. UC has no current program for seed-stage investment and the investor community is reluctant to invest in these early stage companies. UC creates approximately fifty start-ups annually that could benefit from seed-stage investment. To provide between \$100,000 and \$250,000 in early stage funding to 20% of these new ventures, an annual investment of approximately \$1 million to \$2.5 million will be necessary. The President should determine the scope and definition of the program and the metrics for performance.

UC should establish a mechanism to invest in UC start-up companies, either through the establishment of or participation in a venture capital fund or funds. An annual investment of \$2.5 million will permit two to three investments in the \$500,000 to \$1.5 million range.

UC should also develop opportunities for venture philanthropy at each campus.

The President should identify possible funding sources to fund campus patent costs centrally, expand the Proof of Concept fund, and to invest in UC start-up companies with revenue potential.

Recommendation 2:

Campuses should review and ensure that their technology commercialization operations function as high performing service-oriented departments which support a culture of entrepreneurship and innovation within the research enterprise.

The success of technology transfer at the University of California is the product of campus research disclosures and each campus must design a structure to deliver services to the faculty that encourages participation in the process.

Technology transfer operations at the campuses should be faculty-centric, service-oriented and user friendly with a focus on sound business practices. The success of technology transfer depends on creating and nurturing an entrepreneurial culture on campuses where technology transfer personnel actively engage with faculty. Campuses should invest in staff with relevant commercial product expertise and product development experience and give them the resources, incentives, and autonomy to be successful.

The Office of the President should maintain its role as a clearing house for opportunities to enhance campus-based technology commercialization, and coordinate, facilitate and report on sharing of best practices around the system.

Recommendation 3:

Campuses should consider establishing local advisory boards of experienced faculty, alumni and business leaders who can help educate and mentor faculty and student entrepreneurs, and when appropriate

advise local technology transfer offices on commercial potential of new disclosures.

Campuses must create a culture of entrepreneurship to meet the needs of the market by partnering with local investors and companies and designing technology transfer operations to suit local market conditions and opportunities.

The local advisory boards should consist of local business leaders, alumni, investors, experienced entrepreneurial faculty members and technology transfer experts to mentor and advise researchers, and to act as consultants to local technology transfer offices on the commercial potential of new inventions and opportunities for participating in potentially successful start-ups using both internal and external funding. The local advisory boards should also advise campus executive leadership on the effectiveness of the campus' investment in technology transfer in the context of systemwide policies.

Recommendation 4:

The Regents should establish an Ad Hoc Committee on Technology Transfer to monitor systemwide efforts to enhance technology commercialization.

Creating and maintaining a culture of entrepreneurship and innovation must be grounded in the engagement of the senior leadership of the institution, including Chancellors, the President, and the Board of Regents.

The Working Group recommends that an Ad Hoc Committee on Technology Transfer be established to advise the President and the Board on the effectiveness of the University's investment in technology transfer. The membership of Committee should consist of two Regents, two Chancellors and up to five outside members drawn from the investor, entrepreneur, faculty, and alumni communities.

The goal of the Ad Hoc Committee should be to maximize the long-term revenue potential of UC's intellectual property development and technology transfer and to:

- Identify significant barriers, including bureaucratic and cultural barriers, to bringing UC technology transfer to market;
- Assist in fundraising for venture philanthropy funds for participating campuses (with a focus on national and international opportunities);
- Meet periodically with campus representatives to discuss technology transfer operations strategies;
- Ensure the autonomy of campuses to develop and manage their own licensing programs with invention disclosures percolating from the intersection of market demand and faculty-driven research; and,
- Strive to create a culture of entrepreneurship at the University of California.

Conclusion

The charge of the Working Group was to make recommendations to maximize revenue from technology transfer. These recommendations should not be interpreted to suggest that the Board of Regents intends to micromanage technology transfer. Such an approach would be doomed to failure. Corporations, federal and State governments, foundations, and investors must all be contributors, collaborators and partners with University faculty and campuses. Building relationships is imperative; instituting a culture of innovation and entrepreneurship is the goal; revenue will follow, albeit it by many years.

In issuing this report, the Working Group recognizes that UC's technology commercialization programs support the education, research and public service missions of the university in multiple ways, including generating licensing revenue, and that in the current fiscal environment, maximizing revenue potential increases the contribution technology commercialization can make to the institution's financial health.

The Working Group is hopeful that these recommendations will enhance the entrepreneurial culture of the University, boost investment in technology transfer and prioritize technology transfer at the highest levels of the University, and, in time, will result in increased licensing revenue, thriving start-ups, and viable future economic growth in California.

Appendices

- 1. Interviews of the Regents Working Group**
- 2. Financial Performance of UC Compared to Peers**
- 3. Implementation Strategies for Best Practices**
- 4. Funding for Technology Transfer and the Distribution of Royalty Income**

Appendix 1

Interviews of the Regents Working Group

Overview of UC Licensing (February 10, 2012)

- Vice President Steven Beckwith
- Executive Director William Tucker, Innovation Alliances and Services (OP)

Discussion with UC Tech Transfer Offices (March 2, 2012)

- Assistant Vice Chancellor Erik Lium (UCSF)
- Vice Chancellor Carol Mimura (UCB)
- Assistant Vice Chancellor Jane Moores (UCSD)
- In addition, each UC campus submitted a two page statement identifying best practices and obstacles.

Discussion with UC Researchers (March 13, 2012)

- Sujit Dey - Professor of Electrical and Computer Engineering (UCSD)
- Roger Tsien - Professor of Pharmacology/Chemistry & Biochemistry (UCSD)
- Richard Mathies - Professor of Chemistry and Director of the Center for Analytical Biotechnology (UCB)

Discussion with Tech Transfer Directors of Private Universities (March 22, 2012)

- Katharine Ku – Stanford University, Director of the Office of Technology Licensing
- Lita Nelsen – MIT, Director of the Technology Licensing Office
- Orin Herskowitz – Columbia University, Vice President of Intellectual Property and Technology Transfer and Executive Director of Columbia Technology Ventures

Discussion with Tech Transfer Directors of Public Universities (June 25, 2012)

- Carl Gulbrandsen - Managing Director, Wisconsin Alumni Research Foundation
- Ken Nisbet - Executive Director, Office of Technology Transfer, University of Michigan
- Ray Atilano - the Director of Technology Commercialization, The Ohio State University
- David Day - Director, Office of Technology Licensing, University of Florida

Discussion with Chancellors Katehi (March 13, 2012) **and Chancellors Desmond-Hellmann and Drake** (July 13, 2012)

Discussion with CIO Berggren and CFO Taylor (July 19, 2012)

Appendix 2

Financial Performance of UC Compared to Peers

Metrics of UC technology transfer operations compared to other leading universities with whom the Regents Working Group met. Data as reported to Association of University Technology Managers 2010 Licensing Survey

Metric	UC	Columbia	Michigan	MIT	Stanford	Wisconsin-Madison
Total Research Expenditures (annual average, FY2006-FY2010)	\$4,262,094,309	\$631,763,138	\$930,348,893	\$1,304,923,600	\$726,518,253	\$992,579,000
Disclosures received during FY2010	1565	333	290	521	467	356
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	3.67	5.27	3.12	3.99	6.43	3.59
Total U.S. Patent Applications filed during FY2010	1183	351	307	569	476	216
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	2.78	5.56	3.30	4.36	6.55	2.18
Total U.S. Patents issued during FY2010	297	66	82	172	180	133
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	0.70	1.04	0.88	1.32	2.48	1.34
Startups formed during FY2010	75	12	10	17		5
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	0.18	0.19	0.11	0.13		0.05
Licenses & Options executed during FY2010	252	61	97	96	90	62
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	0.59	0.97	1.04	0.74	1.24	0.62
Licenses & Options active at close of FY2010	2096		396	919	1944	529
per \$10 million Total Research Expenditures (annual average, FY2006-FY2010)	4.92		4.26	7.04	26.76	5.33
Total License Income received in FY2010	\$104,434,511	\$147,237,631	\$39,822,113	\$69,200,000	\$65,466,286	\$54,300,000
per Total Research Expenditures (annual average, FY2006-FY2010)	2.45%	23.31%	4.28%	5.30%	9.01%	5.47%
External Legal Fees paid in FY2010	\$26,583,654.00	\$10,733,433	\$5,731,315.00	\$15,300,000.00	\$7,059,494.00	\$9,780,000.00
per Total Research Expenditures (annual average, FY2006-FY2010)	0.62%	1.70%	0.62%	1.17%	0.97%	0.99%
Reimbursements for Legal Fees received in FY2010	\$20,825,631	\$3,474,885	\$4,040,148	\$8,760,000	\$2,747,634	\$1,250,000
per External Legal Fees (FY2010)	78.34%	32.37%	70.49%	57.25%	38.92%	12.78%

Note: Columbia's research expenditures are averaged for FY2007-FY2010. University of California totals only cover items under the UC Patent Policy; other institutions may include copyrights and other patented technologies also in their totals.

Appendix 3

Implementation Strategies for Best Practices

The following key objectives and implementation strategies emerged from the Working Group's interviews with UC researchers, technology commercialization leaders and campus executives.

1. **Strengthen faculty engagement, education, outreach and client service:**

Establishing and maintaining strong relationships with faculty who are educated about technology commercialization has been reported by leading programs as a key to long-term success. Such engagement builds a culture of entrepreneurship on a campus and reinforces the message that technology commercialization is an important way in which the University meets its public service mission. Enhancing and sustaining a culture of entrepreneurship and technology commercialization requires ongoing commitment from university leadership combined with appropriate incentives that align the interests of all stakeholders. Entrepreneurial cultures at institutions such as Stanford and MIT have evolved over many generations of faculty and are often described as an "organic" element of the campus culture.

Near-term strategies include:

- ***Reviewing Technology Transfer Office (TTO) organizational structures and workflow to allow TTO professionals to create proactive interactions with researchers.***
TTO professionals need to have the time to work directly with researchers to build rapport and trust in advance of any specific invention disclosure. Skilled TTO professionals can partner with the researcher to ensure that disclosures are timely and complete. Early interactions with the faculty allow TTO professionals to begin to understand the commercial potential of the research. Office structures and processes that create an environment where the TTO is purely reactive to unsolicited disclosures leads to faculty disengagement and often distrust based on a lack of transparency.
- ***Developing business processes and business process management tools to ensure the delivery of high quality services in a timely manner.***
TTOs are service organizations and should be structured and managed accordingly. Successful TTOs have well-defined service standards and business processes that allow managers, staff and clients to track any invention in the commercialization pipeline and identify bottlenecks or barriers that limit success.
- ***Investing in in-house capabilities or third party services to help TTO professionals more effectively evaluate the patentability and commercial potential of new disclosures.***
Evaluating the potential of new disclosures requires considerable effort, and

without access to information resources, internal analyst level support or third-party analysis services, this work falls on the TTO professional, diverting them from the all-important relationship-management component of their work. Competent, detailed and trusted analysis also helps educate researchers about the strengths and weaknesses of their inventions and helps rationalize resource allocation towards the most promising technologies.

- ***Creating and/or supporting internal organizational structures that educate faculty on the skills and knowledge needed to be successful entrepreneurs, including advisory committees or mentorship programs.***

Entrepreneurship education is not exclusively within the purview of the TTO, and across campuses, different groups fulfill this role. While such activities often have grass-roots origins, they benefit from organizational support and institutional coordination to ensure that they are as effective as possible. Visible institutional support for entrepreneurship is essential in establishing and maintaining this culture on a campus.

- ***Regularly reviewing and when appropriate, revising university policies and procedures to remove barriers to commercialization while maintaining an unwavering commitment to the principles of an academic research university.***

Even though UC has recently reviewed its intellectual property policies and practices, it behooves effective institutions to regularly review policies and practices to ensure that they best serve the objectives of supporting technology commercialization.

Mid- and long-term strategies include:

- ***Establishing appropriate incentives for faculty to participate in entrepreneurial activities.***

Promotion and tenure policies are administered at the department or school level, but senior academic leadership should encourage local decision-making bodies to reward innovation and entrepreneurship provided it is not detrimental to the fundamental tenets of the academy. The challenge to incentivizing faculty participation is to determine the basis for the reward such that it does not distort academic values or the process and outcome of technology commercialization.

- ***Celebrating success across all participants in the entrepreneurial ecosystem.***

Beyond formal promotion and tenure, public recognition for individuals who contribute to growing and sustaining an entrepreneurial culture will signal to all that such behavior is lauded by the university. Creating a Presidential or Chancellor's award for entrepreneurship on a team or individual basis helps signal that such behaviors are desirable.

- ***Solidifying early-stage efforts to build mentorship networks to support the entrepreneurial aspirations of researchers.***

University and campus leadership must continue efforts to create support

systems for faculty and staff who aspire to commercialize their technological innovations. Establishing some overarching administrative structure to coordinate these activities and report to senior leadership on progress/success reinforces the importance of such activities.

- ***Establishing Regental recognition of the value of an entrepreneurial culture.***

Culture change requires that leadership espouse these values over sustained periods that transcend the tenure of individuals. Affirmative statements from the Regents on this subject will ensure that leadership continues to espouse these values.

2. Invest in the scope and quality of UC's patent portfolio:

Successful technology transfer programs rely on creating and maintaining a portfolio of licensable patents for a long enough time for the market to evaluate their commercial relevance. Because university discoveries often lead market application by many years, it may take at least 10 years for a patent's true value to be recognized. Because patents are granted for 20 years from application, technology whose value is recognized long after the initial disclosure and the issue of the patent can result in licenses that return significant value to the university. Creating a strong patent portfolio requires significant and ongoing financial investment. The changes to patent law encompassed by the America Invents Act of 2011 will very likely increase the cost of protecting and maintaining UC's patent portfolio because of the need to file more complete patent applications sooner to preserve their value. Increasing globalization of business also requires that for important discoveries, UC file more at-risk filings internationally, which will dramatically increase patent costs.

Strategies include:

- ***Providing funding to support patent filing in cutting-edge areas that are not necessarily seen as valuable by incumbent industry players.***

Because of the long time horizon before real value can be recognized, UC should file and maintain patents in emerging areas of technology. With limited budgets, the lack of an obvious licensee often precludes filing. Increased funding combined with academic and industry feedback on the potential commercial relevance of emerging technology areas will help ensure UC maintains a robust patent portfolio.

- ***For patentable technology with a potential for high commercial relevance, fund the filing of foreign counterparts to ensure the portfolio is as valuable as possible to potential licensees.***

U.S.-only protection used to be sufficient to incentivize investment in patented technology. However, the emergence of major markets outside of North America and the globalization of manufacturing, even in the pharmaceutical area, demands that UC obtain foreign patent protection for its important inventions in order to induce industry investment. Foreign patent protection is expensive, so

increased funding is essential so that the overall scope of the patent portfolio is not compromised to accommodate strategic foreign filing of important inventions.

- ***Maintaining patents by paying annuity fees well into the life of the patent.***

In the absence of a licensee, and in the era of limited funding, it can be tempting to abandon issued patents in the absence of a licensee, so as to preserve funds for new applications. Premature abandonment of seminal early stage patents because of the lack of explicit interest by industry can erode the overall value of the patent portfolio, so funding for periodic patent maintenance and annuity fees is a critical part of an intellectual property management strategy.

- ***Supporting the use of tools to assist in monitoring industry trends and technology applications to detect potential for licensing or enforcement actions against patent rights infringement.***

Software and business intelligence tools and related service providers can assist TTO professionals in evaluating industry trends and determining whether patents and related scientific publications are built upon UC's fundamental discoveries. Such approaches can identify potential licensees or, in extreme circumstances, identify patent infringers against whom UC should enforce its intellectual property rights.

- ***Monitoring and enforcing licensee compliance with the terms of existing agreements.***

All strong licensing programs should include a robust licensee compliance program. Statistics show that a very high proportion of licensees are actually out of compliance with their license agreements, either through inadvertent omission or active intent. UC has funded an external royalty audit program over the past several years which has netted more in unreported income than the cost of the program. Any program to invest in the scope of the patent portfolio also has to include funding to support licensee compliance initiatives.

- ***Provide some mechanism to fund patent enforcement.***

Unavoidably, UC will, as it has in the past, be forced to sue companies who choose to infringe our patents rather than enter into a license agreement. Funding for enforcement actions has, to date, been a charge to campus budgets. While UC has generally been successful in such actions, it does require the campus to invest valuable discretionary funds to the detriment of other programs. Creating a mechanism to fund patent enforcement that relieves campus management of the immediate financial impact would, with the appropriate oversight, enhance UC's ability to enforce its rights.

3. Invest in university-created business to develop and support technology-based economic development:

The current funding and investment climate creates challenges in translating early stage inventions generated by university researchers into commercially valuable products and services. Investments beyond the scope of federal and other traditional research funding

agencies is needed to mature technologies and create sustainable business to exploit them to create public benefit and economic value. Private funding for pre-seed and seed-stage investments, even in California, is insufficient to support the translation of many new ideas into businesses that generate economic prosperity for the State. Creating funding for translational and early-stage development programs is of increasing importance to the way universities support economic development in their local and regional economies.

Near-term strategies include:

- ***Creating funding mechanisms to support “proof-of-concept” experiments that clearly demonstrate the commercial application for a particular invention.***

A first step in inducing investor interest in a technology is to show the commercial potential through some form of “proof of concept” at the university. These limited scope, focused projects are generally beyond the funding mandate of traditional governmental agencies, and too early to attract industry support. Creating a pool of university funds dedicated to supporting “proof of concept” research will make UC’s technologies more attractive to investors, and also help identify which ideas warrant aggressive patent protection.

- ***Making seed-stage investments in nascent businesses that move technology from the university into the private sector and begin product development.***

Entrepreneurs and investors agree that a limitation to new venture creation is the lack of seed-stage capital. Even with clear proof-of-concept data, obtaining the initial \$500,000 to \$1 million investment is a limiting step. A number of universities are creating “captive” seed-stage investment funds to support faculty-initiated companies. Investments can be in the form of equity or convertible debt. Seed-stage investments are often needed to bridge the gap to more established angel/venture investors, and help create and maintain an entrepreneurial ecosystem in the local community.

- ***Selectively investing in early stage UC-based companies where such investments help strengthen the company and create the potential for equity-based returns to support the university’s mission.***

Beyond seed-stage investments, UC has the opportunity to make follow-on investments in its start-ups that have real commercial potential. Investment at this stage is designed to create strong local companies where the return to UC is part of the asset allocation strategy managed by the University’s investment professionals. Because the size of follow-on investments can be much larger than at the seed-stage, appropriate research and investment due diligence must be built into such programs.

- ***Actively managing equity in UC-based companies to maximize financial return.***

UC manages its small equity holdings created as part of its existing licensing

program in a passive “programmed” manner. Such a program is appropriate for the nature and level of these holdings. If UC, through a broader seed-stage and follow-on funding program, increases the size and scope of its equity holdings in early stage companies, then it should reevaluate the management of such holdings so as to maximize the financial return to the university.

Mid-to Long-term strategies include:

- ***Regularly evaluate the impact of initial institutional funding aimed at promoting technology commercialization.***

Institutional investment in such areas is a new concept for almost all academic institutions, and thus the success of UC’s approaches should be monitored and compared to like efforts at other flagship research universities. Programs should be revised and adapted to meet ongoing institutional and economic environmental changes.

- ***Consider establishing a separate institutional structure with funding and mandate to invest in UC start-ups.***

Early stage investments in UC start-ups will likely leverage third party research and investment strategies. Based on UC’s experience with this approach, and the experience of other institutions that have created “captive” venture investment funds, UC could consider creating a similar investment vehicle.

- ***Investigating the value of creating or expanding dedicated incubators/accelerators to house nascent UC-based start-ups.***

Across the country, universities are committing resources to create incubators/accelerators that allow start-up companies to begin business operations close to, if not on, campuses to maintain and build long term relationships with emerging businesses. The UCSF/qb3 “Garage” network is an example of how such efforts can play a significant role in increasing university-industry engagement with early-stage companies. Developing an institutional strategy to support such endeavors will ensure that such efforts are sustained into the future.

Appendix 4

Funding for Technology Transfer and the Distribution of Royalty Income

Funding technology transfer:

The funding mechanism for technology transfer across the UC system varies by campus. Some campuses fund operational and patenting costs out of the campus share of licensing income, and some fund these costs out of general operating budgets. Neither is an optimal solution as the former suffers from the unpredictability of future royalty income and the latter from the pressures on the general University operational budget. Patenting costs may or may not be limited to a specific budget, but most campus offices operate under a “zero sum game” scenario where additional funding for operations comes at the expense of patenting and vice versa.

Prior to the late 2000s, the costs associated with UCOP’s support for technology transfer was allocated to the campuses based on their use of each particular type of service. Campus charges were deducted from the campus share of royalty income, with any shortfall covered by the campus from other sources. Currently, funding for UCOP functions is bifurcated. Direct operational support for accounting or prosecution docketing is allocated to the campuses electing to use central services provided by Innovation Alliances and Services with the relevant charges deducted from the campus share of royalty income. Legal counsel, policy advice and information systems operations are part of the total UCOP budget supported by “funding streams”.

The size and funding of UC technology transfer operating budgets for FY 11 are provided in Table 1 below.

Distribution of royalty income:

Royalty income from licensed inventions is distributed according to UC’s Patent Policy. After legal expenses and payments to any joint owners of the intellectual property, the remaining funds are distributed as follows. Under the current Patent Policy, inventors receive 35%, 15% goes to the campus to specifically support research, 37.5% goes to the campus to support general instruction and the remaining 12.5% is returned to the campus as an augmentation to the State General Funds. The use of all campus funds is at the discretion of the Chancellor, and different campuses distribute them differently. For example, a campus may direct the funds to the Dean of the School from which the invention arose, or direct the research share to the laboratory of the investigator. In some cases the campus share is used to fund the technology transfer office. The “General Fund” share must be used in accordance with the rules that apply to other General Funds.

The distribution of royalty income for FY 2011 is provided in Table 2 below. (Note: most income in FY 2011 was covered by a prior Patent Policy which did not include the 15% research share.)

Table 1

FISCAL YEAR 2011												
Campus budget analysis (amounts in thousands of dollars)												
Campus	BK ¹	DA	IR	LA	ME	RV	SB	SC	SD	SF	UCOP IAS ¹	UCOP Other ²
Staffing level (FTE)	10	19	12	22	1.1	6.5	6	2	31	15	16.6	19.75
Funding Source	Royalty income	University funds (90%) & royalty income (10%)	University funds	Royalty income	University funds	Royalty income	Royalty income	University funds	University funds	Royalty income	Campus recharge	University Funds
CAMPUS OPERATING BUDGET	\$ 1,308	\$ 1,860	\$ 1,684	\$ 2,335	\$ 92	\$ 767	\$ 848	\$ 283	\$ 3,702	\$ 1,963	\$ 1,463	\$ 3,885
RECHARGE FOR IAS SUPPORT SERVICES	\$ 72	\$ 228	\$ 217	\$ 180	\$ 189	\$ 96	\$ 132	\$ 35	\$ 65	\$ 100	\$ 149	
Use of UCOP recharge services; see Note 1	C	B,C	B,C	C	A,B,C	B,C	C	B,C	C (partial)	C		
	UCOP through Innovation Alliances and Services (IAS) provides certain technology transfer support services to campuses on a recharge basis, as noted: (A) 1 licensing support, (B) prosecution docketing and (C) financial accounting services. Accordingly FTEs at these campuses are proportionately lower than others because of their choice to use UCOP support rather than hire internal FTEs											
	2 Includes: (A) IAS IT systems development and maintenance, (B) RPAC policy development and guidance, and (C) OGC legal review.											

Table 2

FISCAL YEAR 2011										
UC royalty income distributions (amounts in thousands of dollars)										
Campus	BK¹	DA	IR	LA	ME	RV	SB	SC	SD	SF
Inventor Shares: <i>distributions to inventors under Patent Policy; payment based on prior FY income (except BK, Note 1)</i>	\$ 15,487 ¹	\$ 3,435	\$ 1,450	\$ 10,927	\$ 10	\$ 1,803	\$ 701	\$ 48	\$ 9,106	\$ 8,782
Research Allocation Share: <i>distribution to campus specifically to support research - applies only to a subset of inventions</i>	\$ 115	\$ 340	\$ 80	\$ 1,348	\$ 4	\$ 254	\$ 154	\$ 18	\$ 1,934	\$ 1,956
General Fund Share: <i>distribution to General Fund to augment the State's appropriation for UC, as required by Patent Policy</i>	\$ 18,685 ¹	\$ 1,300	\$ 931	\$ 365	\$ (113)	\$ 876	\$ 431	\$ (56)	\$ 937	\$ 1,018
Income To Campus: <i>distribution to campus Chancellors to use at their discretion to support instruction and research</i>	\$ 55,981 ¹	\$ 3,559	\$ 2,713	\$ (253)	\$ (345)	\$ 2,375	\$ 1,137	\$ (186)	\$ 878	\$ 1,098
Total Income Distributed in FY11:	\$ 90,228¹	\$ 8,634	\$ 5,174	\$ 12,387	\$ (443)	\$ 5,308	\$ 2,423	\$ (176)	\$ 12,854	\$ 23,575
¹	Does not include Berkeley technologies managed by LBNL; royalty income for 2011 includes one-time royalty advance of \$86.2 million for "Immune Activator for Treating Cancer" technology; certain inventors of "Immune Activator for Treating Cancer" were paid inventor shares in FY 11.									