Collaborative Innovation

It's all About Networks and Partnerships

February 3, 2015
Italian VCRs Delegation
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ipira.berkeley.edu

Outline

Innovation life cycle
Infrastructure, philosophy, results
Collaborative innovation
Examples – bridging gaps through partnerships

Entrepreneurship, Startups

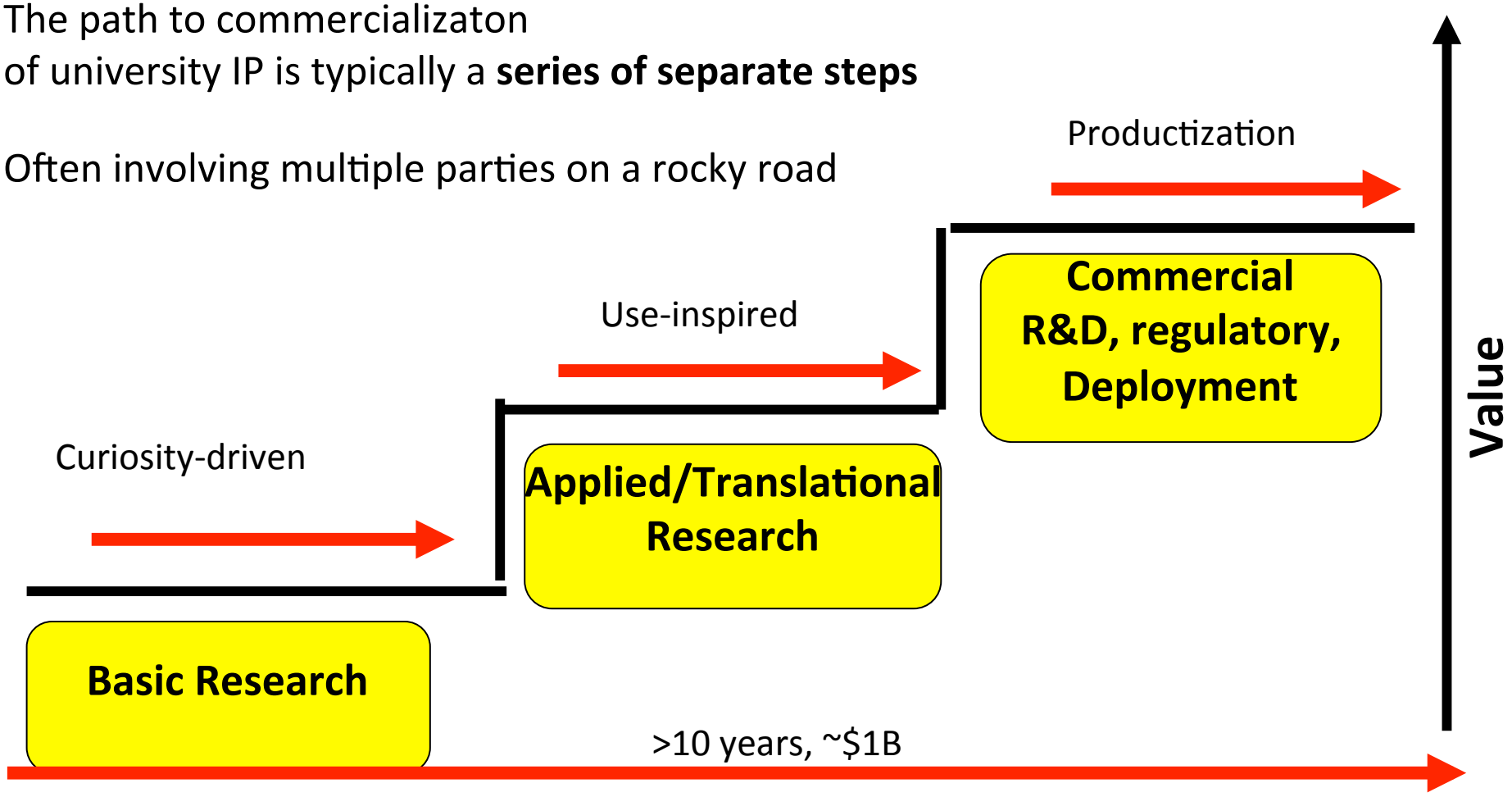
IPIRA
Office of Intellectual Property
& Industry Research Alliances
University of California, Berkeley

University Research Results are Early-Stage

Commercial investment in and by the private sector is required
to bring basic research results to the point of practical application

The path to commercializaton
of university IP is typically a **series of separate steps**

Often involving multiple parties on a rocky road

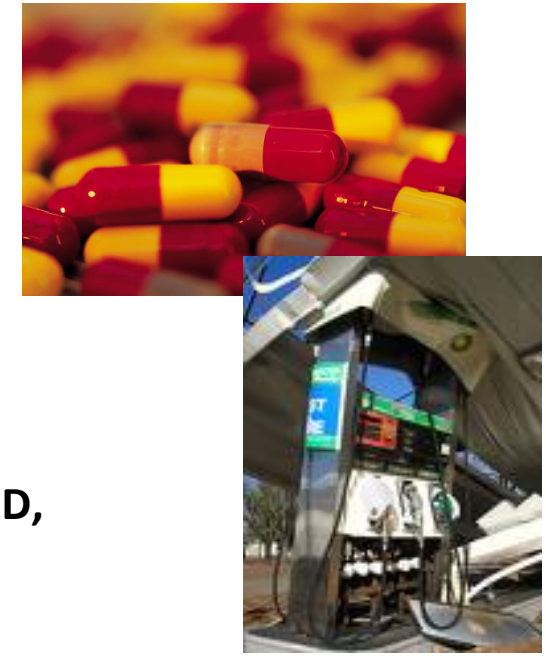


The Translational Research Gap is Both Wide and Deep

University research results are embryonic
Rights to University IP are licensed to industry for commercial development

Bench to bedside

Bench to fuel tank

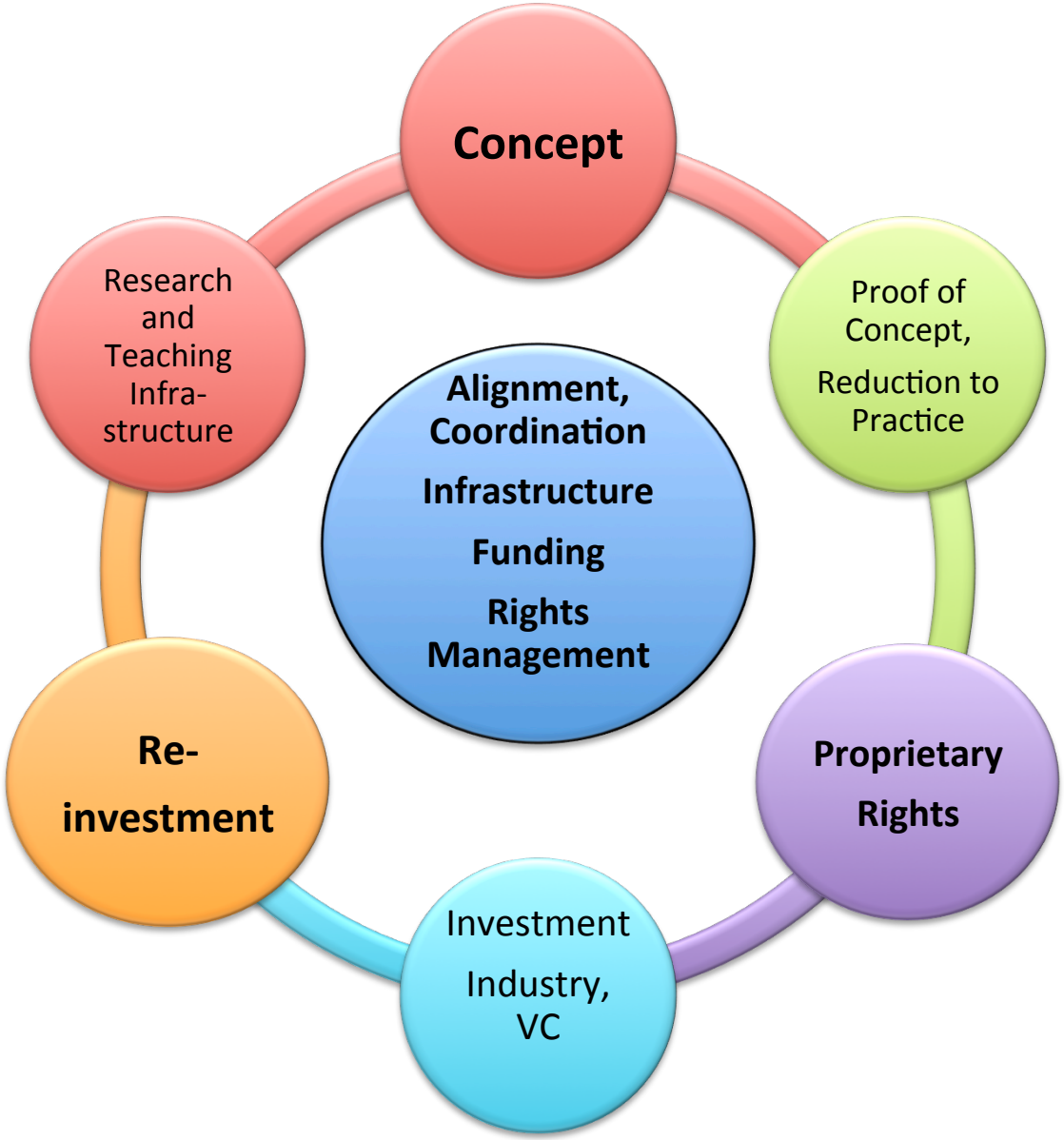


Licensees invest enormous sums in risky R&D, manufacturing, regulatory approvals

IP licensing gives industry an incentive to invest

Innovation – a Virtuous Cycle of Creation, Translation, Deployment, Value Creation, Reinvestment

$ ➔
Influx of Investment ***at any point*** perpetuates the cycle



Infrastructure

Stanley Hall at UCB

"In many ways the building is designed to actually change the way research is done."

Biologists, physicists and engineers to solve problems together.

And

Public & Private Cooperation, Collaboration, PPPs and PDPs Help Us to Implement a Shared Vision

TRANSLATE basic, academic, research results into goods and services

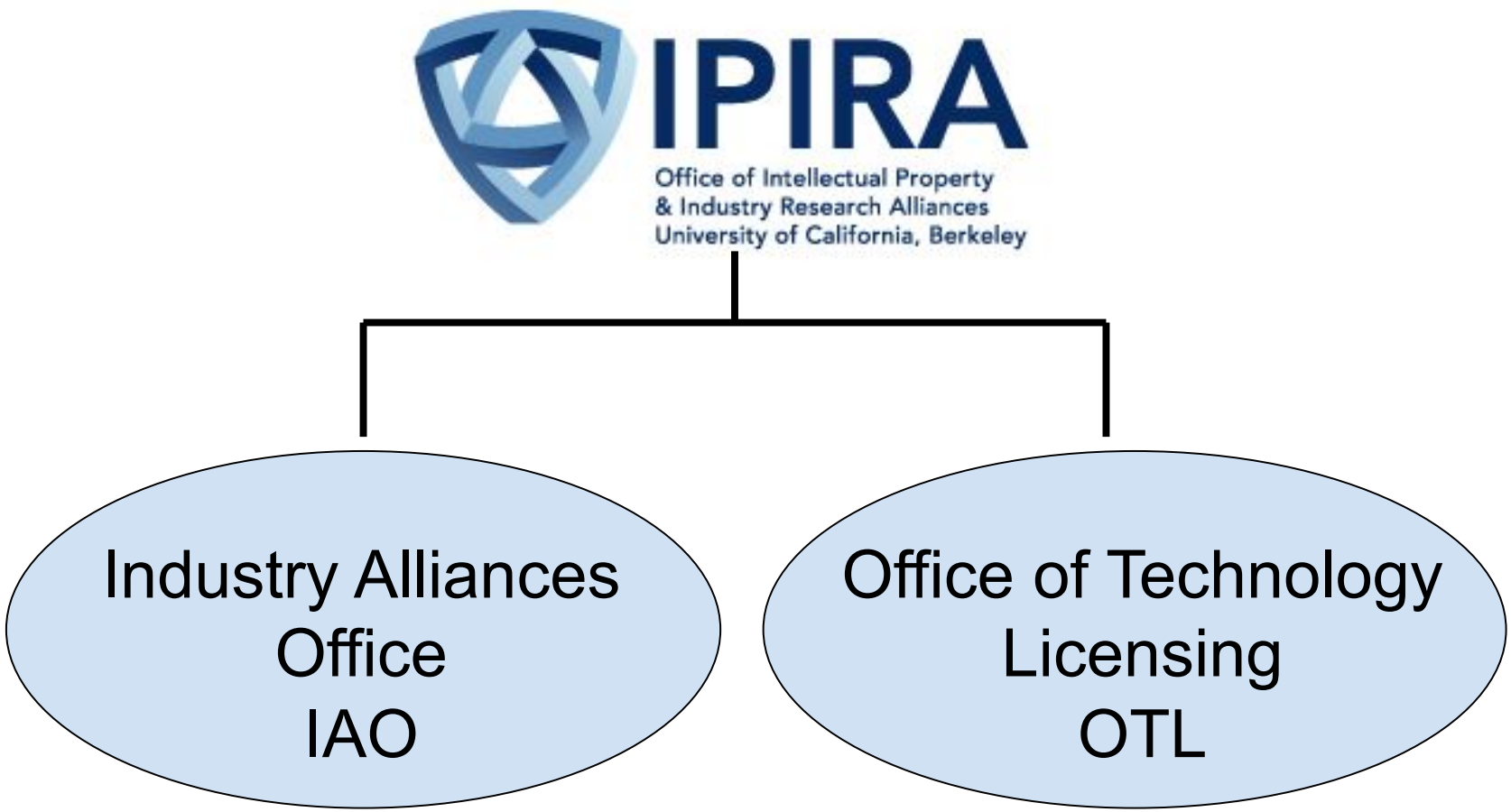
ACCELERATE innovation

CATALYZE commercial uptake and investment

Science-to-technology transition can be expedited through innovative Public-Private Partnerships

- ✓ input from industry provides valuable insight
- ✓ problems to be solved
- ✓ where and how academics can help

2004 Restructure into IPIRA
Increase corporate sponsored research
Under an industry relationship model
Make research more relevant to industry



IPIRA's Mission

- Service to faculty
- Multifaceted relationships with companies & foundations
- Enhance the Berkeley campus research enterprise through Intellectual Property (IP) management from a single portal
- Increase industry research
- Facilitate and strengthen new types of agreements to reflect changing relationships with foundations and industry
- Support economic development through technology and knowledge transfer including entrepreneurship
- Accomplish the above without compromising our principles or mission

Eight Underlying Principles Tantamount to Policy

1. Open Dissemination of Research Results & Information
2. Commitment to Educate Students
3. Accessibility for Research Purposes
4. Public Benefit
5. Informed Participation
6. Legal Integrity and Consistency
7. Fair Consideration for University Research Results
8. Objective Decision Making

Philosophy

Technology Transfer is an *ongoing relationship continuum, not a single transaction*

Movement in BOTH directions, in and out of university

many years, many points of contact

Relationship model : collaborations, partnerships are key

Our networks are our strength

Open Innovation Principles: innovation as an open system

- We must work together
- To accelerate innovation & catalyze commercialization
- Including PPPs and PDPs to bridge translational research gaps
- Innovate faster, better

The ICT Perspective

Information Technology is:

Not biotech, not pharma

Incremental improvements

Short R&D timeframes

No running royalties

Freedom to operate

Nonexclusive, often NERF, license

NOT exclusive, royalty bearing, high risk, high investment

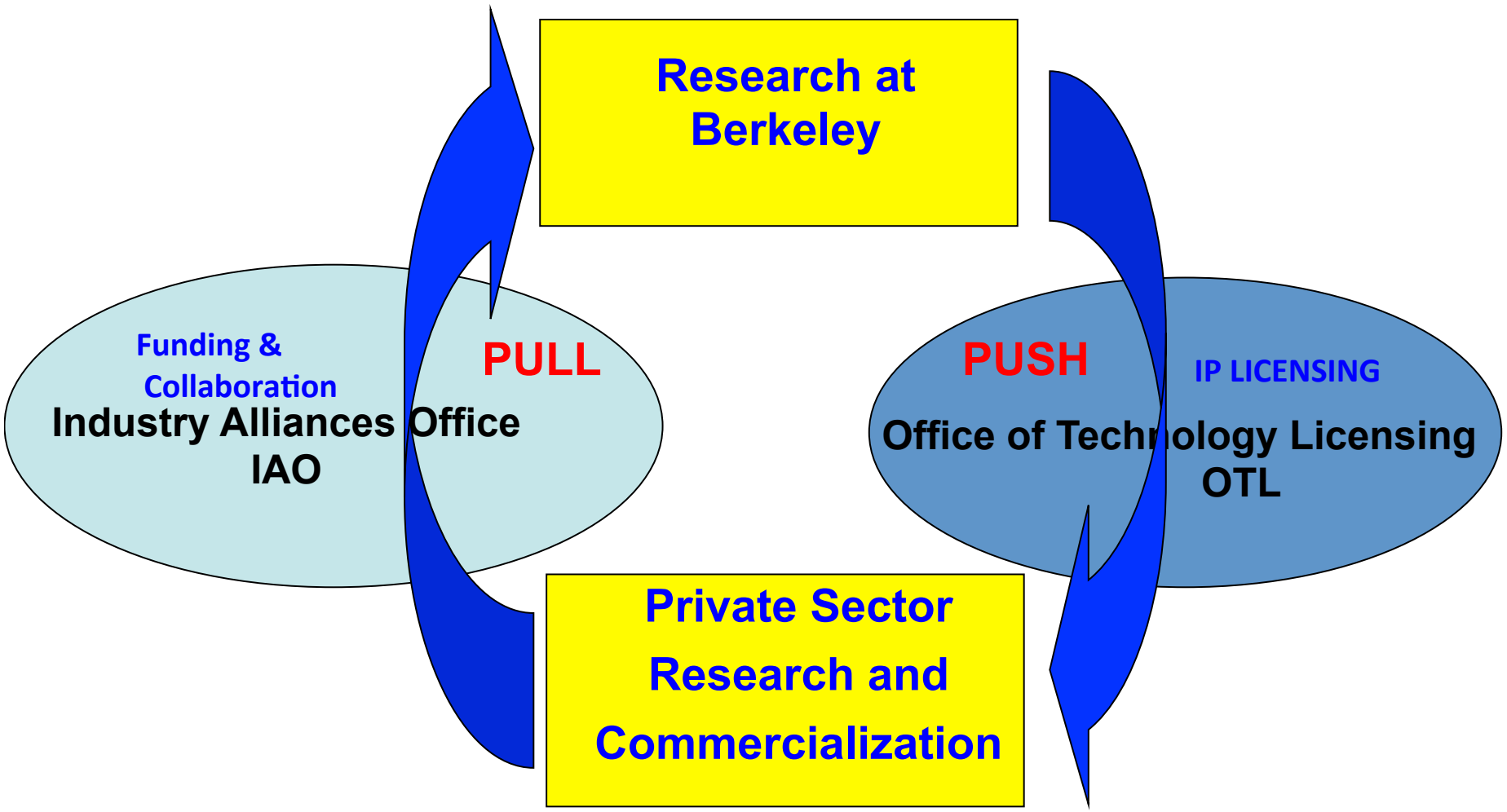
Publication and public domain fine

We hear you:

HP's Global Collaborative Research (HP Open Innovation)

Intel Lablet at Berkeley Open Collaboration

Energy Biosciences Institute, others

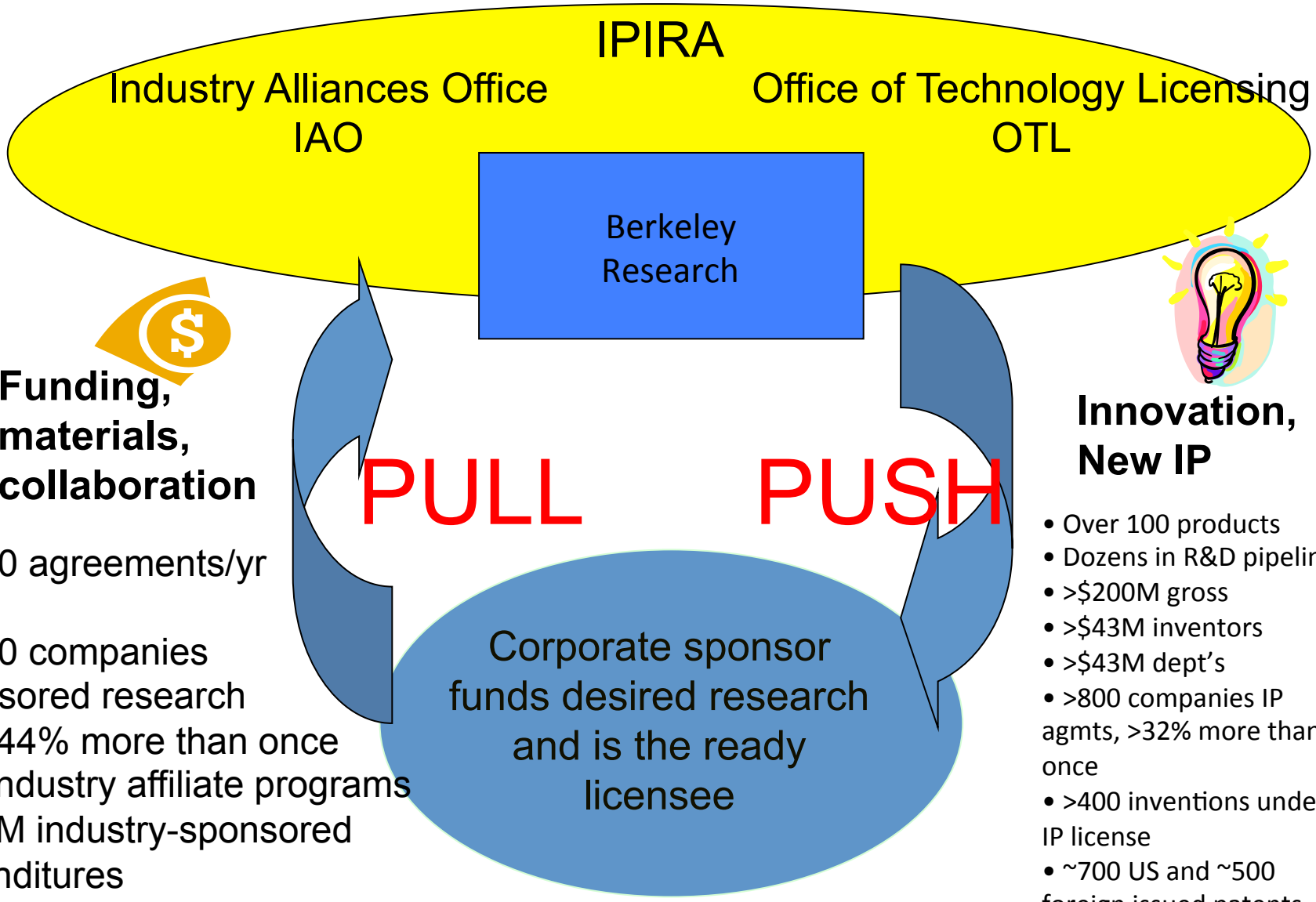


Corporate Sponsored Research Agreements, Collaboration Agreements, Incoming MTAs, Industry Affiliates Programs SBIR/STTRs

Patents, Copyright protection and licensing, outgoing MTAs, Support of IAO agreements, Startups

Virtuous Cycle: Corporate funding produces "improvement" IP

PPPs, collaboration, accelerate innovation, service to faculty



Funding, materials, collaboration

- >650 agreements/yr
- >850 companies Sponsored research
  - 44% more than once
- 17 industry affiliate programs ~$90M industry-sponsored expenditures

Innovation, New IP

- Over 100 products
- Dozens in R&D pipeline
- >$200M gross
- >$43M inventors
- >$43M dept's
- >800 companies IP agmts, >32% more than once
- >400 inventions under IP license
- ~700 US and ~500 foreign issued patents

Relationship Model Yields Fruit

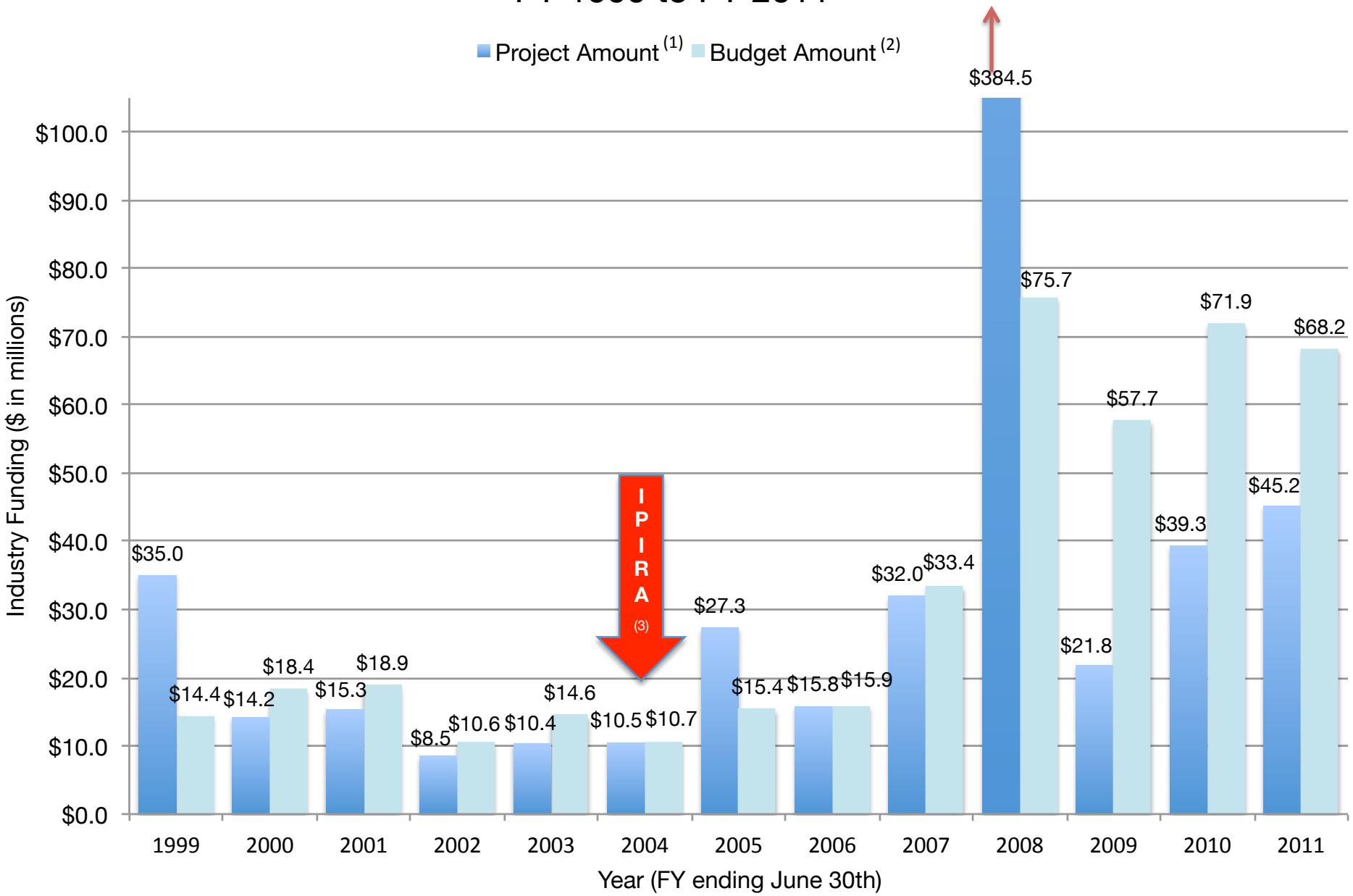
All vectors "up"

- >825 companies sponsor research, 45% repeat customers
- $86M industry expenditures

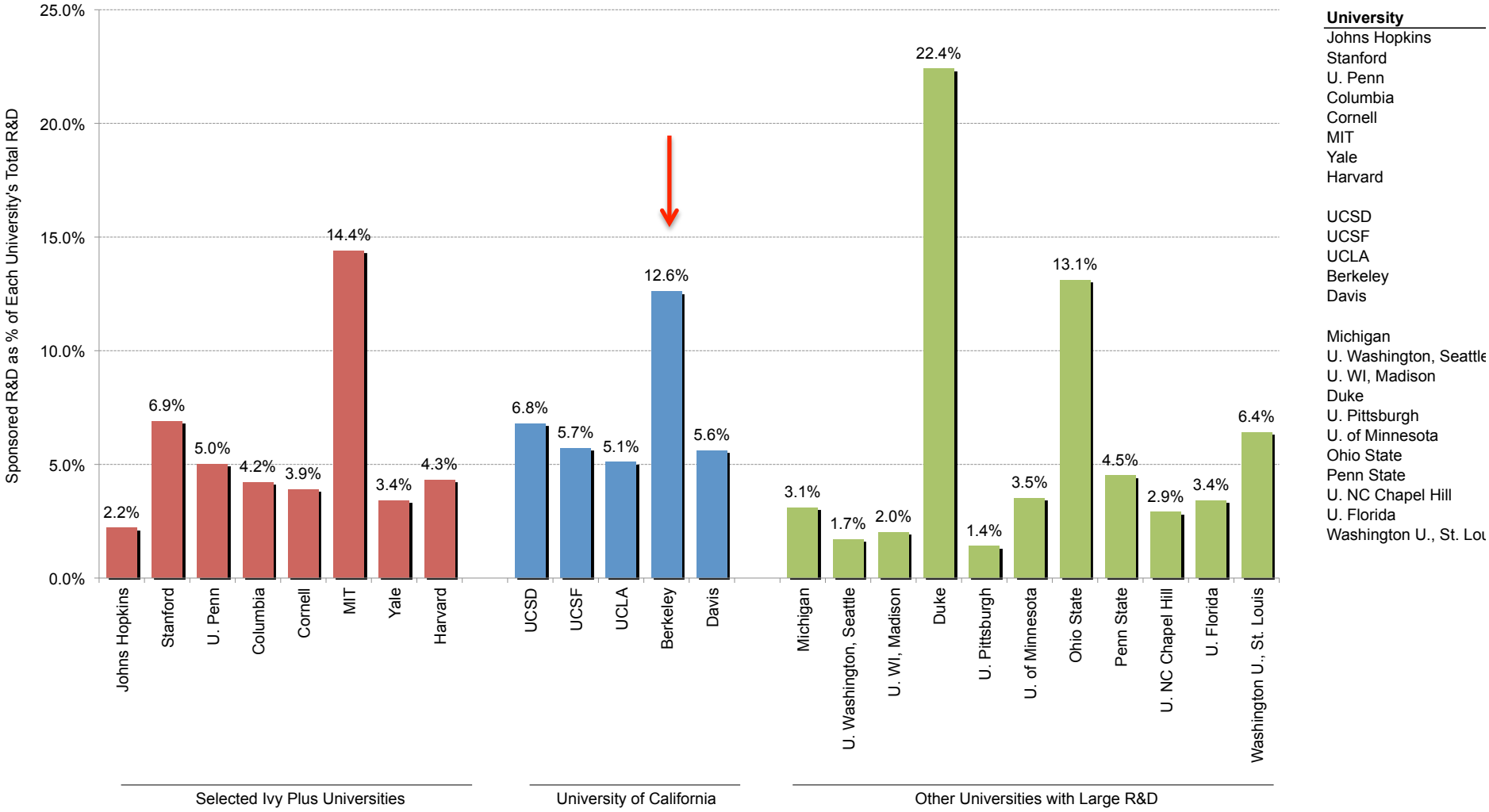
- > 15 industry affiliate programs

- >780 companies have licensed IP rights, 31% more than once
- 150 startup companies, between 2007-2011, raised 1.3B,
- 65 raised an average of $13.8M

- 24% of new invention disclosures from Industry sponsored research
- $200M gross licensing revenue, $45M to inventors, $45M depts.


UC Berkeley Industry Funding
FY 1999 to FY 2011
Project Amount (1)
Budget Amount (2)
Industry Funding ($ in millions)
$0.0
$10.0
$20.0
$30.0
$40.0
$50.0
$60.0
$70.0
$80.0
$90.0
$100.0
$35.0
$14.4
$14.2
$18.4
$15.3
$18.9
$8.5
$10.6
$10.4
$14.6
$10.5
$10.7
$27.3
$15.4
$15.8
$15.9
$32.0
$33.4
$384.5
$75.7
$21.8
$57.7
$39.3
$71.9
$45.2
$68.2
IPIRA (3)
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year (FY ending June 30th)

Percentage of Industry Sponsored R&D Expenditure by Educational Institution, FY 2012



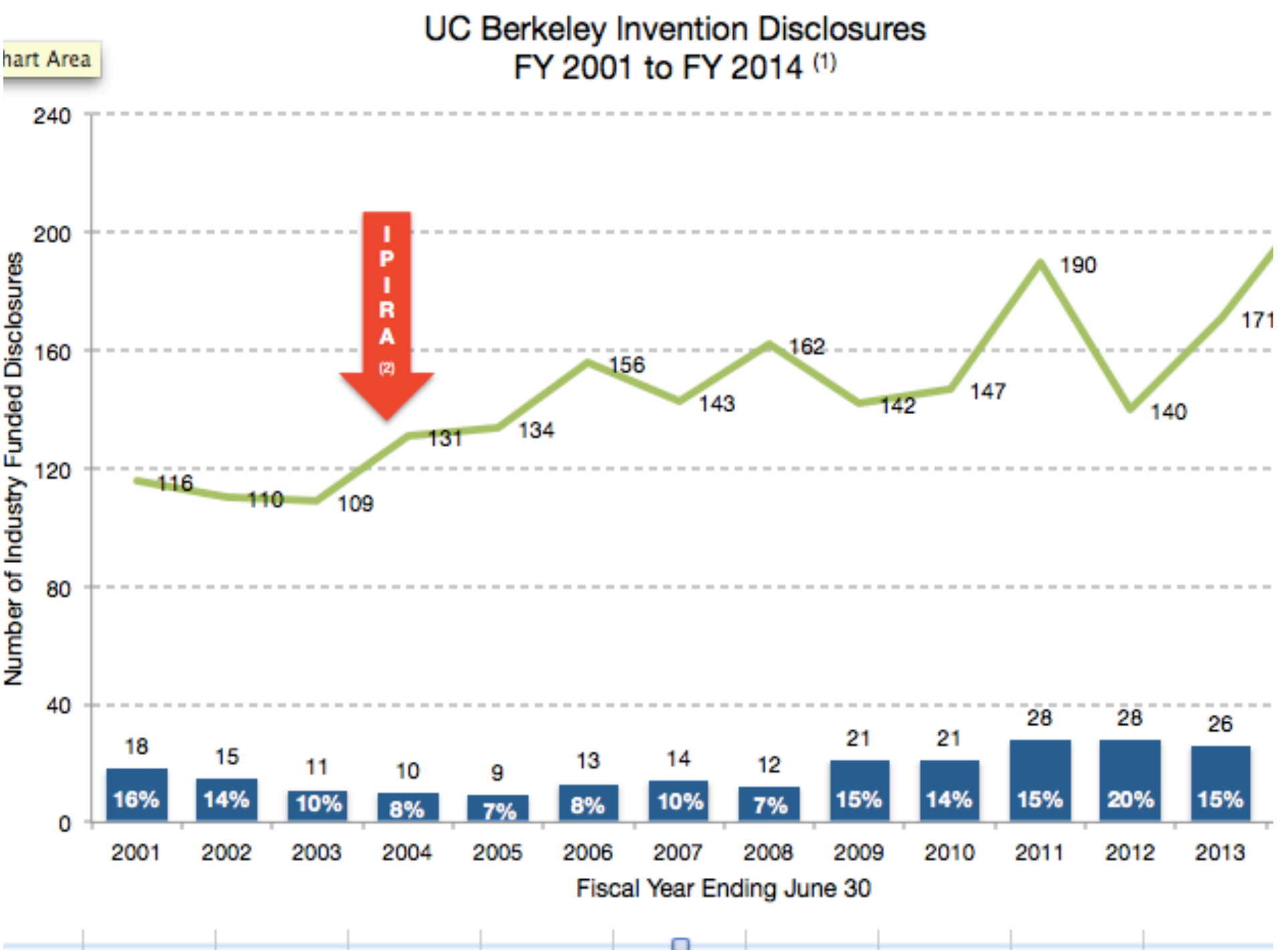
University

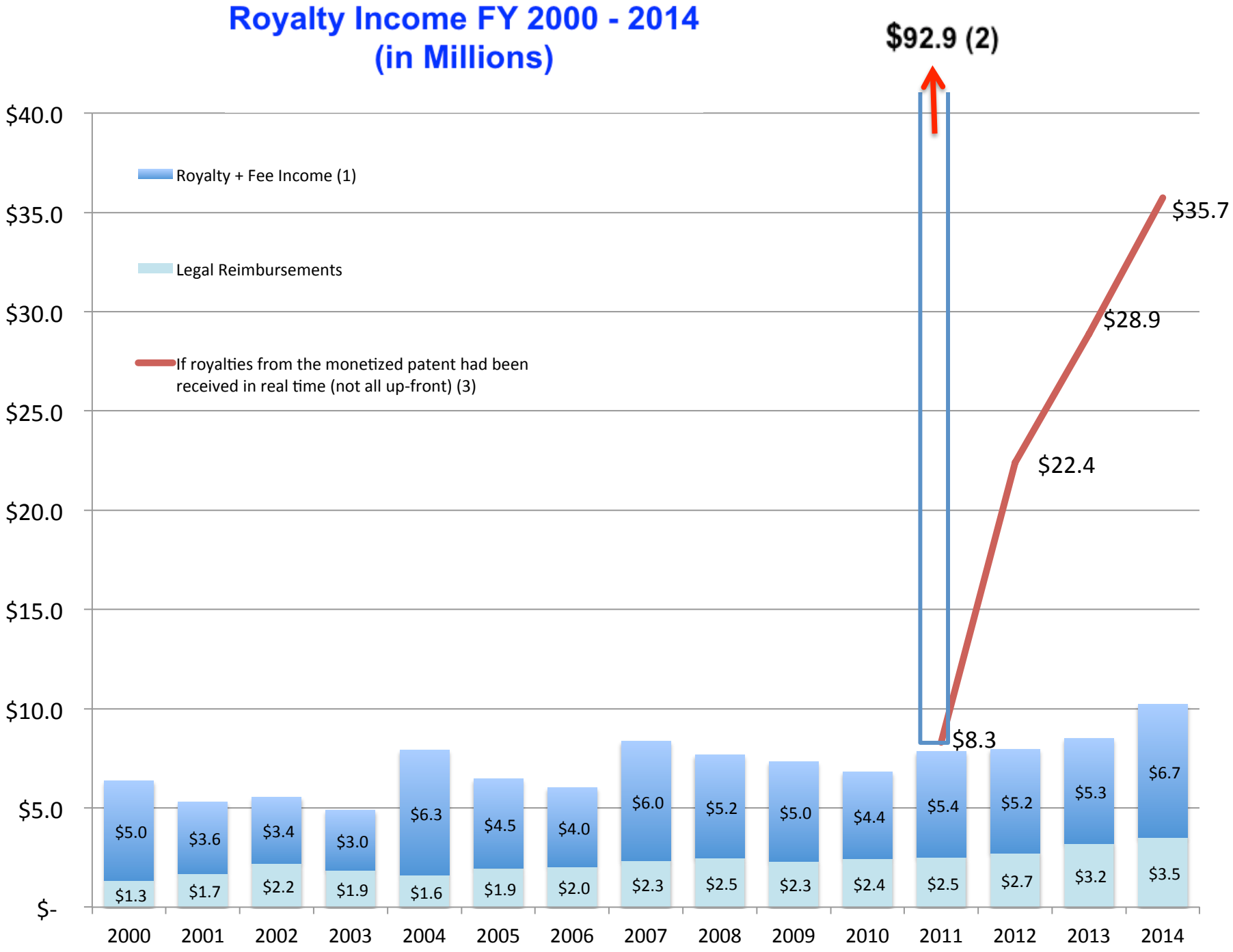
Johns Hopkins
Stanford
U. Penn
Columbia
Cornell
MIT
Yale
Harvard

UCSD
UCSF
UCLA
Berkeley
Davis

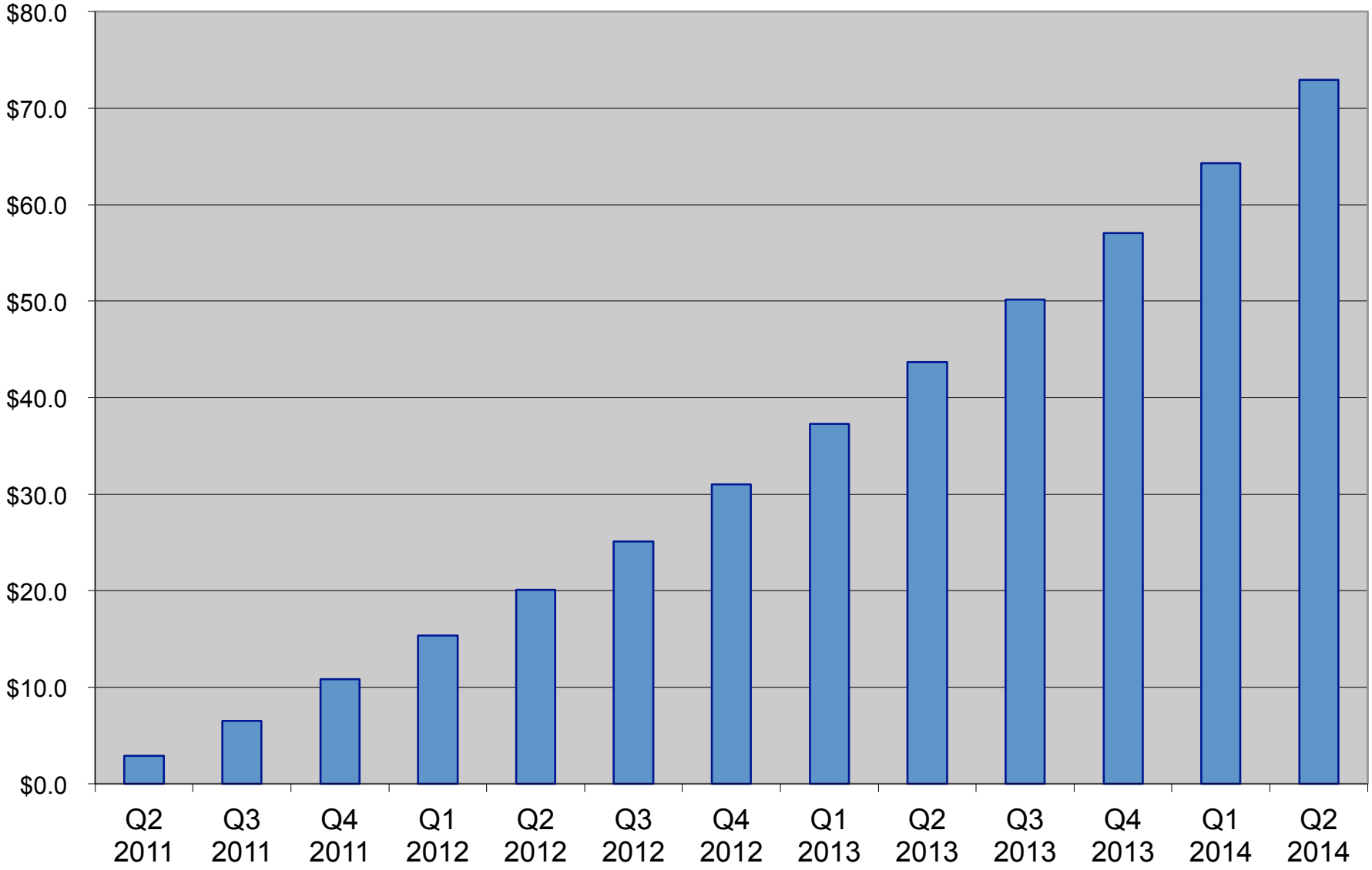
Michigan
U. Washington, Seattle
U. WI, Madison
Duke
U. Pittsburgh
U. of Minnesota
Ohio State
Penn State
U. NC Chapel Hill
U. Florida
Washington U., St. Lou

Source: NSF.gov.
Note: Duke has a very large clinical trials infrastructure and corresponding funding from pharmaceutical companies.

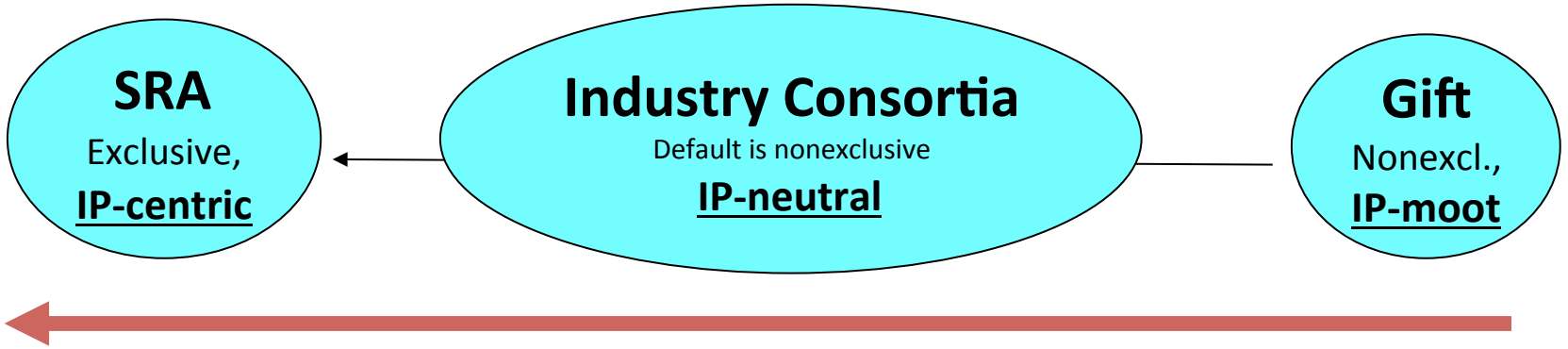

hart Area
UC Berkeley Invention Disclosures
FY 2001 to FY 2014 (1)
Number of Industry Funded Disclosures
240
200
160
120
80
40
0
IPIRA (2)
116
110
109
131
134
156
143
162
142
147
190
140
171
18
16%
15
14%
11
10%
10
8%
9
7%
13
8%
14
10%
12
7%
21
15%
21
14%
28
15%
28
20%
26
15%
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Fiscal Year Ending June 30


Royalty Income FY 2000 - 2014
(in Millions)
$92.9 (2)
$40.0
$35.0
$30.0
$25.0
$20.0
$15.0
$10.0
$5.0
$-
Royalty + Fee Income (1)
Legal Reimbursements
If royalties from the monetized patent had been received in real time (not all up-front) (3)
$35.7
$28.9
$22.4
$8.3
$5.0
$3.6
$3.4
$3.0
$6.3
$4.5
$4.0
$6.0
$5.2
$5.0
$4.4
$5.4
$5.2
$5.3
$6.7
$1.3
$1.7
$2.2
$1.9
$1.6
$1.9
$2.0
$2.3
$2.5
$2.3
$2.4
$2.5
$2.7
$3.2
$3.5
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

$72M Cumulative Royalty in $ Millions @ 3% if Not Monetized



A Full Spectrum of IP Management Strategies to Achieve Impact, Access, Uptake & Dissemination



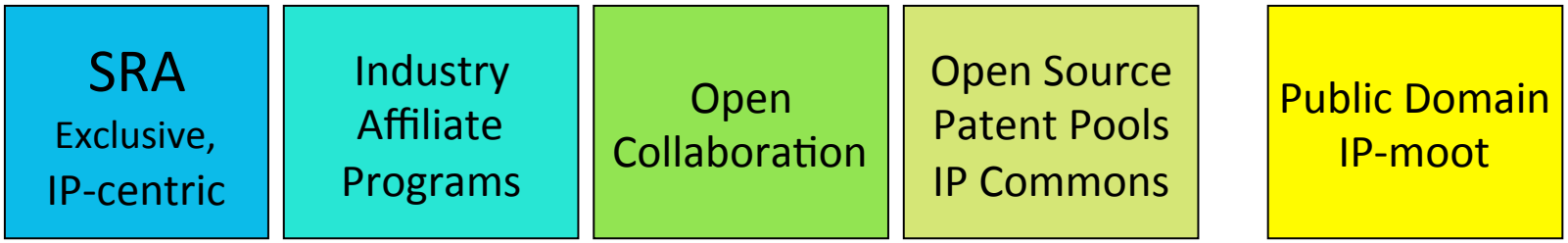
IP expected
Work plan
Deliverables
Budget

Intermediate overhead
Membership agreement
Information & Relationships

No contract
No deliverables

See ipira.berkeley.edu homepage to download brochure

Corresponding Menu of Transaction Types



Decreasing emphasis on IP, deliverables, ownership

Continuum of management tools to ensure access, dissemination

Innovation acceleration RELATIONSHIP LIFECYCLE

Carol Mimura, "Nuanced Management of IP Rights: Shaping Industry-University Relationships to Promote Social Impact", Chapter 9 in Working Within the Boundaries of Intellectual Property, Oxford University Press, pp. 269-295, April 30, 2010. Ed. By Rochelle Dreyfuss, Harry First, Diane Zimmerman.

The Industry-University interface is multifaceted

- Corporate sponsored research
- Corporate collaborations
- Material and knowledge transfer
- Consulting and other public service
- IP creation and licensing
- Gifts: cash, endowed chairs, equipment, sponsorship of graduate programs
- Graduate fellowships
- Industry consortia (memberships)
- Exchange of personnel, sharing of resources
- Investment in UC employee-founded startups
- Networks of service providers and capital that support entrepreneurial activities

Partnerships

Unifying goal of translating research into tech solutions

POV of the Research Institution

- Diversity funding sources
  - In applied fields
  - Industrial sights
- Broad relationships
- Training, future jobs

Industry POV

- Leverage infrastructure
- Lower indirect costs
- Insights @ cutting edge
- R&D tax credits
- Talent pipeline

Bridge funding, knowledge gaps
Hasten translation

Anatomy of PPPs and PDPs

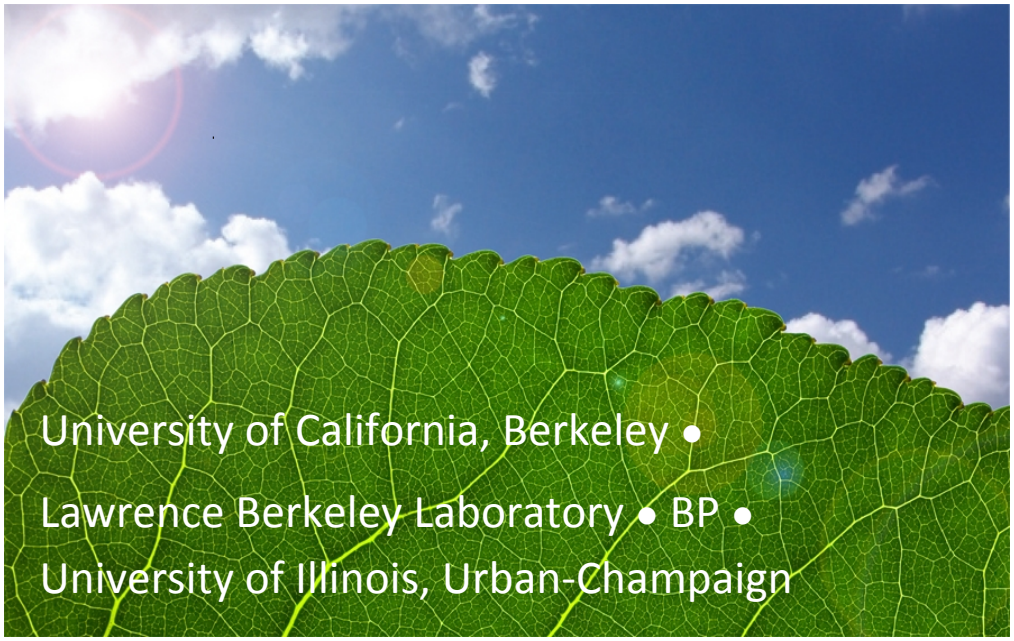
- business models, partnership structure, IP management strategy

  - who are the parties – for-, non-profit, hybrid
  - find and preserve incentives, deliver ROI
  - maintain mission and goals of each participant and the grantor
  - how are property rights, including IP, treated?
  - and tangible properties (data, materials)
  - timing of entrances and exits, and how

  - what are the parties roles, milestones, which are distinct, overlapping?
  - how is it financed? Kinds of financing, and timing
  - how many and what kinds of contracts are needed?
  - how are results delivered, measured and put to USE?

- successful partnerships
  - flexible and nimble IP management strategies coupled to new business models
  - push and pull mechanisms
  - creative, motivated negotiators, drafters – goal is collaboration
  - change the culture of collaboration

Energy Biosciences Institute



www.energybiosciencesinstitute.org

- $500M over 10 years
  Funded by BP
- Sponsored Research
- ~25 lead investigators
- Broad, multidisciplinary
- > 320 researchers
- Bottom up – open innovation
- Dedicated space
- Grants making program
- Open call for proposals

Energy Biosciences Institute

California Research Alliance by BASF (CARA)

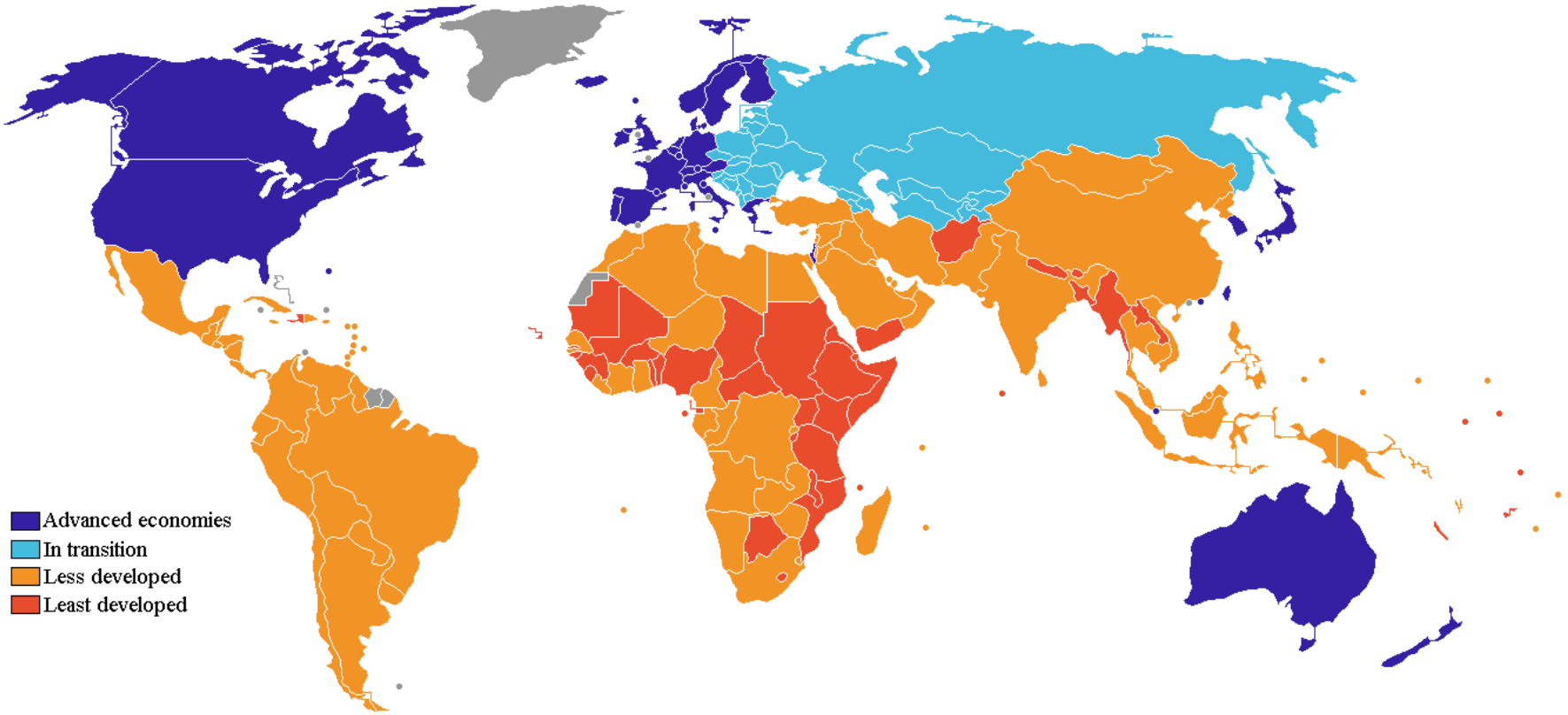
New Materials

Hub-and-Spokes Model

Berkeley as hub
UCLA and Stanford initial research partners

"CARA represents the new wave in corporate-academic partnerships, a collaborative intersection of the brightest minds that work on the molecular and nanoscale to achieve incomparable 21st century innovation for real-world issues in energy, health, the environment and sustainability."

Partnerships to address market failure in Global Health
- **innovation on the innovation process, itself**



- Italy 20% age 65+*
- In Haiti 4%*

2.4B live in low income countries

3.1B in middle income countries

World population of 6.5Billion

~1B in wealthiest

http://ipira.berkeley.edu/socially-responsible-licensing-ip-management

Socially Responsible Licensing
University of California, Berkeley

IPIRA
Office of Intellectual Property & Industry Research Alliances
University of California, Berkeley

IPIRA combines IP licensing and industry-sponsored research in one office to develop and deploy Berkeley innovations. Through its Socially Responsible Licensing Program, Berkeley partners with industry, start-ups, and not-for-profits to formulate technologies that lack traditional profit drivers. IPIRA has set new paradigms for research partnerships since its founding, helping to develop malaria therapies, tuberculosis drug targets, protein-enhanced sorghum, diagnostics for dengue fever and other infectious diseases, novel anti-viral compounds, water purification filters, and pesticide-free crops.

Nutritionally-Fortified Sorghum

Sorghum is a staple for over 500 million, but a poor source of nutrition, protein, and starch. The research of Bob Buchanan and Peggy G. Lemaux enhances its digestibility by modifying sorghum's grain endosperm. Supported by a grant from the Gates Foundation, Berkeley partnered with Africa Harvest and DuPont/Pioneer to maximize its social impact. The contract involved a paid-up, royalty-free, worldwide perpetual license, and defined the field of use as "any charitable objective."

Samoan Anti-Viral Compounds

The Mamala tree contains significant anti-viral properties, and a partnership between the Government of Samoa, Falealupo Village, Professor Jay Keasling, and Berkeley aims to identify and isolate its prostratin genes. Discoveries will be attributed to, and commercialization revenues shared with, Samoa and ten villages. Berkeley further endeavored to use best efforts to license therapies for the public benefit.

Low-Cost Water Treatment

Haas School of Business

Berkeley Engineering

Partnering expertise from engineering (antimicrobial filters) and the Haas School of Business (market and user adoption studies), Berkeley and a sponsor executed two research agreements to develop and test low- and no-cost water purification devices. By leveraging the sponsor's expertise in developing and delivering clean water innovations in developing countries, UC Berkeley extended its research into areas where its partner has both technical expertise and field relationships.

New TB Drug Target

Mycobactium tuberculosis lies latent in one-third of all people and is the world's top killer of indivudials with HIV, but novel TB therapies are rare. Professor Carolyn R. Bertozzi discovered four genes within the bacteria that may be linked to its latent survival. Four patents on TB's sulfotransferase pathway were "donated" to the Pool for Open Innovation in 2010, for the express purpose of advancing research on sixteen neglected diseases in the Least Developed Countries. Berkeley is the first university to contribute its IP to the Pool. Under a Creative Commons Green Exchange Public License, licensees – such as the TB Alliance – can inspect both the patent rights offered by Berkeley and the accompanying license, reducing uncertainty and transaction costs, and streamlining uptake for patent rights with biomedical utility in the Least Developed Countries.

by Jay Purcell, Berkeley Law, Supported by the Henry Wheeler Center for Emerging & Neglected Diseases (CEND), UC Berkeley

http://ipira.berkeley.edu/socially-responsible-licensing-ip-management

Rapid & Handheld Point-of-Care Diagnostics

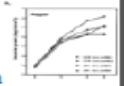
Dengue viruses infect more than 50 million every year, causing severe and life-threatening infections. Professor Eva Harris' lab and the Sustainable Sciences Institute partnered with the Department of Electrical Engineering to develop a low-cost, hand-held diagnostic for dengue. IPIRA patented and licensed the invention to SSI, where grants from the Rockefeller & Acumen Foundations supported development. Outside "for-profit" countries, Berkeley's license empowers royalty-free and not-for-profit use of SSI's resulting product.

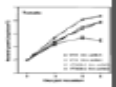
As doctoral students in Berkeley's Computer Science and Electrical Engineering departments, Octavian Florescu and Karl Skucha invented the technology behind a microchip-based, rapid, point-of-care diagnostic that can be configured to detect nearly any antigen (HIV, malaria, HPV). IPIRA's license to their start-up, Silicon BioDevices, preserves the end-product's availability in the UN-defined Least Developed Countries.

CellScope's Cell-Phone Microscope

Bioengineering Professor Daniel Fletcher and his students developed a low-cost, clinical-quality microscope that attaches to a conventional cell phone. The technology enables health workers to send digital images of blood or tissue samples, removing the need for field-based laboratories and accelerating disease diagnosis and epidemic tracking in countries lacking health infrastructures. Supported by Microsoft External Research, CellScope will offer free licenses in developing countries.

Durable & Pesticide-Free Crops





The BS2 gene confers resistance to plant pathogens, and can be introduced into plants to enhance durability. Two Blades Foundation licensed BS2 to develop pesticide-free, resilient crops for subsistence agriculturalists. The license expressly aims to benefit "less developed" farmers, and waives royalties for distribution in the Least Developed Countries. It also includes tiered-royalties from wealthier countries to subsidize delivery for free, or at minimal cost in the poorest countries.

In the Pipeline

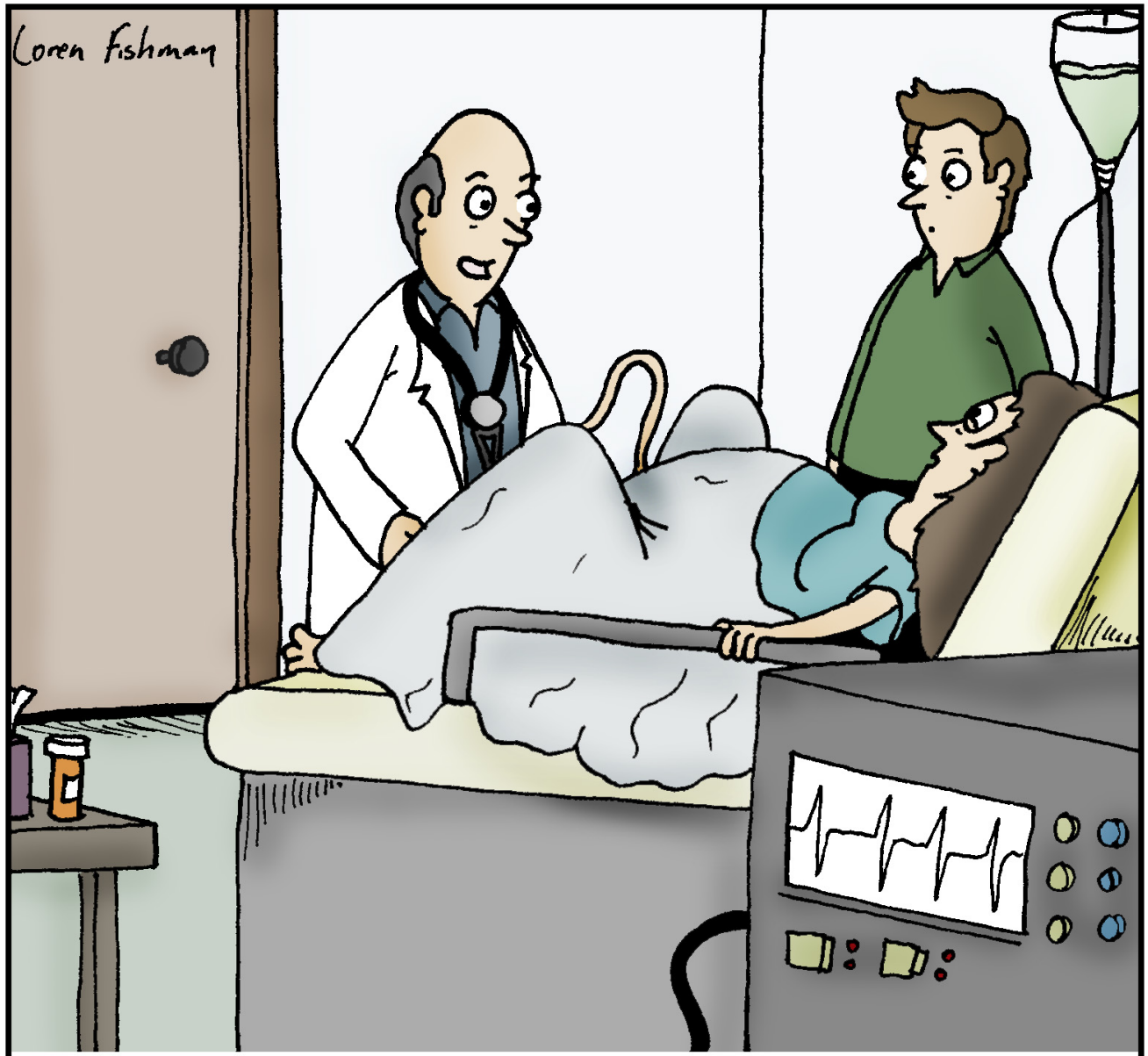
IPIRA collaborators Institute of One World Health and Silicon BioDevices are pursuing joint research on the latter's microchip-based diagnostics. Development of cell phone-based diagnostics continues with new investors. In 2011, IPIRA aims to develop contracting tools for clean technology, following successes in IT and life sciences licenses.

Product Development Partnership for Malaria Therapies

Production costs of malaria-therapy artemisinin are a barrier to its availability. Professor Keasling sought a new approach: engineer *Saccharomyces cerevisiae* to produce it. With funding from the Gates Foundation, Keasling's Berkeley lab researched the basic gene cloning. Amyris, a Berkeley-founded start-up, continued the strain engineering and fermentation scale-up, while lead grantee, the Institute for One World Health (iOWH), managed the regulatory and distribution aspects of the project. Simultaneous funding from the Foundation enabled parallel performance of basic, translational, and regulatory work, cutting years off the typical bench-to-bedside timeline. The product development partnership involved a three-way collaboration agreement and two royalty-free licenses from IPIRA. In 2004, the partners de-risked the project by advancing it along the value chain, and in 2008 sanofi-aventis sublicensed the rights from iOWH and Amyris.

http://ipira.berkeley.edu/socially-responsible-licensing-ip-management

Startups from Cal



"Congratulations... It's a corporation!"

Startups founded to commercialize Berkeley IP

- >162 startups
- $1.7B in VC funding 1998 - 2012
- 65 raised ave. $13.8M 1998-2012
- 91 SBIR grants

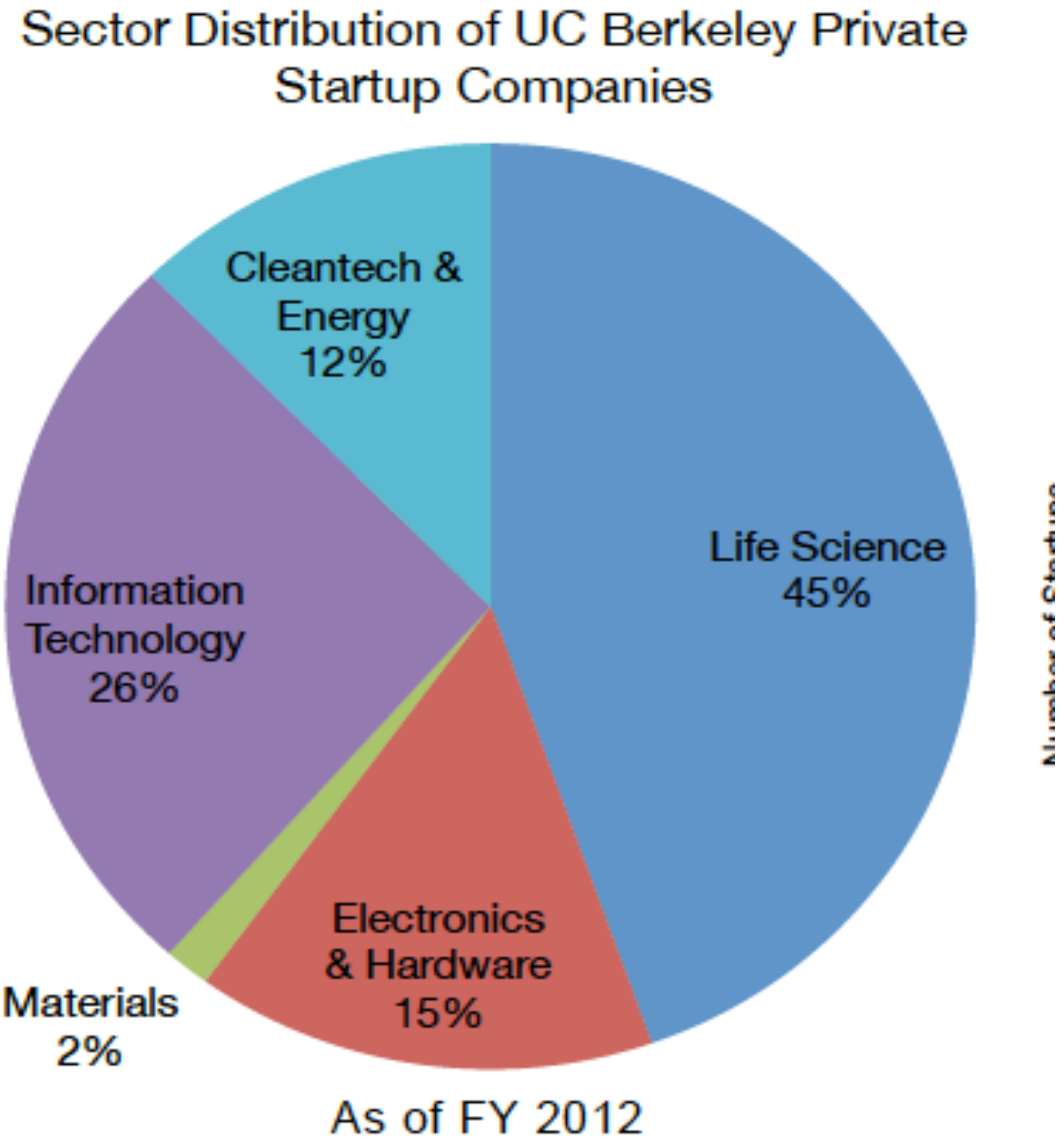
http://ipira.berkeley.edu/success-stories
http://ipira.berkeley.edu/partial-list-private-capital-providers

- Cutting edge research inst.
- PoC, seed, Private capital
- Entrepreneurial culture
- Critical density small Cos
- High % on Sci. Adv. Boards
- Tax, mfging credits
- Supportive policies COI, COC
- Visas, SBIR, STTR
- Service, facilitation networks

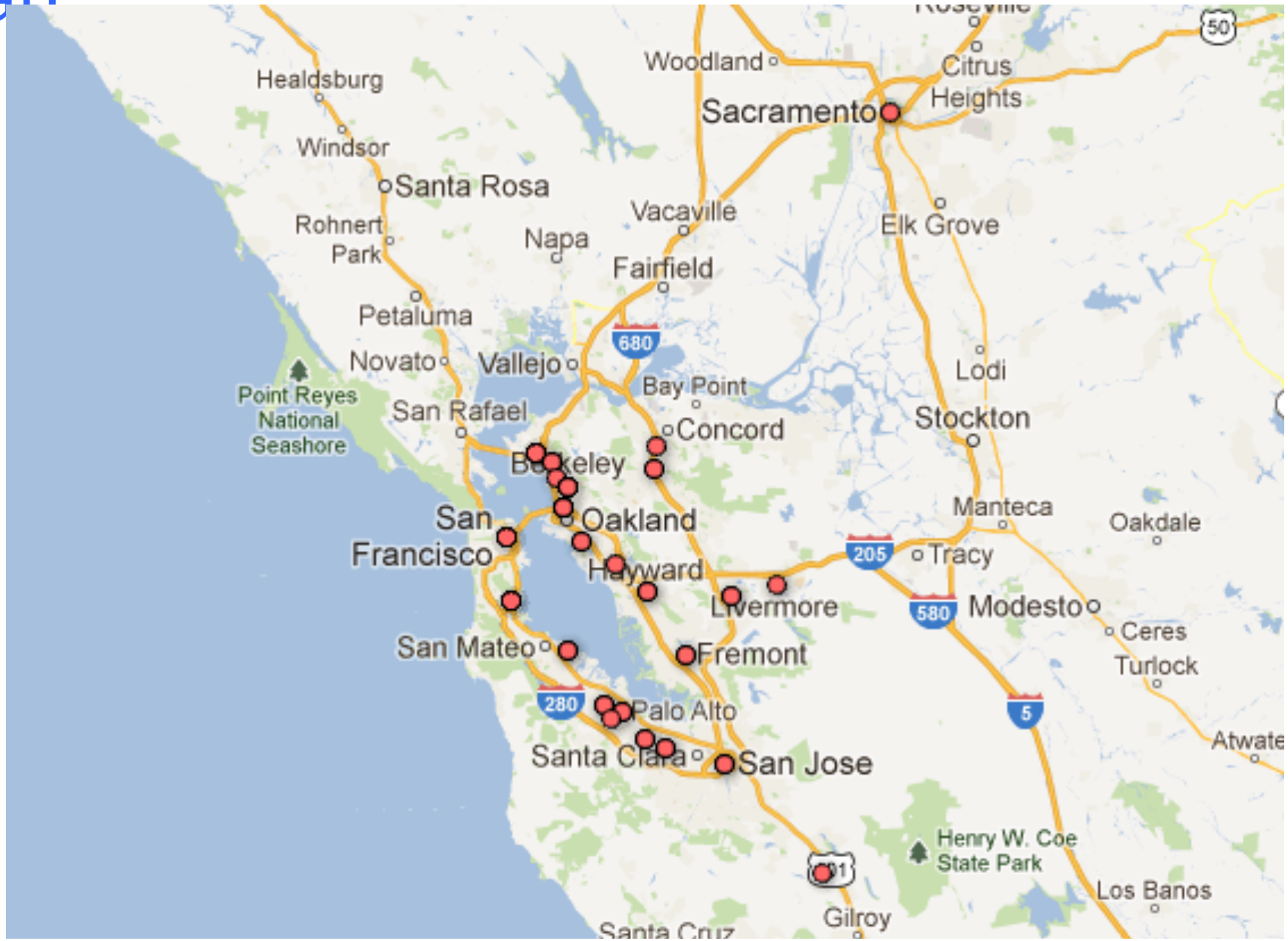
- Lester Center for Entrepreneurship @ Haas School of Business
- Ctr for Entrepreneurship & Technology in CoE
- Incubators, accelerators
- Venture advisors, mentors

Partial List of Berkeley Startups

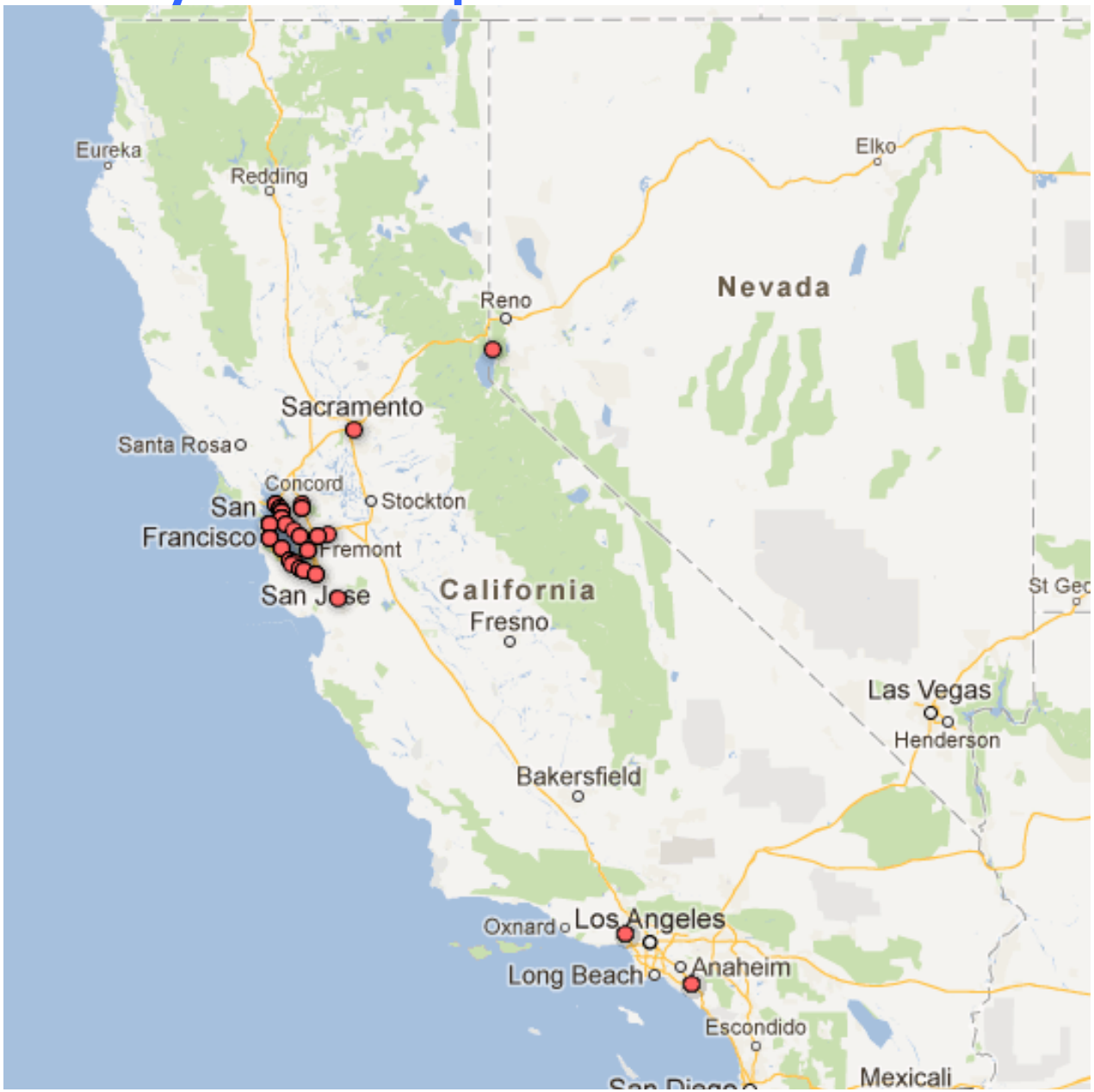
4D Biotechnologies
Acacia Biosciences (Acq By Rosetta/ Merck)
Aclima
Adura Technologies
Alien Technology
A/F Protein
Aguru
Ambrx
Amyris
Aptility (fka MicroClimates)
Ardesta
Arkal Medical
Atheer
Aurora Biofuels
Bandwidth9
Bandwidth10
Berkeley Bionics (Later Exoworks, now Eksobionics)
Berkeley Biosciences
Berkeley Madonna
Berkeley Microinstruments
Bethere
BIO-H2
Bioscale
Calimetrics (Acq By LSI Logic)
Calisolar
Caribou Biosciences
Catalyst Biosciences
Cell Guidance Systems
Cellasic (acq. By Millipore)
Cellscope
Cerebrotech
Chiron (Acq By Novartis)
Cnnsuperchip
Cognitive Wearable Technologies
Colusa Software (Acq By Microsoft)Ju
CommandCAD (acq. by Cadence)
Cooler
Cyberpac
Davis Allergy Research
DiAssess
Digital Mosaic Systems
Discera
DNA Sciences
ElmedTech
Endobionics (Now Mercator Medsys)
Ensighta Security (acq. by FireEye)
Escharax Medical
Euclid Media
Excellin Life Sciences
Exelixis
Filgen Biosciences
Fluxion Biosciences
FLX Micro
Fuel FX
Genocea Biosciences
Goodguide
Harmonic Devices
Health Interactive (Now Covarium)
HFTA
Hybrid Wisdom Labs
Imedd
Imprint Energy
Inktomi (Acq By Yahoo)
Integenx (Fka Microship Biotechnologies)
Intellione (Later TTech Systems)
Iris Micromedical
Isatis
Juvenon
Kaiwood Technologies
Kalinex
Kinemed
Leucadia Technologies
Libraria (Acq by Eidogen-Sertanty)
Lightstage
Luminus Devices (acq. San'an)
Lumiphore
Lygos
Magnetic Insight
Medifuel
Mediphone
Mendel Biotechnology
Microreactor Systems
Mimesyn
Modulus Video (Acq By Motorola, then by Google)
Molecular Dynamics (Acq by Amersham Biosciences, Then GE Healthcare)
MOR Innovations
Nanogriptech
Nanonerve
Nanosys
Nanovasc
Neomorphic Software (Acq By Affymetrix)
Neuprene Chemical
Nprint Solutions
Omniox
Oncobionic (Acq by Angiodynamics
O.N. Diagnostics
Onix Microsystems
Onwafer Technologies (Acq by KLA Tencor))
Oswald Green (Now Go2 Water)
Photoswitch Biosciences
Preference Metrics
Protiveris
Q-CHEM
Quadrant Imaging
Receptron
Redwood Bioscience
Renovis
Rha Technology
Rubicon Digital Mapping Associates
Safely
Secured Streams
Silicon Basis
Silicon Biodevices
Silicon Genesis
Silicon Laboratories (acquired by Silicon Clocks)
Similix
Singulex
Smartsense Energy
Solidus Biosciences
Spiral Genomics
Sunesis Pharmaceuticals
Taoit
Target Analytics
TeraOps
Thuris
TruVideo
Tularik (Acq By Amgen)
Two Blades Foundation
Urban Scan
Valitor
Ventria Bioscience
Xenometrics (acq. By Disc. Partners)
Zephyrus


Sector Distribution of UC Berkeley Private Startup Companies
Cleantech & Energy 12%
Life Science 45%
Information Technology 26%
Electronics & Hardware 15%
Materials 2%
As of FY 2012

Berkeley Startup Co. locations: Bay Area Map



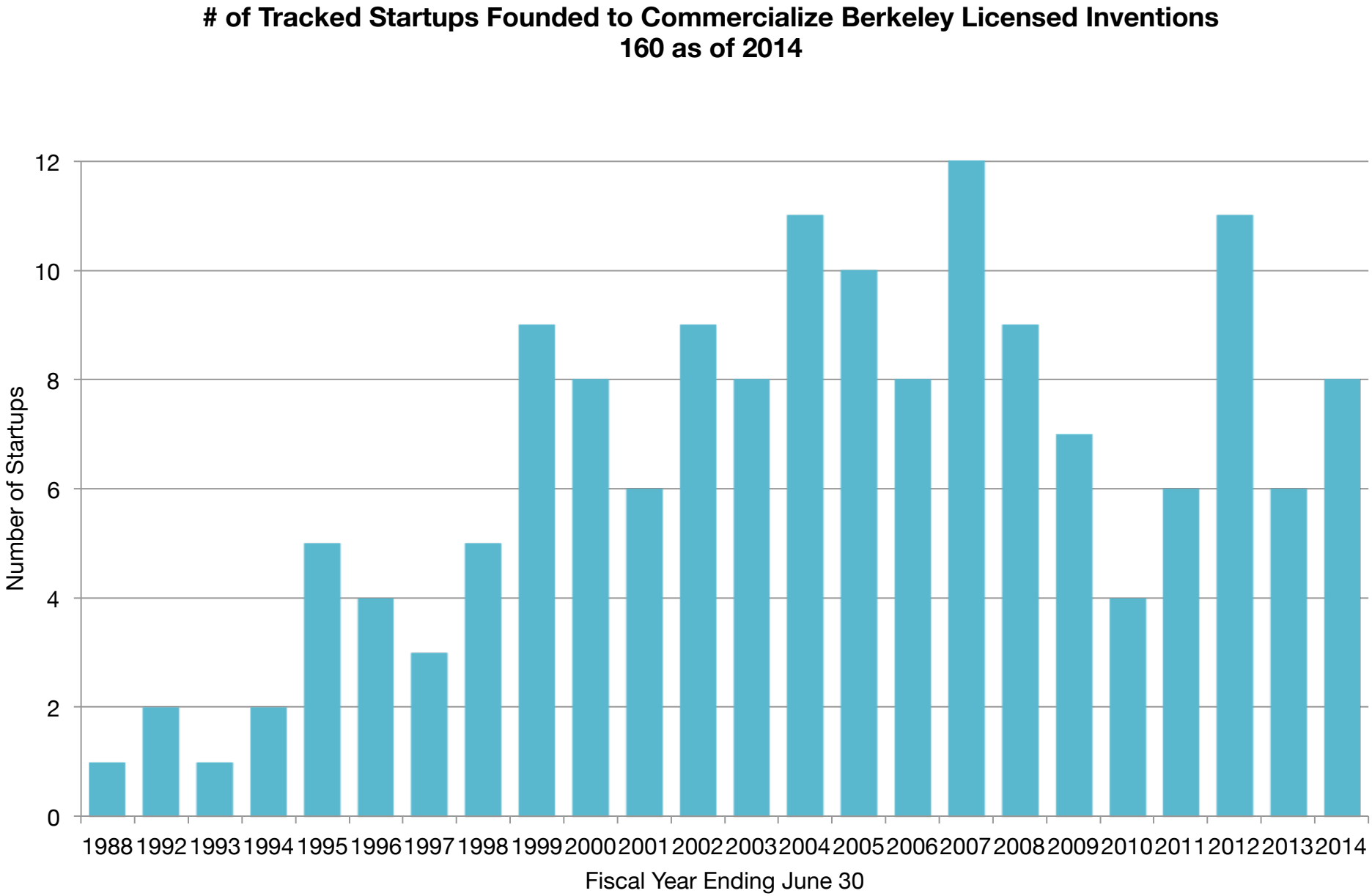
Berkeley Startup locations: CA Map



Berkeley Startup locations: US map

Berkeley Startup locations: Global Map

http://ipira.berkeley.edu/success-stories



It Came from Berkeley – Startups Bringing
Global Health & Technology Solutions to the World

Denge virus diagnostic

SUSTAINABLE SCIENCES INSTITUTE

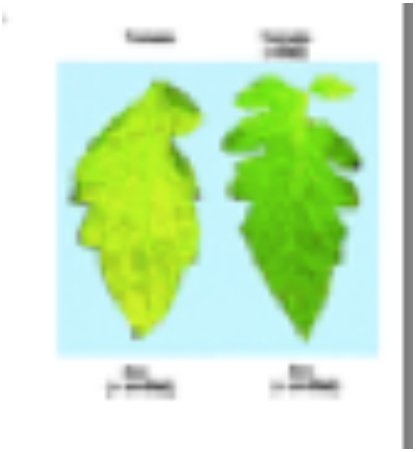
Developing Scientific Capacity to Address Public Health Needs Worldwide

CellScope's Cell-Phone Microscope

Rapid, Point-of-Care Diagnostics

SILICON BIODEVICES

Durable & Pesticide-Free Crops
Two Blades Foundation

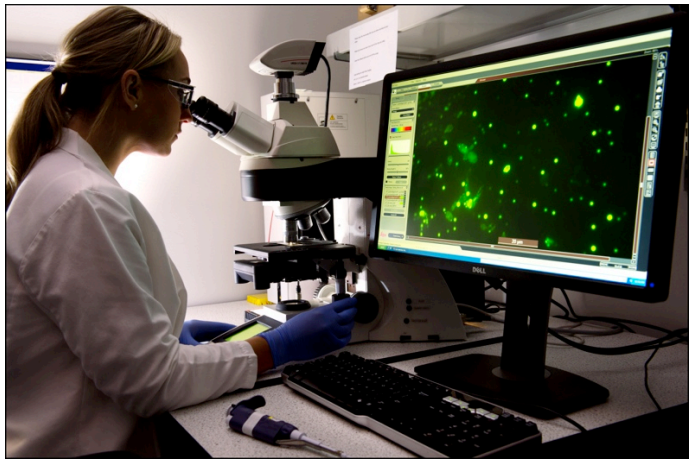


Ventria Bioscience

Safe, Reliable, Accessible
Bioactive Proteins

Amyris Biotechnologies From Curing Malaria to Better Fuels

Delivering sustainable growth for the worlds leading brands



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The New York Times

SundayBusiness

SUNDAY, JUNE 3, 200

BRIGHTIDEAS

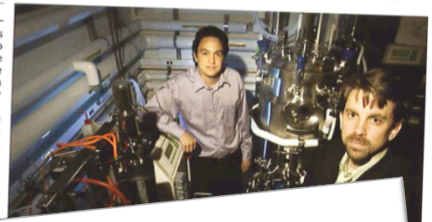
SLIPSTREAM

First, Cure Malaria. Next, Global Warming.

By JASON PONTIN

AMYRIS BIOTECHNOLOGIES has almost finished developing a cheap cure for malaria that could save the ves of millions of the poor. Now, using the ime technology, this start-up in meryville, Calif., wants to create new ofuels that may help save the planet.

Even in an industry much attached to yperbole, few companies have excited ich high hopes. Investors include the Bill Melinda Gates Foundation, which grant- 1 the Institute for OneWorld Health 12.6 million to finance Amyris's anti- ılarial drug, and two princes of Silicon alley venture capital, John Doerr of leiner Perkins Caufield & Byers, and inod Khosla of Khosla Ven



Creating life forms: There's an app for that

Amyris's 'bio-factories' produce medicines and other products – and concerns about unknown risl

BY ARIANA EUNJUNG CHA

For scientist Jack Newman, creating a new life form has become as simple as this: He types out a DNA sequence on his laptop. Clicks "send." And a few yards away in the laboratory, robotic arms mix together some compounds to produce the desired cells.

Newman's biotech company is creating new organisms, most of them forms of genetically modified yeast, at the dizzying rate of more than 1,000 a day. Some convert sugar into medicines. Others create moisturizers that can be used in cosmetics. And still others make biofuel, a renewable energy source usually made from corn.

"You can now build a cell the same way you might build an app for your iPhone," said Newman, chief science officer of Amyris.

Some believe this kind of work marks the beginning of a third industrial revolution — one based on using living systems as "bio-factories" for creating substances that are too tricky or too expensive to grow in nature or make with petrochemicals.

PETER DASILVA FOR THE WASHINGTON

Jack Newman, Amyris's chief science officer, says bio-factories offer a green alternative

LEADING INVESTORS

TOTAL · TEMASEK HOLDINGS · KPCB · Fidelity INVESTMENTS · BIOLDING investment · TPG BIOTECH · khosla ventures · naxos

AMYRIS

Thank you! Berkeley Startups: Partial List of VC & Private Capital Investors

3i
5AM Ventures
Abingworth Management
Acumen Foundation
Adams Street Partners
Advanced Technology Ventures
Allen & Company
Alta Partners
AME Cloud Ventures
Angels Forum/Halo Fund
Apax Partners
Applied Genomic Technology Capital (AGTC) Funds
Archangel BioVentures
Arch Venture Partners
Ardesta
Avery Dennison
Beagle Ltd.
Bill and Melinda Gates Foundation
Biomedical Partners
BioVeda Capital
Claremont Creek Ventures
CMEA Ventures
Convexa
Credit Suisse First Boston
Crocker Capital
Cross Creek Capital
CSFB Private Equity
DAG Ventures
Delphi Ventures
De Novo Ventures
DFJ - Draper Fisher Jurvetson
Digital Bandwidth
Domain Associates
Dow Chemical Company
Dupont iTechnologies
El Dorado Ventures
E.M. Warburg, Pincus & Co.
Emigrant Capital
3iEquitek Capital
Essex Woodlands
First Analysis
Flagship Ventures
Forward Ventures
Frazier Healthcare Ventures
Gabriel Venture Partners
Gemplus
Globespan Capital Partners
Goldman, Sachs & Co.
Greenspring Associates
Halo Fund The Angels Forum
HBM Bioventures (formerly Roche Holding AG)
HNW Capital
Hummer Winblad Venture Partners
In-Q-Tel
Intel Capital
International Biotechnology Trust
International BM Biomedicine / Global Biomedical Partners
Khosla Ventures
Kleiner Perkins Caulfield & Byers
Kodiak Venture Partners
Life Science Angels
Lightspeed Venture Partners
Lombard Odier & Cie
Lumira Capital
Lux Capital
Matrix Partners
Mayfield Fund
MDS Capital Corp
Mission Bay Capital
Mohr Davidow Ventures
New Enterprise Associates
New Medical Technologies
NGEN Partners
Noventi
Oak Investment PartnersPartech
Osage University Partners International
Philips Electronics
Phoenix Venture Partners
Physic Ventures
Polaris Ventures
Qualcomm Ventures
Quan Ventures
QuestMark Partners
Qventures
Rock Health
Rho Management
Rona Holdings
Samsung Ventures
Scale Venture Partners
Sierra Ventures
Sevin Rosen Funds
SG Cowen
Skyline Ventures
Strategic Partners
Tallwood Venture Capital
Thomas, McNerny & Partners
Toray International
TPG Ventures
UPM-Kymmene
Vantage Point Capital Partners
Venrock Associates
Versant Ventures
Vista Ventures
Western Technology Investment Inc. (WTI)
X/Seed Captial Management

Entrepreneurship & Economic Impact

Bay Area Council

Economic Institute

Sean Randolph et al.

May, 2014

Based on data as of 2012

UC Berkeley

Stimulating Entrepreneurship in the Bay Area and Nationwide

An Exploration of the Economic Contributions of UC Berkeley through Company Formations by Alumni, Faculty and Affiliates

2014

an analysis prepared by the

BAY AREA COUNCIL ECONOMIC INSTITUTE

Connecting business, labor, government and education

U.C. Berkeley Entrepreneurs

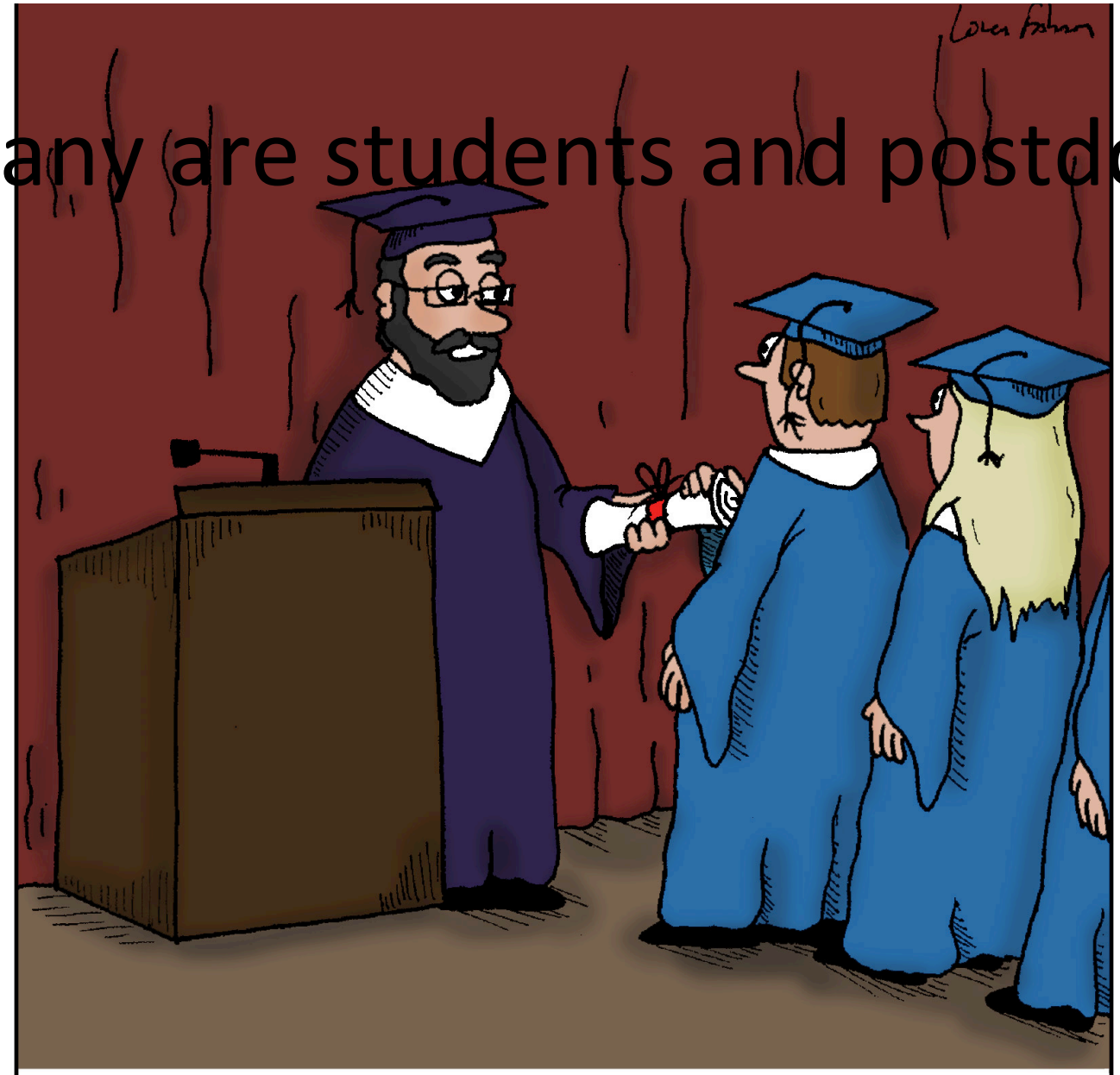
- **Baby Boomers** have been a driving force
  - with a total **of 809 founders**.

- **More women graduates are founding companies.**
  - Women represent 21 percent of all identified Berkeley founders
  - 31% of founders graduating in decade of 2000s are women

- **Diverse academic backgrounds**,
  - 15 different colleges.
  - ~70 % of founders earned graduate or professional degrees from Berkeley.

Nearly 25% of founders have more than one degree from Berkeley.

Many are students and postdocs



"Congratulations, your days of avoiding the real world are finally over."

Economic Impact

- 2,610 firms - **542,433 total jobs**, and on average employ 208 workers each.

- Total global revenues ~**$317 billion**.

- 52% of all firms established by Berkeley founders are in the fields of Professional, Scientific & Technical Services.

- Manufacturing and Computer Systems Design top the list for Berkeley founders in the generation of jobs and revenues.

➢ **Manufacturing** 1,592 workers, $273 billion annual revenue

➢ **Computer Systems Design** firms ave. 518 workers and aggregate annual revenues of $19 billion

Economic Impact is Concentrated in Bay Area

- **55%** of co's established by Berkeley founders are located in the Bay Area.
  - particularly deep roots in **Silicon Valley**.

➢ Firms across the rest of the US account for **19%** of total companies founded and **6% of total jobs**.

➢ Foreign-based firms constitute **<2% of total** firms established by Berkeley founders and **<1 percent of jobs**.

Direct & Induced Impacts

- Broader economic effects across the US economy,
  - firms started by Berkeley founders are responsible for **1,247,490 jobs**
  - **$238 billion** in total US economic output

- Business activities generate **direct** business revenues
  - and indirect and induced revenues through business transactions.
  - total business revenues **$85.9 billion of the total value of goods and services produced in the US,**
  - and of this, **$24.4 billion is personal (payroll) income.**

- **Federal, state and local tax revenues**
  - and in 2012 the **broader ripple effect through the economy totaled $27.3B**.
  - includes employee compensation tax, corporate tax, and consumer tax

TOP 10 UNIVERSITIES

(1/09 TO 7/14)

		founders	companies	capital raised ($M)
1	Stanford	378	309	$3,519
2	UC Berkeley	336	284	$2,412
3	MIT	300	250	$2,417
4	Indian Institute of Technology	264	205	$3,150
5	Harvard	253	229	$3,235
6	University of Pennsylvania	244	221	$2,194
7	Cornell	212	190	$1,971
8	University of Michigan	176	158	$1,159
9	Tel Aviv University	169	141	$1,253
10	University of Texas	150	137	$1,298

DATA: PITCHBOOK

Top Universities

Ranked by number of alumni who founded companies that received a first round of VC funding.

2013 (through 3Q)

1. UC Berkeley	41
2. Stanford University	34
3. MIT	32
4. Harvard University	24
5. University of Pennsylvania	22
6. Carnegie Mellon University	22
7. University of Illinois	22
8. Cornell University	19
9. University of Texas	19
10. University of Michigan	18

2012

1. Stanford University	66
2. UC Berkeley	54
3. University of Michigan	39
4. Cornell University	38
5. Harvard University	36
6. University of Pennsylvania	34
7. MIT	33
8. Indian Institutes of Tech.	29
9. Columbia University	26
10. USC/Duke University (tie)	25

2011

1. University of Pennsylvania	56
2. Stanford University	54
3. UC Berkeley	44
4. Harvard University	40
5. Cornell University	32
6. MIT	31
7. Indian Institutes of Tech.	25
8. Brown University	25
9. University of Michigan	23
10. Univ. of Illinois/Yale (tie)	23

2010

1. Stanford University	36
2. Harvard University	23
3. UC Berkeley	21
4. Cornell University	21
5. University of Pennsylvania	19
6. MIT	19
7. University of Texas	17
8. Carnegie Mellon University	17
9. Brown University	16
10. Michigan/Illinois/Yale (tie)	13

Source: PitchBook

SAN FRANCISCO BUSINESS TIMES

UC BERKELEY AND UCSF SPINOFF COMPANIES

INCORPORATED FROM 2009 TO 2013, RANKED BY FUNDING

	Company Website	Address Phone	University affiliation	Funding[1]	Year incorporated	Business description	Employees	Founder(s)	Top Bay Area executive
1	**Nurix Inc.** *www.nurix-inc.com*	1700 Owens St. Ste. 250 San Francisco 94158 415-865-2057	UC Berkeley	$31,600,000	2009	Develops therapies that modulate the ubiquitin proteasome system for human health	11	John Kuriyan, Michael Rap, Arthur Weiss	Mark Goldsmith Interim CEO
2	**Imprint Energy Inc.** *www.imprintenergy.com*	1320 Harbor Bay Pkwy. Ste. 110 Alameda 94502 510-748-0233	UC Berkeley	$8,500,000	2010	Ultra-thin, flexible, rechargable zinc-based battery technologies	8	Brooks Kincaid, Christine Ho	Devin Mackenzie CEO
3	**CellScope Inc.** *www.cellscope.com*	530 Howard St. Ste. 300 San Francisco 94105 888-930-6490	UC Berkeley	$5,500,000	2010	Smartphone-enabled health diagnostic toolkit; first device is a digital otoscope for ear exams	13	Erik Douglas, Amy Sheng	Erik Douglas CEO
4	**OncoSynergy Inc.** *www.oncosynergy.com*	409 Illinois St. San Francisco 94158 415-666-2193	UCSF	$3,800,000[2]	2011	Develops therapeutics to treat cancer and neurofibromatosis	6	W. Shawn Carbonell, Catherine Park	W. Shawn Carbonell CEO
5	**Bandwidth10 Ltd.** *www.bandwidth10.com*	3575 Sweigert Road San Jose 95132 203-561-0769	UC Berkeley	$3,375,000	2011	Manufactures tunable, single mode, 1550-nm-long-wavelength transceivers for datacom applications	10	Chris Chase, Mike Huang, Yi Rao, Phil Worland, Connie Chang-Hasnain	Phil Worland President and CEO
6	**Valitor Inc.** *www.valitorbio.com*	130 Stanley Hall #3220 Berkeley 94720 510-969-9246	UC Berkeley	$2,121,838	2010	Develops protein conjugates to optimize the performance of biotechnology-based drugs	2	NR	Wesley Jackson CSO
7	**Silicon BioDevices Inc.** *www.siliconbiodevices.com*	820 Heinz Ave. Berkeley 94710	UC Berkeley	$2,000,000[3]	2009	Develops single-use handheld medical tests with laboratory performance	8	Octavian Florescu, Tayson Siegel	Gary Stroy CEO
8	**SeaChange Pharmaceuticals Inc.** *www.seachangepharma.com*	3031 Tisch Way Ste. 704 San Jose 95128 415-937-1732	UCSF	$1,663,603[4]	2009	Uses new technology to predict off-target drug activities and toxicity	6	Michael Keiser, John Irwin, Brian Shoichet, C. Nicholas Hodge	C. Nicholas Hodge President and COO
9	**Atheer Labs Inc.** *www.atheerlabs.com*	2061 Landings Drive Mountain View 94043	UC Berkeley	$1,500,000[5]	2011	3D augmented-reality glasses	20	Soulaiman Itani	Soulaiman Itani CEO
10	**DiAssess Inc.** *www.diassess.com*	NR Berkeley	UC Berkeley	$750,000	2013	Creates rapid DNA diagnostic tests	3	John Waldeisen, Ivan Dimov, Debkishore Mitra	John Waldeisen CEO
11	**Correlia Biosystems Inc.** *correliabio.com*	953 Indiana St. San Francisco 94107 707-813-1860	UC Berkeley	$600,000	2013	Creates proteomic technology that integrates complex assays into portable diagnostic platforms	3	Akwasi Apori, Samuel Q. Tia, M. Kursad Araz	Akwasi Apori CEO
12	**Apricity Therapeutics Inc.** *www.apricitytherapeutics.com*	953 Indiana St. San Francisco 94107 650-361-1192	UCSF	$365,000	2012	Bioscience company that harnesses cellular transporters to improve drug effectiveness and reduce toxicity	2	Kathleen Giacomini, Ethan Geier, Sook Wah Yee, Richard Mamelok, Swati More	Ethan Geier President
13	**Zephyrus Biosciences Inc.** *www.zephyrusbio.com*	2150 Shattuck Ave. PH Suite Berkeley 94704 415-830-7760	UC Berkeley	$350,000	2013	Life sciences company developing tools to enable protein analysis in single cells	8	Kelly Gardner, Josh Molho, Amy Herr	Kelly Gardner CEO
14	**Caribou Biosciences Inc.** *www.cariboubio.com*	2929 Seventh St. Ste. 120 Berkeley 94710 510-982-6030	UC Berkeley	$308,902	2011	Genome engineering platform technology that builds a toolbox based on CRISPR proteins to modify genomes	12	Jennifer Doudna, Rachel Haurwitz, Martin Jinek, James Berger	Rachel Haurwitz President and CEO
15	**Safe Medical Design LLC** *NR*	190 Funston Ave. Ste. 204 San Francisco 94118 415-994-6345	UCSF	$196,000	2012	Urinary catheter design to reduce catheter trauma and infections	5	Maurice Garcia, David Aaronson	David Aaronson Maurice Garcia Co-founders
16	**U.S. Bionics Inc.** *NR*	NR Berkeley	UC Berkeley	$150,000	2011	Develops a trunk-supporting bionic exoskeleton system	NR	Homayoon Kazerooni	Homayoon Kazerooni Founder[6]
NR	**4D Molecular Therapeutics LLC** *www.4dmoleculartherapeutics.com*	953 Indiana St. San Francisco 94107	UC Berkeley		2012	Develops transgene-expressing viral gene therapy products	7	David Schaffer, David Kirn	David Kirn Executive chairman
NR	**Cerebrotech Medical Systems Inc.** *cerebrotechmedical.com*	1249 Quarry Lane Ste. 120 Pleasanton 94566 925-399-5392	UC Berkeley		2010	Develops a noninvasive, continuous monitor for detecting early stages of cerebral bleeding and edema	2	Boris Rubinsky, Mitch Levinson	Mitch Levinson President and CEO
NR	**Emerging Objects Corp.** *www.emergingobjects.com*	1661 20th St. Ste. 1 Oakland 94607 510-907-9967	UC Berkeley		2013	Produces architectural building components manufactured by 3D printing technologies	6	Ronald Rael, Virginia San Fratello	Ronald Rael CEO
NR	**Kuro Labs Inc.** *kurolabs.co*	NR San Francisco 508-395-4914	UC Berkeley		2012	Develops software for diagnostic analytics with applications to mobile battery life and system performance	2	Adam Oliner, Jacob Leverich	Adam Oliner CEO
NR	**Magnetic Insight Inc.** *NR*	NR Berkeley 408-203-6052	UC Berkeley		2012	Develops a new type of medical imaging technology	1	Patrick Goodwill, Steve Conolly	Patrick Goodwill Co-founder[7]
NR	**MLM Medicus LLC** *www.mlmmedicus.com*	190 Funston Ave. Ste. 204 San Francisco 94118 415-994-6345	UCSF		2010	Software apps to make biometric medical, food-portion measurements, clinical studies and nomograms using a smartphone	1	Maurice Garcia	Maurice Garcia CEO
NR	**Rescue Therapeutics LLC** *NR*	NR San Francisco	UCSF		2011	Medical therapeutics	NR	David Jablons, Michael Mann	David Jablons Co-founder[6]
NR	**Spiral Devices LLC** *www.spiraldevices.com*	1440 Fourth St. Ste. C Berkeley 94710 510-292-4575	UC Berkeley		2010	In-vivo gene delivery company	1	Scott Geller	Scott Geller CEO

[1] Includes Small Business Innovation Research and Small Business Technology Transfer program grants and venture capital funding. Company may have received other funding that is not included in this total.
[2] Angel funding.
[3] Funding includes SBIR grants, bridge financing, partnership financing and business competition awards.
[4] SBIR/STTR funding; does not reflect all funding.
[5] Estimated amount of VC funding obtained through SFBT research.
[6] Company did not report a top executive. This is a founder.
[7] Company was looking for a CEO at press time.

▸ CLOSER LOOK

$62M

Amount of funding reported by the UC Berkeley and UCSF spinoff companies on the List

638

Number of startup companies that have been formed from University California research as of 2013 across all campuses. A UC startup is defined as a legally organized/incorporated company whose formation depended on the acquisition of rights to UC's interest in at least one disclosed UC technology.

ABOUT THE LIST

This List includes active, independently operated companies incorporated between 2009 and 2013 that formed to commercialize technology created at the University of California, Berkeley and University of California, San Francisco. Companies are located in the Bay Area, which is defined as Alameda, Contra Costa, Marin, San Francisco, San Mateo and Santa Clara counties.

Information was obtained from the University of California Office of the President and campus representatives. Companies that have not received funding or did not report funding are unranked on the list. Companies in stealth mode are not included.

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Recent VC funding into UCB and UCSF licensed startups

http://ipira.berkeley.edu/sites/default/files/shared/SFBT_-_FINAL.PDF

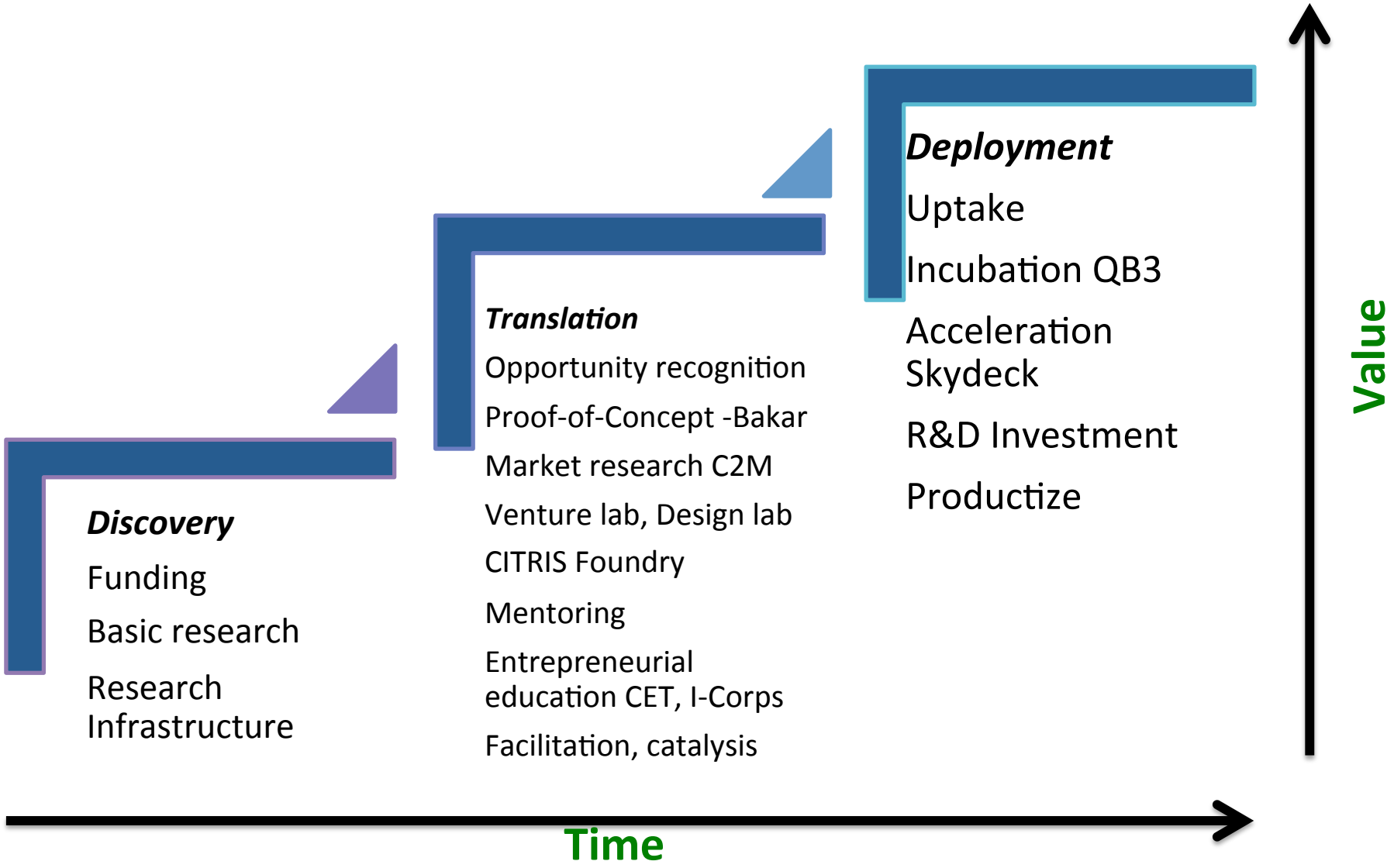
Osage U. Partners - Innovation in VC

Discovery → Development → Deployment

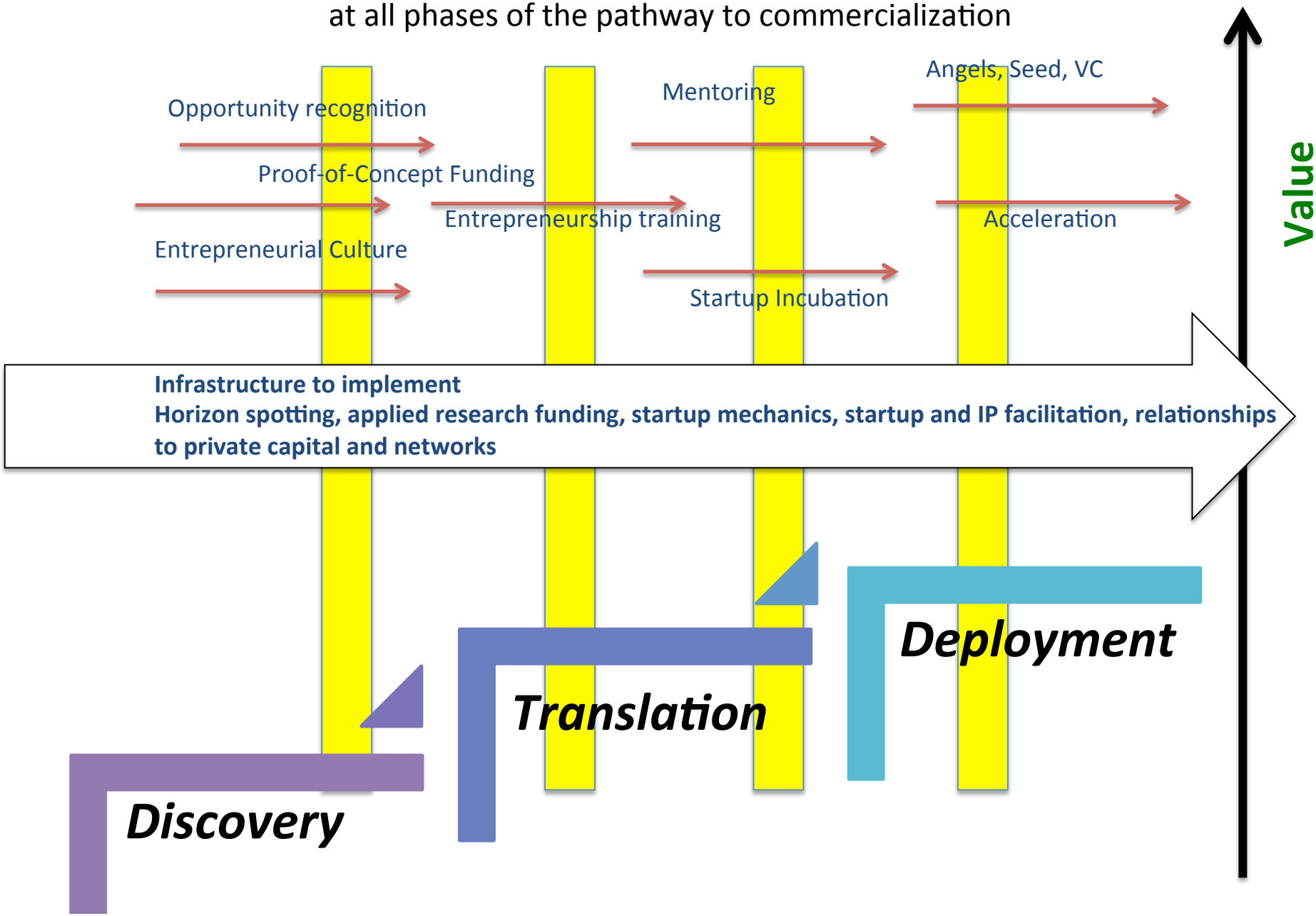
Preemptive Rights

Create and Capture Value

Stages on the stairway to value creation



Next Level: Enhance, sustain culture of innovation and entrepreneurship
Refine an innovation ecosystem that supports researchers and entrepreneurs at all phases of the pathway to commercialization



Entrepreneurship @ Cal

New Directions in Entrepreneurship @ Cal

Bakar Fellows Program

About

The Bakar Fellows Program supports innovative research by early career faculty at UC Berkeley with a special focus on projects that hold commercial promise. **The first cohort of Bakar Fellows was announced in June 2012 (click here to learn more).**

The Bakar Fellows Program will enhance the efforts of UC Berkeley's world-class faculty to translate important scientific discoveries into practical solutions in the fields of Engineering, Computer Science, Chemistry, Biological Sciences, Physical Sciences, and in multidisciplinary work in these areas.

Faculty members selected as Bakar Fellows each receive discretionary research support for a maximum of five years. In addition, the Fellows will become part of and contribute to an ecosystem that brings together faculty, post-docs, students, staff and alumni to form a strong network that assists researchers in introducing their discoveries to the market.

Bay Area NSF Innovation Corps

ABOUT

The Bay Area NSF Innovation Corps (I-Corps™) is a collaboration between the University of California Berkeley, University of California San Francisco and Stanford University and funded by the National Science Foundation that offers educational programs to accelerate the commercialization of science and fosters technology entrepreneurship nationally.

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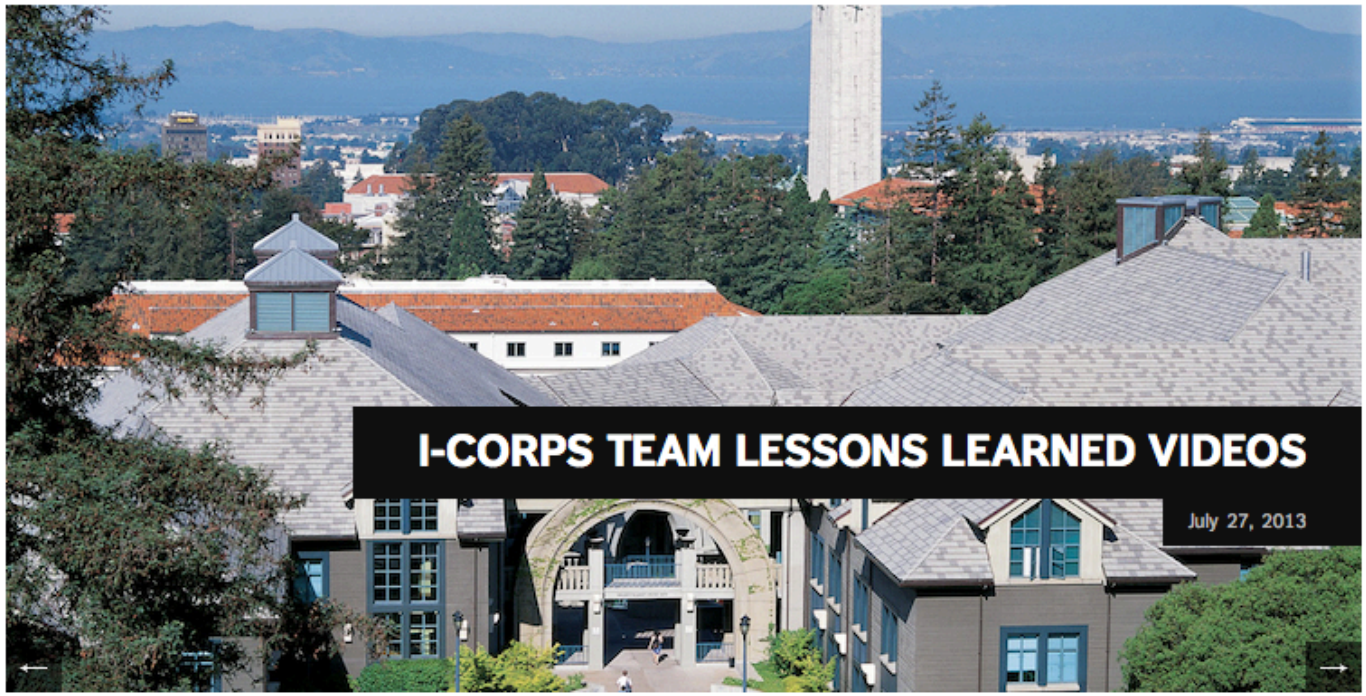
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