



IGNITING INNOVATION
UCI knowledge at work

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An exhibit in the
UC Irvine Langson Library
Muriel Ansley Reynolds
Exhibit Gallery

May 2013 - October 2013

Featuring a talk by the
UCI Vice Chancellor
for Research
John Hemminger

Welcome to the UC Irvine Libraries' spring exhibit,

Igniting Innovation: UCI Knowledge at Work.

Igniting Innovation highlights many of the pioneering ideas developed at UC Irvine that were or currently are being turned into commercial products, particularly in the areas of education, medicine, applied information technology, and environmental technologies.

The exhibit showcases the research process that leads to ground-breaking ideas and the Libraries' role in nurturing new knowledge, while also exploring the university-industry partnerships that facilitate technology transfer, patent licensing, and entrepreneurial relationships. Finally, we provide examples of how UCI educates and leads on the newest approaches to strategic innovation and entrepreneurship.

We are delighted to have John Hemminger, UCI Vice Chancellor of Research, as the featured speaker for our exhibit opening event on May 21, 2013.

I hope you enjoy the exhibit and return to view others in the future.

Lorelei Tanji
University Librarian

Igniting Innovation: UCI Knowledge at Work

Innovation is represented by the conversion of knowledge into new products and processes which, when commercialized, generate wealth. Advances in ideas happen at the knowledge frontier, originating from state of the art scientific and technological research. The UCI Libraries and the University have an important role in supporting innovation and identifying which innovations may help the transformation and economic growth of Orange County.

The UCI-Industry partnership exploits the strengths of academe and industry. Many innovators are not adept at downstream activities such as scaling-up, and the marketing and distribution of commercial products. Industry has these skills and the tolerance for the considerable risk-taking and investment that is needed to bring a technology idea to full development.

Proximity to top-tier universities has been attributed to the success of industrial high technology clusters such as Orange County's "Silicon South." Orange County has one of the most diverse technology environments in the nation with more than 600 biomedical and information technology companies, which employ close to 100,000 people. This partnership creates an economic "aura" that benefits the surrounding cities and counties of the university. In 2011 alone OCTANe said that in Orange County "about 3,300 patents were granted here, UC Irvine reported more than 100 new inventions, and investment capital was expected to be about \$550 million."

UCI has world-class research facilities and educational resources. The multiple research centers and institutes allow faculty to collaborate and innovate across departments to solve problems in new ways. These solutions produce an abundance of patents and licensing possibilities enriching UCI's relationships with the local business community. A recent study estimates the total contribution of university licensing to United States gross industry output is at least \$162.1 billion and as much as \$686.9 billion. Innovation comes from new knowledge and UCI is at the center of facilitating new knowledge creation.

UCI-Industry Collaboration

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1. ***University – Industry Technology Transfer Conceptual Model.*** From "Reengineering university—industry interactions: knowledge-based technology transfer model." European journal of economics, finance, & administrative sciences. Issue 40: 47-58. 2011.
2. ***Engines of innovation : the entrepreneurial university in the twenty-first century.*** Holden Thorp and Buck Goldstein. Chapel Hill : University of North Carolina Press, 2010.
3. ***Creativity and the global knowledge economy.*** Michael A. Peters, Simon Marginson, and Peter Murphy. New York : Peter Lang, 2009.
4. ***The new idea factory : expanding technology companies with university intellectual capital.*** Clifford M. Gross, Uwe Reischl, Paul Abercrombie. Columbus, OH : Battelle Press, 2000
5. ***"Orange County is 'innovation dense'."*** OCTANe, 2012.

UCI has a large number of biomedical, environmental, and technology companies surrounding it in the Orange County area as possible collaborators.

6. **"Orange County is 'innovation dense'."** OCTANe, 2012.
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7. **"UCI research centers and institutes."** OCTANe, 2012.

These centers and institutes provide a mechanism and organizational structure for collective research and interdisciplinary activities that are fundamentally different from those that occur normally within the schools and departments. They are intended to foster the development of short and long-term research programs that span disciplines and academic units, thereby making it possible for faculty members to work collaboratively.

8. **"UC Irvine economic impact on Orange County economy."** UC Irvine, 2012.

TECHNOLOGY TRANSFER

One mission of UCI is helping faculty to have an increased chance of seeing their ideas turned into real-world products. The UCI side of the process could be summarized in 5 areas: supporting discovery, improving opportunity recognition, helping test feasibility and marketability, protecting intellectual property, and assisting licensing and use of ideas. The benefits to the University and its "inventors" are the licensing fees industry will pay to explore an idea. The University can also find that by being less dependent on government funding they are cushioned from major cutbacks from government, industry, or foundation sources.

The guiding hand in this process is the Office of Technology Alliances and their four areas of managing innovation at UCI: technology transfer, identifying inventions, patenting & protection, and the innovation support ecosystem.

9. **Technology transfer and the university.** Gary W. Matkin; foreword by Clark Kerr. New York : Macmillan Pub. Co., 1990.
10. **What every engineer should know about technology transfer and innovation.** Louis N. Mogavero, Robert S. Shane, with contributions by Joel Schechter and Norman L. Parr. New York : M. Dekker, 1982.
11. **"UCI Office of Technology Alliances."**

The UCI Office of Technology Alliances (OTA) helps license and manage UCI's invention portfolio. OTA ensures that the federal, state and private investment in UCI research has the greatest possible positive impact on people and the economy. They foster economic development through the formation and nurturing of new businesses. OTA also actively manages the risks associated with university and industry interactions.

12. **"UCI technology transfer process."** UCI Office of Technology Alliances, 2012.
13. **"Global dimensions of intellectual property rights in science and technology."** Office of International Affairs, National Research Council ; edited by Mitchel B. Wallerstein, Mary Ellen Moguee, Roberta A. Schoen. Washington, DC : National Academy Press, 1993.
14. **"Intellectual Property Management."**

The management and protection of intellectual property (IP) is critical to research. Intellectual property is a legal concept which refers to creations of the mind, the owners of which are granted certain exclusive rights. Common types of intellectual property rights include copyrights, trademarks, patents, and industrial design rights.

BIOMEDICAL INNOVATIONS

UCI's Department of Biomedical Engineering has led the way in researching biomedical devices. Orange County has one of the largest concentrations of biomedical device companies in the United States which has led to many start-up ideas originating with UCI research. In fact 41% of the inventions developed at UCI were in the medical field. These recent innovations in hearing research are creating life changing devices for potentially millions of people.

SOUNDCURE

This innovation was developed in the UCI Hearing & Speech Lab by Dr. Fan-Gang Zeng, Director of the Center for Hearing Research and UCI Professor of Otolaryngology and Biomedical Engineering. Dr. Zeng and his researchers worked with a tinnitus patient using a cochlear implant to create a custom sound that could be played over an MP3 player. The patient, who suffered from severe tinnitus, reported that the "calming, pleasant tone" provided consistent relief. Continuing that work, Dr. Zeng, audiologist Dr. Jeff Carroll and Dr. Hamid Djalilian (UCI Associate Professor of Clinical Otolaryngology) successfully expanded their efforts to treat more tinnitus sufferers (including those who do not have cochlear implants) to see if custom sound therapy could be used widely. They reported their successes with low-pitched external sound at the September 2007 meeting of the American Academy of Otolaryngology. A firm, Allied Minds, learned of the UCI work, licensed the technology, created a company called SoundCure™ and put together an executive team. In September 2011, SoundCure began offering the "Serenade® Tinnitus Treatment System" to audiologists.

15. **"That Ringing Sound."** (Illustration from McClatchy-Tribune.) Pat Brennan. Orange County Register "UCI: New device eases painful ringing in ears" May 8, 2012.

Tinnitus is the medical term for "hearing" noises in your ears when there is no outside source of the sounds. The noises can be soft or loud. They may sound like ringing, roaring, buzzing, hissing, or whistling.

16. **"UC Irvine Hearing and Speech Sound Testing Laboratory researchers."**
 - a. Kelly M. Reavis, Vanessa S. Rothholtz, Qing Tang, Jeff A. Carroll, Dr. Hamid Djalilian, and Dr. Fan-Gang Zeng.
 - b. Dr. Hamid Djalilian.
 - c. Dr. Fan-Gang Zeng.
17. **Serenade Device from SoundCure.**

Serenade is a sophisticated Digital Signal Processing (DSP) platform that enables patients to use customizable sound therapy for each patient's unique tinnitus. It has three types of treatment sounds and data logging that records patient usage.
18. **"Temporary suppression of tinnitus by modulated sounds."** Kelly M. Reavis, Vanessa S. Rothholtz, Qing Tang, Jeff A. Carroll, Hamid Djalilian, and Fan-Gang Zeng. Journal of the Association for Research in Otolaryngology. 13 (4) 2012.
19. **"Tinnitus treatment : clinical protocols."** Edited by Richard S. Tyler. New York : Thieme, 2006.
20. **"UC Irvine Hearing and Speech Sound Testing Laboratory."**

Professor Fan-Gang Zeng and his associates at the UC Irvine Hearing and Speech Laboratory are working with a patient assessing his hearing.
21. **"Serenade Poster."**

The SoundCure Company provided the exhibit with promotional materials they use to educate physicians and patients.

NUROTRON

Dr. Fan-Gang Zeng, Director of the Center for Hearing Research and UCI Professor of Otolaryngology and Biomedical Engineering helped create an algorithm allowing a person's cochlear implant to process musical and speech tones with much greater fidelity. He worked with UCI's Office of Technology Alliances to start a company that tests and manufactures cochlear implants. "I made a vow that this time the invention would benefit people who need this technology," says Zeng. Nurotron Biotechnology Inc., tests and manufactures low-cost, high-performance cochlear implants. Currently available in China, the devices are awaiting regulatory approval in the U.S. and Europe.

Coding Strategy for tone language

Nurotron tone language coding strategy extracts the fundamental frequency (F0) of speech signals in

real-time manner, and at the same time changes the amplitude envelope of the speech signals according to the extracted fundamental frequency signals, making the amplitude envelope of the speech signals approximate to the fundamental frequency, thus improving tone recognition and speech recognition.

Nurotron Biotechnology Inc. Ltd

22. **"Professor Fan-Gang Zeng Holding Cochlear Implant."** UCI press release, Sept. 16, 2011.
23. **Cochlear implants : auditory prostheses and electric hearing.** Fan-Gang Zeng, Arthur N. Popper, Richard Fay, editors. New York : Springer, 2004. Springer handbook of auditory research ; v. 20.
24. "Fundamental frequency is critical to speech perception in noise in combined acoustic and electric hearing." Jeff Carroll, Stephanie Tiaden, and Fan-Gang Zeng. The Journal of the Acoustical Society of America. 130, 2011.
25. "A Chinese Implant Takes Aim at Cochlear." **Bloomberg BusinessWeek.** Bruce Einhorn and Natasha Khan. No. 4323: 53-54. 2013.

The Nurotron device is competition for the more widely known Australian cochlear device.

26. **"Nurotron Device."** From Nurotron Biotechnology Company, Ltd.
 - a. **Sub-cutaneous implanted electrode.**
 - b. **External earpiece.**

The earpiece transmits sound to the electrode via a magnetic circuit connection. The connection allows the earpiece to be recharged or have its software updated.

- c. **Diagram of Nurotron device.**

INCLINE 2

IDENTIFYING INVENTIONS

A marketable idea has to pass through many barriers to improve its chances of being useful and marketable. The Office of Technology Alliances' (OTA) office guides faculty through the assessment of their idea for patentability and marketability.

27. **Nurturing science-based ventures : an international case perspective.** Ralf W. Seifert, Benoît F. Leleux, Christopher L. Tucci. London : Springer, 2008.

The University and the inventor need to work together to identify innovations which may have commercial possibilities.

28. **"UCI inventions portfolio by academic unit."** UCI Office of Technology Alliances, 2012. Innovation is not confined to a single department or school at UCI. As of September 14, 2012 there were 906 active UCI inventions from more than 7 different academic units.
29. **"Increase in Active UCI Inventions."** UCI Office of Technology Alliances, 2012. UCI has experienced a steady increase in the use of inventions derived from UCI research.
30. **Entrepreneurship for scientists and engineers.** Kathleen Allen. Upper Saddle River, N.J. : Prentice Hall, 2010.

While scientists or engineers have immense technical knowledge they may need education in the unique environment of the entrepreneurial venture.

31. ***"Income from and value of UCI Innovation."***

A few of the important inventions derived from UCI research is shown here. These inventions have produced royalties and fees or have attracted commercial interest in licensing. UCI Inventions earned \$104.04 million in FY 2010 from royalties and fees.

- a. **"Select UCI Inventions."** UCI Office of Technology Alliances, 2012.
- b. **"Top 3 Inventions from UCI Research."** UCI Office of Technology Alliances, 2012.

WALL CASE 3

POWER ENGINEERING & COMPUTING INNOVATION

Innovative technology has been accelerating. Advances in making existing devices work better, communicate more effectively with each other, and saving energy in the process have lead this infusion of theoretical work leading to real improvements. The UCI Department of Electrical Engineering and Computer Science (EECS) is at the forefront of this work. Their knowledge of mathematical and natural sciences is applied to the theory, design, and implementation of devices and systems for the benefit of our society.

ZEROWATT

32. **"Dr. Fred Tzeng."**

Fred Tzeng worked with Payam Heydari on the ZeroWatt circuitry. He graduated from UCI with Bachelor's, Master's and Doctoral Degrees in Electrical Engineering. He now devotes his time to licensing ZeroWatt patents and rights.

33. **"Dr. Payam Heydari, UCI Professor, Electrical Engineering and Computer Science."**
Dr. Heydari and Dr. Tzeng developed the ZeroWatt circuitry.

34. **"ZeroWatt circuitry."**

A diagram from the ZeroWatt promotional literature show the electronics involved.

35. **"Diagram of the ZeroWatt analog to digital conversion."**

Diagram of how the ZeroWatt circuit helps smoothly convert analog signal to digital with less power loss.

ONE-CYCLE

Keyue Smedley, UCI Professor of Electrical Engineering and Computer Science started and directs the Power Electronics Laboratory at the University of California, Irvine. She developed a "One-Cycle Controlled (OCC) Switching Circuit," a power-conversion technique that can be applied to any switched variables. Direct benefits of her OCC research include improved electrical-grid stability and reliability, alternative energy adoption, a reduction of industry operating losses, and the conservation of electric energy. Smedley's technology has resulted in the Orange County company; One-Cycle Control, Inc. which produces standardized controllers ("OCC inside") for three-phase AC to DC, DC to AC, "noise cancellation" for power, VAR enabling improved efficiency, and reliability, as well as reducing size and cost.

36. **"One-Cycle Sales Booth with Professor Keyue M. Smedley."**

37. "Unified constant-frequency integration control of active power filters." Keyue M. Smedley and Luowei Zhou. **U.S. Patent 6,249,108 issued June 19, 2001.**

38. "Renovating the power system." Heather Wax. **Women in Engineering Magazine, IEEE** 2 (2): 24-25. 2008.

39. **"One-cycle equipment."**

a. **"Orange County OCC technician and production area."**

b. **"Diagram of OCC circuit."**

One-cycle control (OCC) can be utilized for harmonic (noise) cancellation, helping to improve the power quality in power line transmission. When people refer to 'bad' power quality, much of the time they are describing the extraneous spikes or 'noise' damaging

the power equipment. The controller is able to 'clean out' that type of noise. OCC delivers a new paradigm of active conversion of 3-phase power without software.

- c. **"15kW OCC-PECC rectifier for military use."** (PECC- Power Electronics Controls & Conditioning).

This is the first stage of a two-stage power conversion system that enables increased efficiency, power density, and power quality for military mobile generator sets. The controller converts variable-frequency variable-voltage AC power ("Wild Power") from a variable-speed generator set to stable high-quality switch-selectable 50Hz, 60Hz or 400Hz DC output which is needed for modern electronic equipment. In May 2010, the OCC team received the 2010 SBIR Army Achievement Award in a Pentagon Ceremony for this development program.

HIPERWALL

The saga began in 2004, when Calit2 researchers secured a \$393,533 National Science Foundation grant to build a tiled display wall for visualizing massive data sets. Over the next year, the project took shape in the Visualization Lab on the second floor of the Calit2 Building. It was unveiled in the summer of 2005 – a 23x9-foot, 50-screen display, which allowed researchers to view their data as a single, full-screen visual or as a series of smaller images displayed simultaneously for comparison purposes. At the time, the Highly Interactive Parallelized Display Wall – HIPerWall, as it was known – was the world's highest-resolution grid-based system, providing a total resolution of 200 million pixels. Its creators, recognizing the presence of a commercial market, started Hiperwall Inc., with CEO Jeff Greenberg at the helm and co-founded by former UCI electrical engineering and UCI computer science Assistant Professor Steve Jenks and Calit2 postdoctoral researcher Sung-Jin Kim, both of whom developed the middleware and software for the distributed computing and rendering display system. The company had incubated in the Calit2 Building from the time it incorporated in 2008 until its move last December 2012 into a 6,000 square-foot Irvine headquarters.

40. **"Steve Jenks, Jeff Greenberg, and Sung-Jin Kim."**

The initial researchers of HIPerWall at UCI were former UCI Assistant Professor of Electrical Engineering and Computer Science Steve Jenks, Calit2 postdoctoral researcher Sung-Jin Kim. Steve Jenks was an Orange County businessman who wanted to see Hiperwall become a product and helped Jenks and Kim develop Hiperwall in the Calit2 business incubator.

41. **"A new point of view: HIPerWall leads researchers to genetic discovery."** Anna Lynn Spitzer. Interface 3 (2):16-17. 2007.

The 200-million-pixel, tiled, grid-based wall gives researchers a larger-than-life view of their data sets at extremely high resolutions. Professors Steven G. Potkin and James H.

Fallon said "On HIPerWall, all of a sudden patterns came out very quickly. Hidden layers were revealed that allowed us to say, 'look at this!' We should be able to finish in about one-tenth the usual time."

42. **"Systems, methods, and devices for manipulation of images on tiled displays."**
Jenks, Stephen F., Sung-Jin Kim, and Jeff Greenberg. U.S. Patent Application 12/819,105, filed June 18, 2010.
43. **Hiperwall pictures**
 - a. **"Viewing extremely large images."**
 - b. **"Displaying data and images on multiple screens."**
 - c. **"Focusing in on data of interest."**

INCLINE 3

PATENTING & PROTECTION

The Office of Technology Alliances (OTA) assists faculty with applying for a patent. The OTA also helps license ideas or develop options agreements so others can pursue these ideas as commercial products or as new direction for applied research.

44. **"Forms and function of patent administration"** Chapter 6 p. 102 from **Technology transfer and the university**. Gary W. Matkin ; foreword by Clark Kerr. New York : Macmillan Pub. Co. , 1990.

The nature of university involvement with the patent process has changed over time. Initially it was obtaining the patent in the name of the faculty and university. Now the university needs to be as concerned with administration of rights and defense of patents.

45. **Patent it yourself : your step-by-step guide to filing at the U.S. Patent Office**. David Pressman. Berkeley, Calif. : Nolo, 2009.

A highly valued book for introducing faculty and other innovators to the patenting process. In most cases the University helps the innovator fill out the application, fund the fee, and follow it through the long process. A patent for an invention is the grant of a property right to the inventor, issued by the United States Patent and Trademark Office. Generally, the term of a new patent is 20 years from the date on which the application was filed.

46. **"Increase in Number of Active UCI Patents."** UCI Office of Technology Alliances, 2012.

The number of active patents by UCI inventors has increased by 50% from 2005 to 2012. This is due to the efforts of the OTA to publicize patents available from UCI research.

47. **"UCI Patenting Activity."** UCI Office of Technology Alliances, 2012.

In fiscal year 2011 30 U.S. Patents were obtained by the University in the name of faculty. The OTA also maintains statistics on which UCI patents are current being used (and licensed) by different companies.

48. **"Patent Protection and Commercialization of Technology."** UCI Office of Technology Alliances, 2012.

The process of obtaining a patent is illustrated by the OTA. The OTA both protects and markets an invention to maximize its value to the Inventor, University, Licensee, and the general public.

WALLCASE 4

COMPUTER-BASED LEARNING & SOFTWARE INNOVATIONS

Innovations can not only create devices that make the world run better, it can improve the ways we find and use information. UCI Researchers have created tools for understanding the information better. The UCI Departments of Cognitive Sciences and Computer Science explore how the brain learns and how to design software to make it easier to find and use information. Together they help find new ways to create and explore knowledge.

ALEKS

In 1992 Professor Falmagne, Professor of Cognitive Sciences at UCI, obtained a large NSF grant for the development of the ALEKS educational software based on Knowledge Space Theory. He assembled at UCI a team of software engineers, cognitive scientists, and mathematicians. Some of these became officers of the ALEKS Corporation which was established in 1996 to further develop the software make it available to K-12 and College students. Assessment and LEarning in Knowledge Spaces (ALEKS) is a Web-based, artificially intelligent assessment and learning system. The ALEKS software has been granted by UCI to ALEKS Corporation under an exclusive, worldwide, perpetual license.

49. **"Jean-Claude Falmagne, UCI Professor Emeritus, Cognitive Sciences, School of Social Sciences."** UC Irvine, 2011.
50. a. **Knowledge spaces.** Jean-Paul Doignon, Jean-Claude Falmagne. Berlin : Springer, 1999.
- b. **Learning spaces : interdisciplinary applied mathematics.** Jean-Claude Falmagne and Jean-Paul Doignon. New York : Springer, 2011
51. ALEKS information
- a. This graph shows how ALEKS is very useful in assessing incoming student's level of mathematical mastery. With its individual approach to assessing each student's

strengths and weaknesses, effective teaching can take place.

- b. This graph compares the use of ALEKS testing for the math placement of new students as compared to the use of other assessment software. In all cases ALEKS was more helpful in placing more students in different levels of mathematics.

52. **ALEKS Pamphlet**

SRCH2

Founded by UCI Professor of Computer Science Chen Li, the company was incorporated in 2008; it recently changed its name to SRCH² from Bimaple to better reflect its mission. It was a UC Irvine startup headquartered at Calit2's TechPortal incubator. The company produces a proprietary search engine, which uses in-memory algorithms to support ultra-fast instant search on large amounts of data. Li says it is up to 100 times faster than the most commonly used enterprise search software.

53. **"Chen Li, UCI Professor of Computer Science."**

54. **SRCH2 Information**

- a. **SRCH2 promotional information**
- b. **"Features of SRCH2."**
- c. **"SRCH2 Diagrams."**

REACTION/SYNTHESIS EXPLORER

Reaction Explorer was initially developed in 2005 at the University of California, Irvine, in the laboratory of Professor of Computer Science, Pierre Baldi, and is still used in the UCI Chemistry Department to teach undergraduate organic chemistry. Reaction Explorer uses expert system technology to predict the results of arbitrary organic chemistry reactions allowing students to explore the results of novel reactions. Based on the success of this program the technology has been spun off into an independent company that is now making the system available to universities around the world through a strategic partnership with John Wiley & Sons, Inc. Reaction Explorer helps students learn Organic Chemistry by testing their understanding of organic chemistry reactions and the underlying mechanisms that control those reactions.

55. **"Pierre Baldi and Jonathan Chen."** from "Second life search engine gets expert help." Orange County Register Business Column photo gallery. March 12, 2008.

UCI researchers Pierre Baldi and Jonathan Chen built the Synthesis and Reaction Explorers. They are a learning system for reactions, synthesis and mechanisms in organic chemistry. The software allows students and instructors to create their own synthetic pathways by choosing from a wide range of starting compounds and react them to reveal details of the reaction conditions and reagents. A sample screen from the program is displayed behind them, on a Hiperwall screen when they presented the program in 2008

at a Callt2 guest lecture on innovation.

57. **"Synthesis Explorer: A Chemical Reaction Tutorial System for Organic Synthesis Design and Mechanism Prediction."** Jonathan H. Chen and Pierre Baldi. Journal of Chemical Education. 85 (12): 1699. 2008.

58. **Search screen examples**

- a. **ChemDB Portal.**

ChemDB Portal is a resource incorporating Synthesis Explorer, Reaction Explorer, and other chemistry education tools.

- b. **Reaction Explorer Screenshot.**

NUMECENT

Endeavors (now Numecent) technology grew from research carried out at UC Irvine by Gregory Alan Bolcer, Arthur Hitomi, and Peter Kammer, all Ph.D. graduates of the UC Irvine/Institute for Software Research (ISR). The team invented application virtualization and streaming as part of a UCI/DARPA project in 1999. Their project, initially called Magi, is based on open source and Internet standards such as Java, the Apache Web Server and WebDAV. Numecent P2P technology enables organizations, groups and individuals to find, share and act upon information anywhere, at any time, by making the power of a Web server available on any networked or Internet-enabled device. Numecent holds the foundational patents (10 granted) in applications streaming, virtualization and cloudpaging with 10 more patents pending

59. **"Gregory Alan Bolcer, Arthur S. Hitomi, and Peter J. Kammer."**

All three: Bolcer, Hitomi, and Kamer are UC Irvine/Institute for Software Research (ISR) Ph.D. graduates. Bolcer is the Endeavors Technology founder and CTO. Hitomi is the Endeavors Technology VP of Technology, and Kammer is an Endeavors Technology Software Engineer.

60. "Endeavors: a process system infrastructure." Arthur s. Hitomi, Gregory Alan Bolcer, and Richard N. Taylor. IN **Proceedings of the 19th international conference on software engineering** :598-599. 1997.

61. **How Numecent works.**

- a. **"We solve 3 fundamental problems."** Numecent, 2013.

- b. **"Cloudpaging."** Numecent, 2013.

Cloudpaging refers to the ability to not have to store information on a specific machine but to draw the software and data needed over a wireless network while the work is being performed. It can deliver huge applications from the Cloud between 20x to 100x faster

than downloads and execute them natively without installation.

- c. **"Heuristic pushing of pages."** Numecent, 2013.

Heuristic refers to the software's ability to "sense" what you are typing or working on and predict from patterns what information or programs you will need next. A patented innovation, the system creates a statistical tree for a given asset from a sample of users. Once enough statistics have been gathered, the server actually starts pushing likely pages to the client, in advance of an actual request.

INCLINE 4

INNOVATION SUPPORT ECOSYSTEM

By reaching out to industry and building relationships the University tries to help their faculty find business partners. Although many university inventions and discoveries originating from academia are at a stage beyond basic research, they are yet insufficiently developed to be transformed into innovations without additional research designed to establish Proofs of Principle (POP) at many levels: technical proof, intellectual property control proof, safety proof, value proof, economic proof, and attractiveness proof.

- 62. **What every engineer should know about starting a high-tech business venture.** Eric Koester. Boca Raton : CRC Press, 2009.
- 63. "University contributions to economic development, Business incubators, and Research Parks" from **Technology transfer and the university.** Gary W. Matkin ; foreword by Clark Kerr. New York : Macmillan Pub. Co. ; Toronto : Collier Macmillan Canada, 1990.
- 64. UCI interacts with the Orange County business community in a variety of ways. One of the most important is opportunities for researchers and members of the business community to share innovations and perceived commercial needs. This can lead to licensing of existing inventions or shared collaborations creating new innovations. These collaborations can take the form of commercial research located at the UCI Research Park, clinical trials at UCI facilities, or grown in the UCI "Incubators"
 - a. **"UC Irvine Innovation Support Ecosystem."** UCI Office of Technology Alliances, 2012.

A short list of the some of the organizations that nurture the migration of ideas to products as part of UCI-Industry relations include: the UCI Office of Technology Alliances, the UCI Research Park, the medical clinical trials programs overseen by the Office of Clinical Research and Trials, supporting networking organizations such as OCTANe, and technology incubators in computer sciences, medicine, and engineering.

- b. "TechPortal : A helping hand." **Interface** 5 (2) Spring: 5. 2010.

An article produced by the Calit2 TechPortal highlighting the resources available for faculty entrepreneurs as they embark on the process of commercialization.

65. **Perspectives on commercializing innovation.** Edited by F. Scott Kieff, Troy A. Paredes. Cambridge : Cambridge University Press, 2012.
66. **"Examples of Companies Formed to Commercialize UC Irvine Technology."**

The list of some of the companies that has grown from UCI research extends from A to Z. All these companies have an active license, option or letter agreement with UCI.

FLOORCASE 1

Libraries Leading Competitive Intelligence

When someone wants to start a new business, they must understand the playing field of their competition. That means knowing about the forces shaping the industry they will enter, knowing as much as possible about their competition, and knowing the best practices for their work. Altogether this is called Competitive Intelligence.

The UCI Libraries business collection plays a crucial role in Competitive Intelligence. The job of the UCI Business Librarian involves choosing which specialized business information resources- things like financial databases, trade magazines, scholarly journals, and practical books- will best fit the needs of their local community members. The librarian then advises members of that community on how to use those business resources.

Thus, members of the community may visit their library and work with librarians to piece together a cohesive perspective on the steps they will need to take to be successful in business.

67. **"Why libraries should be the next great start-up incubators."** Emily Badger. Theatlanticcities.com February 19, 2013.

68. **"SNL interactive database."**

The SNL database licensed by the UCI Libraries has an interactive demographic map that lets you zoom in on a region to see the consumer Tapestry Segmentation provided by ESRI's (Environmental Systems Research Institute). Tapestry segmentation gives important socioeconomic and behavior characteristics of people in a given area.

- a. **SNL Database Tapestry Map**

- b. **Tapestry Segmentation 06- Sophisticated Squires**
- 69. **"Working with the UCI Business Librarian."**
 - a. & b. The 2012 1st Place Butterworth competition winner, Ferdinand Lucero, and his business partner Tony Crisp, meet with the Research Librarian for Business, Annette Buckley, to discuss using databases for competitive intelligence information for their startup venture, Portfelo.com. UCI Libraries, April 2013.
- 70. **Confessions of an entrepreneur : how to survive the highs and lows of starting up.** Chris Robson. New York, NY : Pearson Prentice Hall, 2010.
- 71. **Entrepreneurship : the engine of growth. (Volume 2: Process).** Westport, CN. : Praeger Publishers, 2007.
- 72. **"Gartner, IBISWorld, and Forrester business databases."**
 - a. Gartner is a major IT industry database licensed by the UCI Libraries. One of Gartner's specialty intelligence products is the Magic Quadrant. These quadrants compare the strengths and capabilities of companies that offer similar goods or services.
 - b. IBISWorld is a database licensed by the UCI Libraries with comprehensive reports on hundreds of large US industries and niche markets. This figure shows the current market share, i.e. the percentage of industry revenue, split across the companies in the Specialty Hospital industry.
 - c. Forrester is an important technology database licensed by the UCI Libraries. Analysts writing for Forrester produce insightful and predictive reports with including charts like this one, which shows the expected increase in consumption of two popular gadgets- smartphones and tablets.
- 73. **Entrepreneur journals**
 - a. **Entrepreneurship Theory and Practice** (Cover)
 - b. **Journal of Business Venturing** (Cover)

FLOORCASE 2

Healthy Competition

One way for students and researchers in the UCI community to challenge themselves in exploring innovative technologies and ideas is through competitions hosted by departments on campus. Here are three examples in which interdisciplinary groups come together to generate compelling ideas and products for the future. Prizes and acclaim can give winners the momentum to turn their concepts into a real business.

74. **New venture creation: entrepreneurship for the 21st century.** Stephen Spinelli, Robert J. Adams. New York : McGraw-Hill/Irwin, 2012.

75. a. **"Venture to vision : 2013 Business plan competition of The Paul Merage School of Business."**

This competition offers all UC Irvine students, staff and researchers the opportunity to form a team, create a business plan and potentially fund their business idea all within six months." A maximum of 16 teams each submit a 15-page business plan to judges who are experienced professionals, entrepreneurs, and investors. The judges give awards based on the quality of the plan, impact of the presentation, and the potential for the idea.

- b. **"Charlie Baecker, Director of the Don Beall Center for Innovation and Entrepreneurship, at Business Plan 2013 Event."** UCI Libraries, 2013.a.

"Charlie Baecker emceed the 2013 Business Plan competition finalists' presentation and awards ceremony." UCI Libraries, 2013.

76. **"ZeroWatt Wins \$15,000 in 2009 Business Plan Competition."** The Paul Merage School of Business Dean's Quarterly. Spring, 2009.

Zerowatt's business plan took first place in the 2009 Business Plan Competition. Today Zerowatt is an active and successful company that provides technology for analog data solutions.

77. **One-page Excerpt From the Merage Sample Business Plan**

What is a business plan? The American Management Association defines it as "a proposal for new business or a strategy for expanding an existing business." In short, it includes the concept, technicalities, market, funding expenses, operational requirements, and anticipated revenue for the new product or service.

78. **Ingenuity UCI Student Technology Showcase**

Sponsored by the Donald Bren School of Information and Computer Sciences, and The Henry Samueli School of Engineering, the Ingenuity: Student Technology Showcase celebrates the top 10 award winning student projects, five from each school, completed during the past academic year. Projects span a range of innovations across categories such as software, digital technologies, and robotics.

79. **"Race car Project."** UCI Libraries, 5/7/13.

a. & b. The Race Car project came from students in The Henry Samueli School of Engineering.

80. **"Robocam Project."** UCI Libraries, 5/7/13.

The Robocam project came from students in The Donald Bren School of Information and Computer Sciences.

81. **"Butterworth Product Development Competition."** Donald Bren School of Information and Computer Sciences, 2013.

Named after IT entrepreneur and UCI Alumnus (B.S. 1974 & M.S. 1981) Paul Butterworth, the competition evaluates new software and systems on their technological merits and potential to impact the market. The goal of the Butterworth Product Development Competition is to create a culture within the Donald Bren School of Information and Computer Sciences (ICS) at UC Irvine that encourages an entrepreneurial spirit among students and encourages the development of new, technically innovative products by graduate and undergraduate students. Judges are experts in the process of starting a business or in the technologies the students are developing.

82. **"Butterworth Product Development Competition: Annual student contest spotlights bright ideas."** Donald Bren School of Information and Computer Sciences, 2012.

- 82 a. The first place winners of the 2012 Butterworth Competition were the Portfelo team. "Portfelo is creating a new experience for people in the modeling industry to market their portfolio and network with each other. While current tools (such as LinkedIn, Facebook, Twitter, 4ormat, and ModelMayhem) solve a small portion of the challenges the industry experiences, Portfelo aims to be the solution to the industry's pain points."

a. **"Title slide image for Portfelo."**

b. **"Members of Team Portfelo gather around their winnings."**

Michael Cupino (leader), Ferdinand Lucero, Jordan Speer, Evan White, Danielle Yu

83. **Academic entrepreneurship and community engagement : scholarship in action and the Syracuse miracle.** Edited by Bruce Kingma. Cheltenham, UK : Edward Elgar Pub., 2011.

FLOORCASE 3

Productive Partnerships

"Invention used to be 1% inspiration, 99% perspiration. These days it's probably 50% collaboration"

The Wide Lens: A New Strategy for Innovation

UC Irvine has many strong ties to the surrounding business community in Orange County and greater Southern California, and these ties are the key to nurturing local entrepreneurship and regional development. These relationships of institutions and people ease the way for technology commercialization by forging productive links between the academic community who research and build new technologies, and the experienced business professionals who can fund and market those new technologies. Here we explore some of those key institutions.

84. **UCI chief executive roundtable**

The UCI Chief Executive Roundtable "has served since 1986 a gateway to mutually beneficial cooperation and knowledge transfer between the business community and the university." It is comprised of approximately 70 Orange County business leaders who are primarily their company's top decision-maker.

- a. **Executive Roundtable Logo & Skyline Images**
- b. **Executive Roundtable Event Image**

85. **OCTANe**

OCTANe was created in 2002 by cofounders Tom Moebus, former vice chancellor of the University of California, Irvine, and Dwight Decker, former CEO and chairman of Conexant Systems. OCTANe puts together programs, events, and mentoring opportunities that unite people and ideas with capital and resources to foster technology growth. Since its founding OCTANe has secured approximately \$50 million in funding for UC Irvine technologies.

- a. **"California is the world's eighth largest economy, and the state produces more intellectual property than all other US states combined."** OCTANe, 2012.
- b. **"Popping OC's Tech Kernels."** Thomas Mobeus. Orange County Business Journal. 27 (38): 63. 2004.
- c. **OCTANe promotional brochure and folder**

86. **The wide lens : a new strategy for innovation.** Ron Adner. New York : Portfolio/Penguin, 2012.

87. **Interface.** 5 (2) Spring 2010.

In partnership with UCSD, Calit2 is a technology incubator and a research institute for new technologies that can benefit society. "To drive innovation, you must be innovative: Calit2 represents a new mechanism to address large-scale societal issues by bringing together multidisciplinary teams of the best minds (both on and beyond UC campuses) in a way that had been impossible earlier."

88. **"TechPortal Orange flyer."**

TechPortal Orange at UC Irvine Medical Center is the first clinically-oriented biomedical incubator facility in Southern California. UC Irvine School of Medicine established TechPortal Orange to address its mission of technology transfer and to accelerate the development of translational research into clinical applications.

89. **"From pitch to rich: five pros share their startup perspectives."**

Invitation to June 6, 2013 "Igniting Technology" program sponsored by Calit2. Note speakers include startup experts from Hiperwall and SRCH2.

90. a. **"The Patient of the Future."** J. Cohen. Technology Review 115(2): 60-63. 2012.

- b. **"Larry Smarr on treadmill."**

Larry Smarr, the founding director of Calit2, puts a very human face to a technological research organization. Making himself a human test subject, he uses sophisticated equipment at Calit2 to monitor his oxygen consumption, heart rate, and DNA data. One of his many quests is to create new systems for improving his health through data monitoring, and by extension, the wellbeing of future generations.

91. **"UCI gets another \$25M from state for IT institute."** Chris Cziborr. Orange County Business Journal. 24 (32): 12. 2001.

92. **California Institute for Telecommunications and Information Technology (Calit2).**

- a. **"Calit2 unveils world's highest resolution display system."** Laser Focus World 44(8): 11. 2008.

- b. & c. **"Setting the stage for next-generation research."** P. Gwynne. Research Technology Management 51(3): 13-16. 2008.

FLOORCASE 4

The Art of Teaching Business

Successful innovation in business goes beyond simply designing a new product, and successful entrepreneurship goes beyond simply selling that new product. Career achievements hinge upon appreciating the complexities of one's work environment, and adapting to dynamic work challenges over time. These transferrable skills for success in business are taught across the academic spectrum at UC Irvine. No matter their major, students at UC Irvine graduate with a custom blend of talents and knowledge that give them the capacity to succeed in their future niche of the professional world.

93. **"Your College Major May Not Be As Important As You Think."** Zac Bissonnett. New York Times Blog: The choice: demystifying college admissions and aid. November 3, 2010. (<http://thechoice.blogs.nytimes.com/2010/11/03/major/?pagewanted=print>) Though this article's title may sound a bit sensational, its core message, that any collegiate major can prepare you for future business and career success, is an important one.
94. **"Creating a community of difference in entrepreneurship scholarship."** William B. Gartner. *Entrepreneurship & Regional Development: An International Journal* 25(1-2): 5-15. 2013.

a. **Entrepreneurship & Regional Development** (Cover)

95. **"Teaching business on campus."**

Many academic departments detail how both their overall curriculum and coursework contribute to the qualities desired by businesses in the professional world. Here are a few examples:

- a. **UCI Humanities building and a course description from the UCI catalog.**
- b. **UCI Social Ecology building and a course description from the UCI catalog.**
- c. **UCI Social Ecology building and a course description from the UCI catalog.**
- d. **UCI Physical Sciences building and a course description from the UCI catalog.**

96. **"The Paul Merage School of Business."**

The Paul Merage School of Business, while recognized as the primary source of business education on campus, tips its hat to the whole UCI community and acknowledges that

every program offers something valuable for business:

"The contemporary executive or manager must be a creative thinker, make complex decisions, and have the ability to perceive and participate in the full scope of an enterprise while understanding its role in the economy....

Students can also ... develop the skills needed for business and management by taking electives such as calculus, statistics, economics, psychology, sociology, computer science, and political science, and are encouraged to take intensive course work in the culture, history, geography, economy, politics, and language of specific foreign countries."

97. **"Merage 2012/2013."**

98. **"Funding the Innovation Economy."** Paul Merage. Orange County Business Journal 28(15): 75. 2005.

99. **"Thought cloud."**

Nowhere is the business theme at UC Irvine more present than its Course Catalog, the official word on UC Irvine's educational accolades and how to earn them. This thought cloud, built from words in the Catalog, highlights the features of learning that contribute to students' future business success.

100. ***Writing culture : the poetics and politics of ethnography : A School of American Research advanced seminar.*** James Clifford, George E Marcus and School of American Research (Santa Fe, N.M.). Berkeley: University of California Press, 1986.

UC Irvine Professor George Marcus is credited with redefining ethnographic fieldwork for the modern era.

101. ***Coming of Age in Second Life: An Anthropologist Explores the Virtually Human.*** Tom Boellstorff. Princeton: Princeton University Press, 2008.

UC Irvine Professor Tom Boellstorff puts a new spin on an old classic.

102. **Tom Boellstorff fieldwork still.**

Boellstorff conducted field research in the online virtual world, Second Life.

