Syllabus for Inventing Breakthroughs and Commercializing Science

Inventing Breakthroughs

3:10PM Wed, Sep 5, Aldrich Hall 012

TOPIC

Introduction

MATERIALS

Langer Lab, The: Commercializing Science (605017)

EC Weeks 1 & 2 Packet

Rhoten, D. and A. Parker, "Risks and Rewards of an Interdisciplinary Research Path." Science Vol. 306, pg. 2046 (2004). (Optional)

Vogel, G. "Working Conditions: A Day in the Life of a Topflight Lab." Science, Vol 285, Issue 5433, 1531-1532 , 3 September 1999 (Optional)

On-Line Absence Notification

This link will take you to the Student Absence Policy and on-line notification link.

Project list

CIMIT

HBS Presentation 9-6-07

Office of Technology Development Harvard University

A Concise Tech Transfer Primer

Inventing Breakthroughs and Commercializing Science: Course Overview

BIDMC Project descriptions

Office of Technology Development Harvard University

ASSIGNMENT

Robert Langer is one of the most prolific inventors in American history as well as a distinguished academic. We will be discussing his lab as an introduction to the themes and issues in our course. The readings, on interdisciplinary research and the Langer Lab, are both optional.

1. What is the process of research in the Langer Lab?

2. What can we learn from Langer's example that we can apply to other science labs and innovation organizations? How much of his lab's success is idiosyncratic to his personal brilliance and how much of it would apply to other labs?
3. Does Langer do science? What is science?
4. If you were a postdoc, would you take a job in the Langer lab? Why or why not?
5. If you were a venture capitalist, how much would you pay to take the Langer Lab "private?"

After our case discussion, Professors Sato and Fleming will give a brief overview of the course. We will hopefully have some pizza during break (to encourage everyone to socialize and begin to form project teams) and then we will begin to hear from our project sponsors.

MBA shoppers, please do not leave during classroom discussions. You may leave during break if you do not intend to take the course.

3:10PM Wed, Sep 12, Aldrich Hall 012

TOPIC

Inventing Breakthroughs

MATERIALS

Inventing Breakthroughs Poll
This poll opens on 9/5/2007 at 6:00 PM
The poll will close on 9/12/2007 at 2:00 PM

Photovoltaic Breakthrough: The Solar Sell (604034)
EC Weeks 1 & 2 Packet

Campbell, A. "Superconductivity: How could we miss it?" Science 6 April 2001: Vol. 292. no. 5514, pp. 65 - 66

First Solar Website (Optional)

Project Interest Poll
This poll opens on 9/07 /2007 and will close on 9/12/2007 at 2:00 PM

New Business Opportunities for Science (Thursday, April 26, 2007)

ASSIGNMENT

Linda Choate's inventors have come up with a breakthrough in solar cell technology. Her manufacturing organization won't accept the technology, however, and her scientists are having difficulty working with the original inventor.
The assigned Science article is required reading for the class, though you need not understand the technical material described in it. Focus instead on the research strategy that resulted in the breakthrough.

1. What are the origins of the conflicts between Toledo, Long Beach, and Palo Alto? How does each organization view itself and the other organizations?

2. Compare the research styles of Harlan vs. Heras. Assume that Harlan and Heras both generate 100 ideas (not the same ideas). Compare the distributions of impact of those ideas, that is, allot the ideas to one of three buckets. How many ideas would you expect to be completely useless, of moderate value (for example, good enough to be incorporated into a product), or breakthroughs? To use a baseball analogy, how many are strike outs, base hits, and home runs - where home runs can score hundreds of points, depending on the magnitude of the breakthrough? Be prepared to explain your allocation.

3. How should the technology influence the research strategy? What is the most effective and efficient strategy for working with modular components? What is the most effective and efficient strategy for working with interdependent (that is, coupled) components?

4. What is Harlan's value to the firm? How should Choate manage him?

5. Should Choate close Palo Alto, close Toledo, or merge them? If you choose to close one of the sites, you need to justify why that site is crucial to the firm and the other one is less important. If you choose to merge, you need to justify the much greater expense and think about how you would manage the integration.

After the case, we will enjoy drinks and sort into stations around the technology you are most interested in. Please make sure you fill out the case poll and the project interest poll, both are required. Don't forget that the master excel spread sheet with detailed project descriptions are listed under day 1.

To form teams, there are two options: 1) find people with similar interests to yourself and different backgrounds (preferably, no more than two similar professions on a team), or 2) tell us what technologies you are interested in and we will match you with an appropriate team. You may choose option 2 at any time, even the night before teams are due (Sept. 26).

3:10PM Wed, Sep 19, Aldrich Hall 012

TOPIC

Barry Riceman at NetD

MATERIALS

Barry Riceman at NetD (A) (606090)
EC Weeks 3 on Packet

Barry Riceman at NetD (B) (606151)
EC Weeks 3 on Packet

Color graphic for network illustration

Barry Riceman Poll
Poll opens on 9/12/07 at 6:00pm and will close at 2:00pm on 9/19/07.

Project Choice Poll 2 (9/17/07)
The poll opens on 9/17/2007 at 2pm and closes on 9/19/07 at 2pm.

ASSIGNMENT

Brandon Fogg's startup has had respectable but unspectacular success to date. Despite having hired outstanding research and manufacturing engineers, the firm is approaching the end of their financial runway, due mainly to problems in commercializing breakthrough ideas. Furthermore, Fogg's best inventor seems oblivious to legal and conventional agreements on Intellectual Property. After reading the cases, please prepare the following questions:
1. Why is NetD having problems commercializing its ideas? What are the patterns and particular causes – why are some projects successfully transferred and others still stuck in the process?

2. What makes Riceman so creative? How much of his success is due to his collaborators? How do his creative processes differ from the other technical leads at NetD?

3. How should Fogg deal with Riceman?

The graphic illustrates the collaboration network of the firm in color instead of the greyscale in the case. Please fill out the project interest poll again, as well as the case poll (both are required, even if you have formed teams). You must form teams by next Tuesday close of business (please email Prof. Sato with teams as soon as they are formed - or let her know as soon as possible if you want her to assign you to a team).

3:10PM Wed, Sep 26, Aldrich Hall 012

TOPIC

The Norms of Scientific Inquiry

MATERIALS

Mertons Ethos of Science: Excerpts and Summaries (9-607-047)
EC Weeks 3 on Packet

Norms of Scientific Inquiry Poll
Poll will open on 9/19/07 at 6:00pm and will close on 9/26/07 at 2:00pm.

Watson, James D. 1968. The Double Helix: A Personal Account of the Discovery of the Structure of DNA. New York: Simon and Schuster. (pgs. 1-132, 157-197)
EC Weeks 3 on Packet

Maddox, Brenda. 2002. Rosalind Franklin: The Dark Lady of DNA. New York: Perennial. (pgs. 119-213) (Optional)

Holden, Constance, "Scientists Keep Some Data to Themselves", Science 27 January 2006:Vol. 311. no. 5760, p. 448 (Optional)

ASSIGNMENT

The explanation of the structure of DNA ranks as one of the most important scientific discoveries of the 20th century. We will use the story of its discovery to discuss how science is done and how it should be done.
Please read the following and fill out the poll. The Merton arguments are helpful in defining criteria for a “good” or “bad” scientist. This is a longer assignment and will take most readers three hours to complete.

1. What does a scientist do?

2. Why do firms do science?

We will hold our project lottery today. Your team should have a ranked list of 4-6 projects that it would like to work on.

End of Inventing Breakthroughs

Choosing the Path to Market

3:10PM Wed, Oct 3, Aldrich Hall 012

TOPIC

Vidient (A)

MATERIALS

How Venture Capitalists Evaluate Potential Venture Opportunities (805019)
EC Weeks 3 on Packet

Vidient (A) (805163)
EC Weeks 3 on Packet

ASSIGNMENT

Please complete the reading and case. Assignment questions will be posted soon.

3:10PM Wed, Oct 10, Aldrich Hall 012

TOPIC

Aptekars Unlikely Spin: Commercializing an MRI Breakthrough from Atomic Clocks and Quantum Computing

ASSIGNMENT

Case will be handed out in class. The Pisano reading is optional.

3:10PM Wed, Oct 17, Aldrich Hall 012

TOPIC

University Firm Relationships

MATERIALS

HP Nanotech: Partnership with CNSI (606-045)
EC Weeks 3 on Packet

HP Nanotech Poll
Poll will open on 10/10/07 at 6:00 pm and close on 10/17/07 at 2:00 pm.

Can Science Be a Business? Lessons from Biotech (R0610H)
EC Weeks 3 on Packet

Ed Silverman "The Trouble with Tech Transfer." Science, Vol 21, Issue 1, pg. 40 January 2007 (Optional)

BP Bets Big on UC Berkeley for Novel Biofuels Center (Optional)

The Wall Street Journal, Tuesday December 21, 2004 VOL. CCXLIV No. 121, Title: Columbia's Pursuit of Patent Riches Angers Companies by Bernard Wysocki Jr.

ASSIGNMENT

For the case, please prepare the following questions. The Wall Street Journal article is required reading.

1. What should Stan Williams do? Renew the relationship (for how much), do the research internally, or contract with foreign universities?

2. What went wrong? If Williams were to renew the relationship, what should he do to avoid similar problems in the future?

3. Review the Bob Langer Lab model of technology transfer (from our opening case discussion). How would (and should) HP view the Langer model?

4. Did HP drive too hard a bargain? UCLA?

5. Do you agree with Columbia's Intellectual Property strategy?

6. Who should pay for science?

3:10PM Wed, Oct 24, Aldrich Hall 012

TOPIC

Intellectual Property Management

MATERIALS

Matt Conners "Patents" presentation

An Introduction to Patents & Trade Secrets

Intellectual Property & Strategy

Grindley, P. and D. Teece, "Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics." California Management Review Volume 39, 2, 1997. (CMR074) (Optional)

EC Weeks 3 on Packet

Jaffe, A. and Lerner, J., "Patent Prescription: A Radical Cure for the Ailing US Patent System," IEEE Spectrum, December 2004. (Optional)

Benkler, Y., "Commons-Based Strategies and the Problems of Patents," Science 305:1110-1111. (Optional)

Staedter, Tracy. "Academic Patent Binge," Technology Review Dec. 2003/Jan. 2004. (Optional)

"Can Patents Deter Innovation? The Anticommons in Biomedical Research" By M.A. Heller. Science Magazine 280 (5364) 698-701 (Optional)

Barton, J "Reforming the Patent System" Science 287 (2000): 1933-1934 (Optional)

"University-Based Science and Biotechnology Products: Defining the Boundaries of Intellectual Property." Kesselheim, Aaron S. MD, JD; Avorn, Jerry MD. JAMA Volume 293(7),16 February 2005 pgs.850–854 (Optional)

Link will take you to HU pin login page. Just enter pin number.

Kintisch, Eli "What Good Is a Patent? Supreme Court May Suggest an Answer" Science 17 February 2006:Vol. 311. no. 5763, pp. 946 - 947 (Optional)

Epodia Poll

Poll will open on 10/17/2007 at 6:00 pm and will close at 10/24/2007 at 2:00 pm

Epodia: Demise of the HBS case-writing Monopoly? (605077)

Linux, Supplement to Epodia (606067)

Larry Sanger's Knowledge Free-for-All (606068)

ASSIGNMENT

Today we will have the opportunity to hear from legal and technology transfer experts on intellectual property issues. During a presentation by Matt Connors we will have the opportunity to ask questions.

I will be looking for good questions from the class and a good question will improve your class participation grade (in this and all "speaker" classes). Questions are due the night before class.

The only assignment today is to review the IP and licensing issues in your project and use this opportunity to get input from these experts.

This topic could easily take up an entire course, and I have listed a great number of readings. Since Connors is reviewing the basics, however, I am making all readings optional.

Open Source is a new phenomenon that has been described as a revolution in the process of innovation. Open source communities warrant study due to their success, similarities to the institutions of science, and potential to influence commercial strategies. Most importantly for our purposes, they also provide a new model for the commercialization of science. One of the options for your projects will be to "open" the technology.

After reading the case and assigned supplements, please prepare the following questions:

1) Assess the strengths and weaknesses of the Open Source, Wikipedia, and HBSP models, and communities of science, for their respective purposes. What does each model need to be successful?

2) What is the creative process in each of the above? Be specific - draw the process flow chart similar to the one in the case for HBSP (And to experience the process of Wikipedia first hand, you may contribute an entry at http://en.wikipedia.org/wiki/Main_Page).

3) Which model should Epodia use? Open-Source, Wikipedia, or commercial? Be prepared to explain and defend your choice in class and prepare a plan of action to implement your recommendation (basically, how should the protagonists proceed, given your choice?).

4) What technologies are most suited in general for development in Open Source communities?

End of Choosing the Path to Market

Group Dynamics

3:10PM Wed, Nov 7, Aldrich Hall 012

TOPIC

Spud Spy

MATERIALS

Spudspy Poll

Poll opens on 10/31/07 at 6:00pm and will close on 11/7/07 at 2:00pm.

SpudSpy

EC Weeks 3 on Packet

Background on MIT's Technology Licensing Office (from the Langer case) (Optional)

Technology Transfer at U.S. Universities (Optional)

ASSIGNMENT

Read the case and prepare the following questions - we will distribute the note in class.

1. What went wrong?
2. Why are Anderson and Huang so upset? Should they be?
3. Can the project be salvaged?
4. What's your assessment of Cohen's role thus far? What would you recommend to Cohen as his next steps?
5. What's your assessment of the university's technology commercialization office? What should the role be of such offices?
6. What can we do to avoid these problems in our class projects?

Tim Oyer will be discussing your prior art assignments after the case.

3:10PM Wed, Nov 14, Aldrich Hall 012

TOPIC

Harvard Engineering/Broad Institute

ASSIGNMENT

Cases will be passed out in class.

3:10PM Wed, Nov 21, Aldrich Hall 012

TOPIC

3:10PM Wed, Nov 28, Aldrich Hall 012

TOPIC

Class Presentations (for admin use only)

3:10PM Wed, Dec 5, Aldrich Hall 012

TOPIC

Napo Pharmaceuticals

Napo Pharmaceuticals (E223)

Drug Pricing National Bioethics Council

End of Group Dynamics