Open Source:
From Anecdote to Policy Instrument

Stephen M. Maurer
smaurer @berkeley.edu

A New Innovation Incentive

Grants

Prizes

Contract Research

Patents

Open Source

How Well Does Open Source Generalize?

Beyond UNIX?

Beyond Software?
Folklore, Farming, Academic Science, Machine Tools, GIS…

Demonstrating Generality: Drug Discovery
2000 Answer: Optimistic (and Wrong)
2005 Answer: Gloomy (and Wrong)

Standard Objections

"Innovators Must Recover Their Costs"

"Open Source and Patent Incentives Can't Coexist"

Big Pharma

New Therapies ⬇ ⬆ Money

Patients

Wes Cohen, *Does Open Source Have Legs?* in INTELLECTUAL PROPERTY RIGHTS IN FRONTIER INDUSTRIES, (R. Hahn, ed., 2005).

Software Makers

New Code
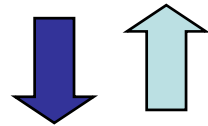
Money

Users

Response:

The Argument Proves Too Much…

- Not all software (drug discovery) is commercial.

- Software (drug discovery) is not monolithic.

Drug Discovery is Not Monolithic…

Basic Research	**How Disease Works**
Finding Targets	
Validating Targets	**Points of Intervention**
Finding Lead Compounds	
Optimizing Lead Compounds	**Finding Drugs**
Process Development	**Learning to Make Drugs**
Pre-Clinical Testing	
Phase I Tests	
Phase II Tests	**Testing**
Phase III Tests	
Approval	
Phase IV Tests	

The 2008 Answer – Optimistic (and Right)?

From Anecdote to Understanding

A Rich Literature

Why OS Works - Incentives

When OS Can Improve Welfare

Stephen M. Maurer and Suzanne Scotchmer, *Open Source Software: The New Intellectual Property Paradigm*, in Handbooks in Information Systems, Vol. 1 (T. Hendershott, ed., 2006)

This Talk

How Simply Can We Tell The OS Story?
Test #1: Do We Understand Current Examples?
Test #2: Can We *Engineer* New Ones?

The Big Picture:
How Simply Can We Tell This Story?

Incentives

Own Use*
Education
Signaling*
Complementary Products*
Social Psychology

* Incentive Applies to Individuals *and* Firms.

Welfare*

Access

Under- and Over-Provision

Better Information & Transparency

      Reusing Code, Rewarding Productive Workers,

      Identifying User Needs, *etc.*, *etc.*
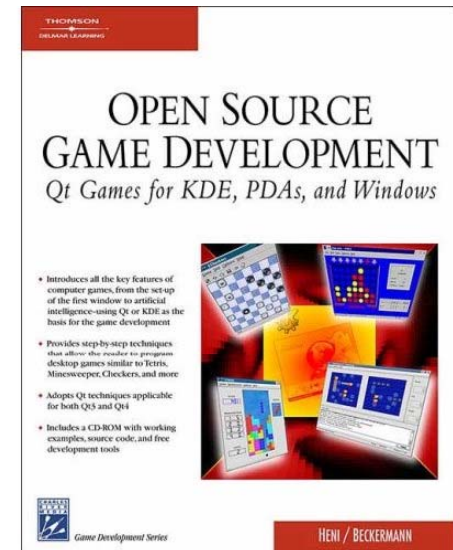
*Compared to IP.

Examples

Own Use

Own Use
Individuals

Classical Open Source
    Users Know Best
    Niche Markets

No (Ethical) Drug Discovery Analog..

Apache

User Innovation

LINUX

Denying Network Effects to Others

"Informants spoke of their contributions as investments in their future tools: They are creating code that they will never have to pay someone to use again."

S. O'Mahoney, "Guarding the Commons: How Community Managed Software Projects Protect Their Work," *Research Policy* 32:1179 (2003)

Drug Discovery Analogs?

1. Cambia/BioForge

CAMBIA BioForge
Biological Innovation
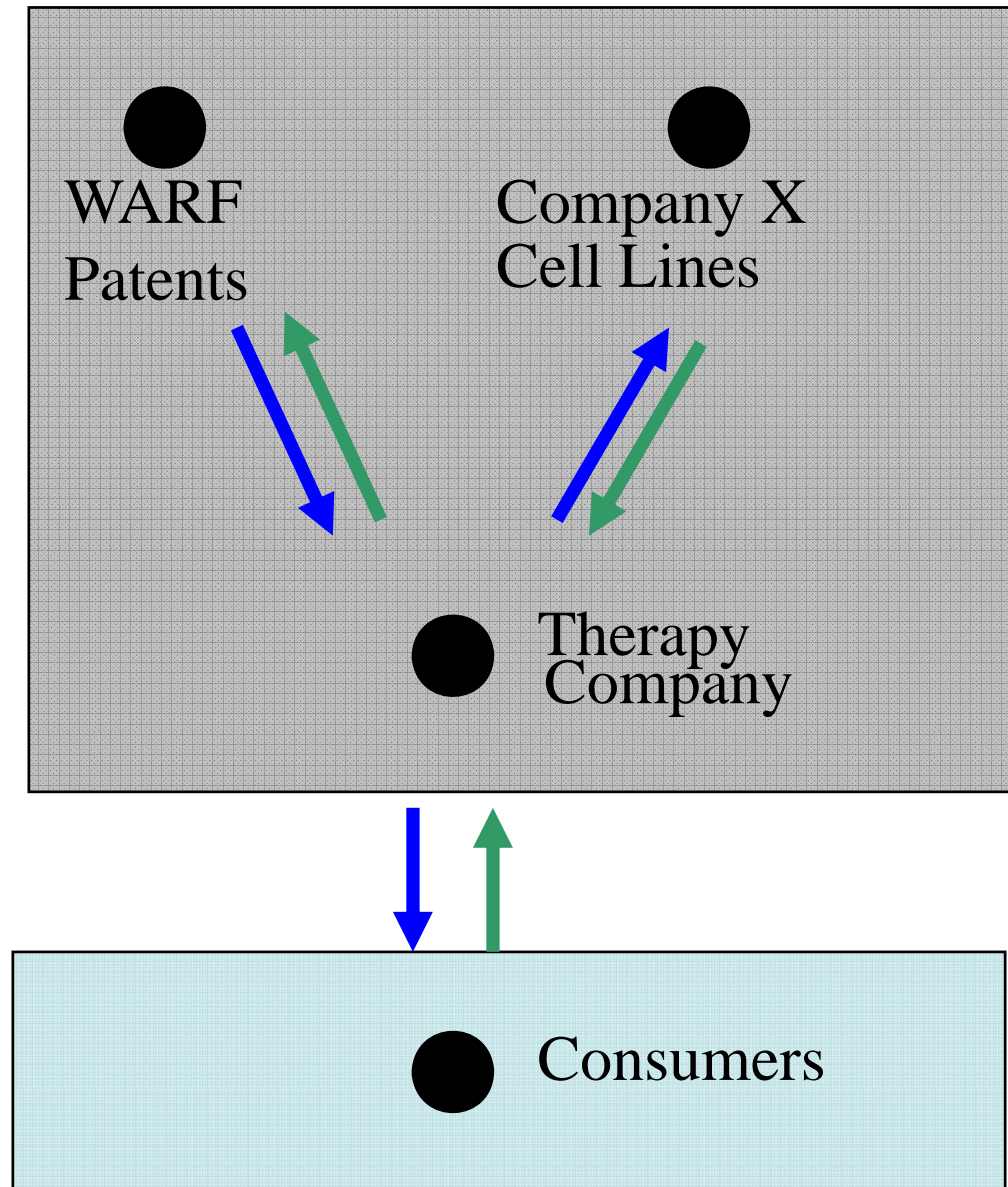
GE Plants

Protected Commons: Open Source or Patent Pool?

"Miniscule" Participation.

Richard Jefferson, Science as Social Enterprise: The CAMBIA BiOS Initiative, *Innovations* 1:11 (2006).

2. Stem Cells

Industry Structure

WARF
Patents

Company X
Cell Lines

Therapy
Company

Consumers

A. A. Cournot, *Researches into the Mathematical Principles of the Theory of Wealth* **(1838).**

Own Use - Companies

WA01	191	26%	HES-6	10	1%
WA09	96	14%	WA14	8	1%
UC06	70	10%	WA13	5	-
HES-3	58	8%	TE04	3	-
HES-4	56	8%	HES-5	2	-
TE06	48	7%			
BG01	46	6%			
TE03	44	6%			
HES-2	32	4%			
WA07	21	3%			
BG02	21	3%			
BG03	13	2%			

National Stem Cell Bank
http://www.wicell.org/index.php?option=com_oscommerce&Itemid=130

FAQs for Requesting Stem Cells

5. Which cell lines should I order?

We get many inquiries for advice as to which lines should be ordered. We suggest that you do some reading of the literature in your field of study to help identify the cell lines used in that research. However, even that groundwork may not lead to a specific recommendation. For example, at WiCell's and Dr. Thomson's UW research laboratories, H1 and H9 have been used more frequently than H7, H13, and H14; therefore, we have more experience with H1 and H9. Even so, we have no evidence that these two lines are "better."

Available at
http://www.wicell.org/index.php?option=com_content&task=blogcategory&id=124&Itemid=190

WARF
Patents

Open Source
Cell Lines

Therapy
Company

Consumers
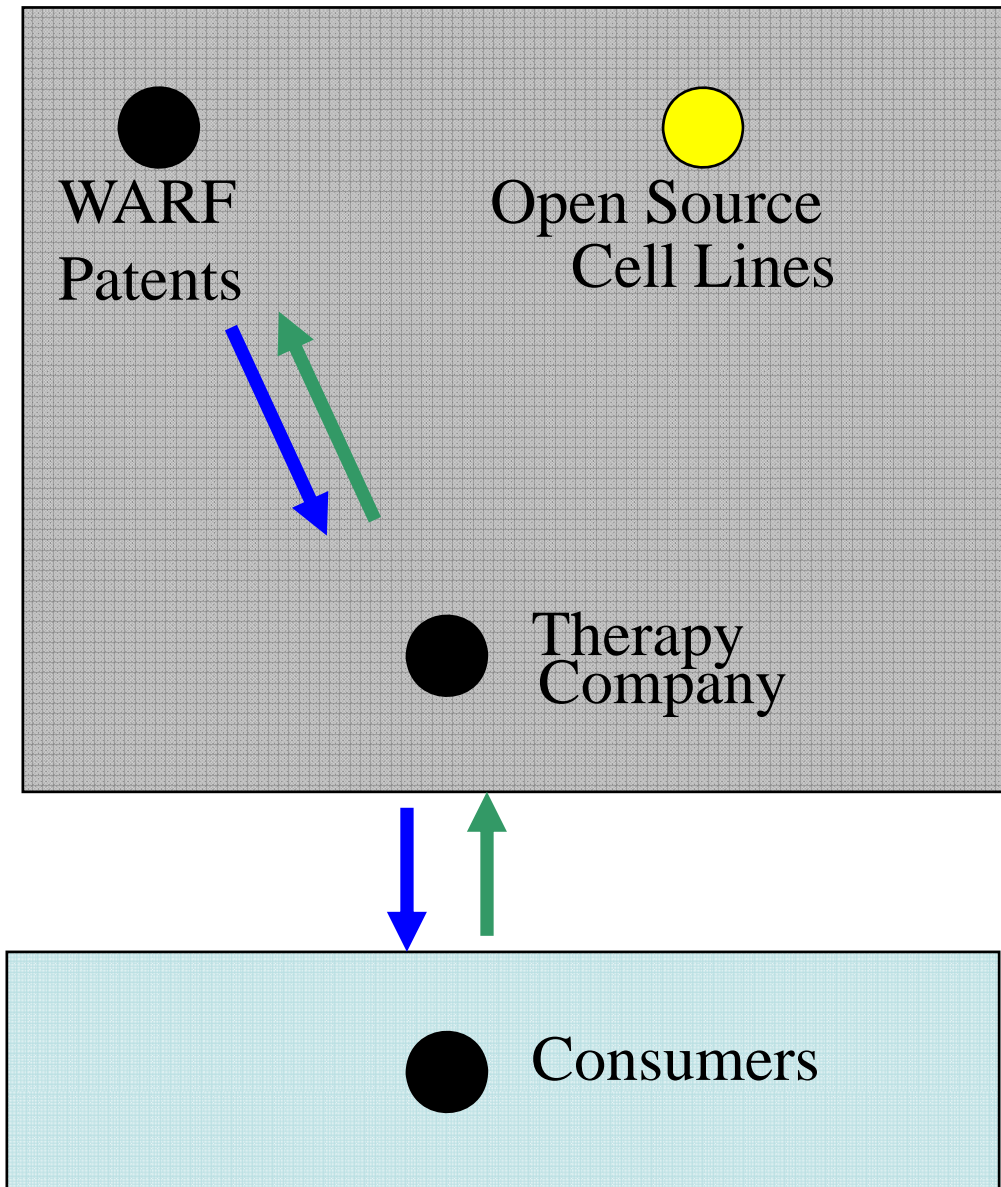
The business case
for open cell lines.

Welfare effects

Education
&
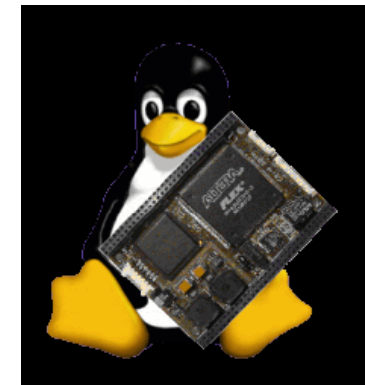# *Signaling*

Education & Signaling

Education

Signaling - Individuals
Pre-History: Plato & Socrates
Apache

Signaling by Firms
Embedded LINUX

Joachim Henkel, "Selective Revealing in Open Innovation Processes: The Case of Embedded Linux," 35 *Research Policy* 953 (2006).

Roberts *et al.*, "Understanding the Motivations, Participation, and Performance of Open Source Software Developers: A Longitudinal Study of the Apache Projects," *Management Science* 52(7): 984-999 (2006).

Drug Discovery Analogs

1. Tropical Disease Initiative

On-Line *In Silico* Drug Discovery.
Validate targets, predict lead compounds.
Education and signaling.

Stephen M. Maurer, Arti Kaur Rai & Andrej Sali, *Finding Cures for Tropical Diseases: Is Open Source An Answer?* 1 Public Library of Science: Medicine 56 (2004)

The Tropical Disease Initiative
An Open-Source Initiative for Biomedical Research

© Ewald Kaemer

The Synaptic Leap   **www.synapticleap.org**

Would TDI Be Useful?

Under/Over-Provision

The *Value* of Ignoring Price Signals

Access

Development rights & increased competition

Manufacturing

Transparency

Pooling Information.

Documenting the best candidates.

Generating New Science?

1b. Open Source Chemistry

Mat Todd's Schistosomiasis Project.
Some Chemistry Costs Are Modest!

T. Kepler *et al.*, "Open Source Research – The Power of Us," *Australian J. Chem*. 59:291 (2006).

The Synaptic Leap www.synapticleap.org

2. Clinical Trials

The Problem With Commercial Trials

75% of Drug Costs!

Could Open Source Do Better?

Phase IV Trials

Treatment costs are already paid for…

Reputation, Education, Altruism

Phase I to III

Would FDA agree?

Harold J. DeMonaco, Ayer Ali & Eric Von Hippel, *The Major Role of Clinicians in the Discovery of Off-Label Drug Therapies*, (Working Paper 1995), *available at* **http://ssrn.com/abstract=780544**.

Complements

Complements

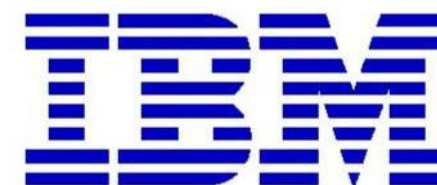# An Old Strategy
IBM in the 1950s
UNIX

IBM (Again)
Red Hat

No Drug Discovery Analogs (?)

Social Psychology

Most of the Above!

LINUX, TDI, OS Chemistry, *etc.*

Conclusion

Taking Open Source Seriously

Symposium on Law &
Economics of IP
Feb. 18, 2008

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