propriété intellectuelle
PROPICE
http://www.mshparisnord.fr/ANR-PROPICE/
communs & exclusivité

Property and Commons

The new issues of shared access and innovation

International Seminar - Paris, 25-26 April 2013

Paul David

Commons and Innovation

[Slideset background
to a brief introductory remarks
at the Propice Seminar,
Paris, 26 May 2013]

Innovation & Commons: Prologue

Here is the conscientious keynoter's quandry:

Among the multiple plausible alternative ways of construing the title given to this session, which was the one that Conference organizers and participants expected to hear about – given the limitations of time?

And, as it is possible in this case that no consensus of expectations will have formed, would it really matter which of the variant themes I take to be focal ?

After pondering the comparative merits of several obvious options, conscientiousness began to seem too great a luxury for keynote speakers, so I selected only one. But, I will reveal the discarded options – to aid you in experiencing "focused" rather than "vague regrets" about the presentation that will ensue…..

Innovation & Commons: alternative readings

- **A Commons is an organizational mode of creating and exploiting socially useful (and economically valuable) innovations.**

  ***FLOSS** (free/libre and open source software) communities provide a familiar paradigm, and from Michael Bauwens we heard of many others.*

- **Comunities pursuing central activities in which their shared resources are employed often will solve problems by generating technical and organizational innovations.**

  While securing their future common access to the knowledge of how to maintain and utilize these new tools, the community generally is more passive about wider dissemination of the information.

- **Common-use agreements -- pertaining to access, preservation and annotation of scientific and technical data and information resources -- form and secure vital bases for sustained future technological and biological innovation.**

  The role of specialized epistemic and communities of practice in these processes is under-appreciated, but critical to realize Big Data's potentials.

Securing the Knowledge Foundations of Innovation:

Thinking about the Contractually Constructed Commons' Roles in the Era of Big Data

By

Paul A. David

Stanford University (USA)
UNU-MERIT (Maastricht, NL)
pad@stanford.edu

Keynote Presentation to the at the International Seminar of the *PROPICE* Project

Property and Commons: New Issues of Shared Access and Innovatoin Association

Convened in Paris, 25-26 April 2013

Five Key Messages – in brief form

- Knowledge, information, intellectual property protection and technological innovation– a tangle of complex, evolving and problematic relationships.
- The periphery and the core of the generalized "anti-commons" threat: 'recombinant novelty meets distributed exclusion rights to basic research tools', resulting in "multiple marginalization" threats to the availability of tool-sets, and formation of extensive cross-disciplinary "discovery spaces" by systematic federation of specialized databases.
- The contractually constructed commons solution to the "data anticommons" will call for innovations in governance and regulation of these commons as "efficient IPR pools".
- The "data deluge" and increasing recourse to Big Data raises the importance of "intermediary" functions served by specialized scientific research communities -- in data identification and cataloguing, quality assurance, and maintenance of open access. How to provide these?
- Explicit public policy is needed to promote contractually constructed commons in exploratory research assets: neither "bottom up" nor "top down" initiatives alone are likely to suffice.

Resonances with several broader themes

- The IPR regime has been transformed from a from publically instituted means of eliciting disclosure of new creative and useful knowledge, into a set legal tools for business to use aggressively to raise commercial rivals' costs, or defensively to counter such strategies; econometric evidence is accumulation that business innovation (e.g., in the UK) is being inhibited by patent thickets. *My concern here is with mitigating the collateral damage that the IPR regime may be doing to the foundations of proprietary R&D in non-proprietary, 'open science' research.*

- Growing attention to the potentialities of the expanding institutional space between the public domain and private property rights in information and data, and the variety of governance arrangements affecting the diverse purposes for which IPR can be exploited. *I will focus on the uses of conventional and sui generis IPR licensing to protect collective creativity in research.*

- The recognized harms resulting from the fragmented and institutionally distributed holdings of (under-licensed and under-exploited) IPR arising from publically supported academic research are likely to become more serious. I will suggest that "inter-institutional pooling" of IP can open a gradual route to undo inefficient sequelae of the internationalization of the "Bayh-Dole revolution."

Back-tracking, to define the terms …

Innovation and Commons –

This economist's "personal conventions" governing the meanings attached to these widely used terms:

Following Schumpeter, *economic innovation is conceptualized broadly in its scope of application, but defined narrowly in regard to its manner of introduction:*

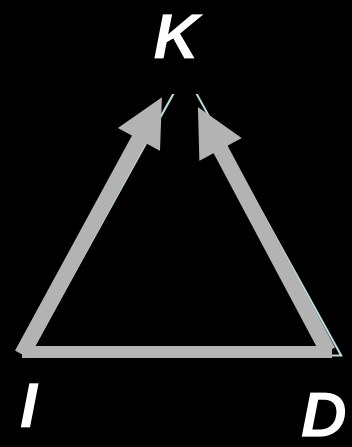
- ***It involves the deliberate introduction of (new) commercializable products or services, or new modes of production (whether technological or organizational.***
- ***It is conceptualized as a process distinct from discovery and invention.***
- ***It need not entail true originality in the sense of "novelty under the sun" – introduction to a new category of potential users, or to the habitants of a region that was entirely unfamiliar with a specific product, technique or service, were instances of "innovation" (and entrepreneurship) for Schumpeter.***

Successful technological innovation is held to spring from the intersection of imagination and existing reliable knowledge.

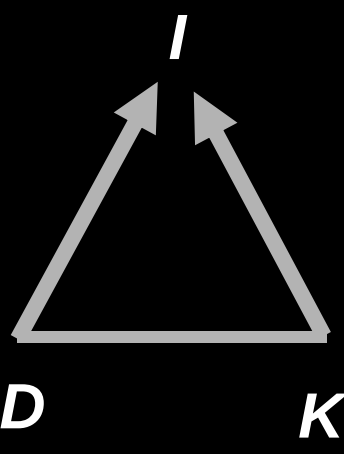
What then is to be understood by "knowledge," and what is its relationship to information and data?

- **K**nowledge is the capability formed from **I**nformation
- **I**nformation is the signal(s) extracted from **D**ata -- using **K**nowledge
- **I**nformation is translated into *actions* (based on **K**nowledge), including the generation and capture of **D**ata

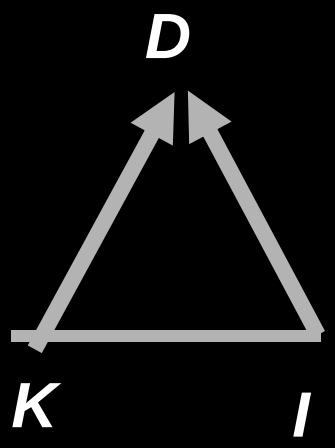
Knowledge as a human capability -- and the "*K I D* - triangles



building knowledge (capabilities for action)



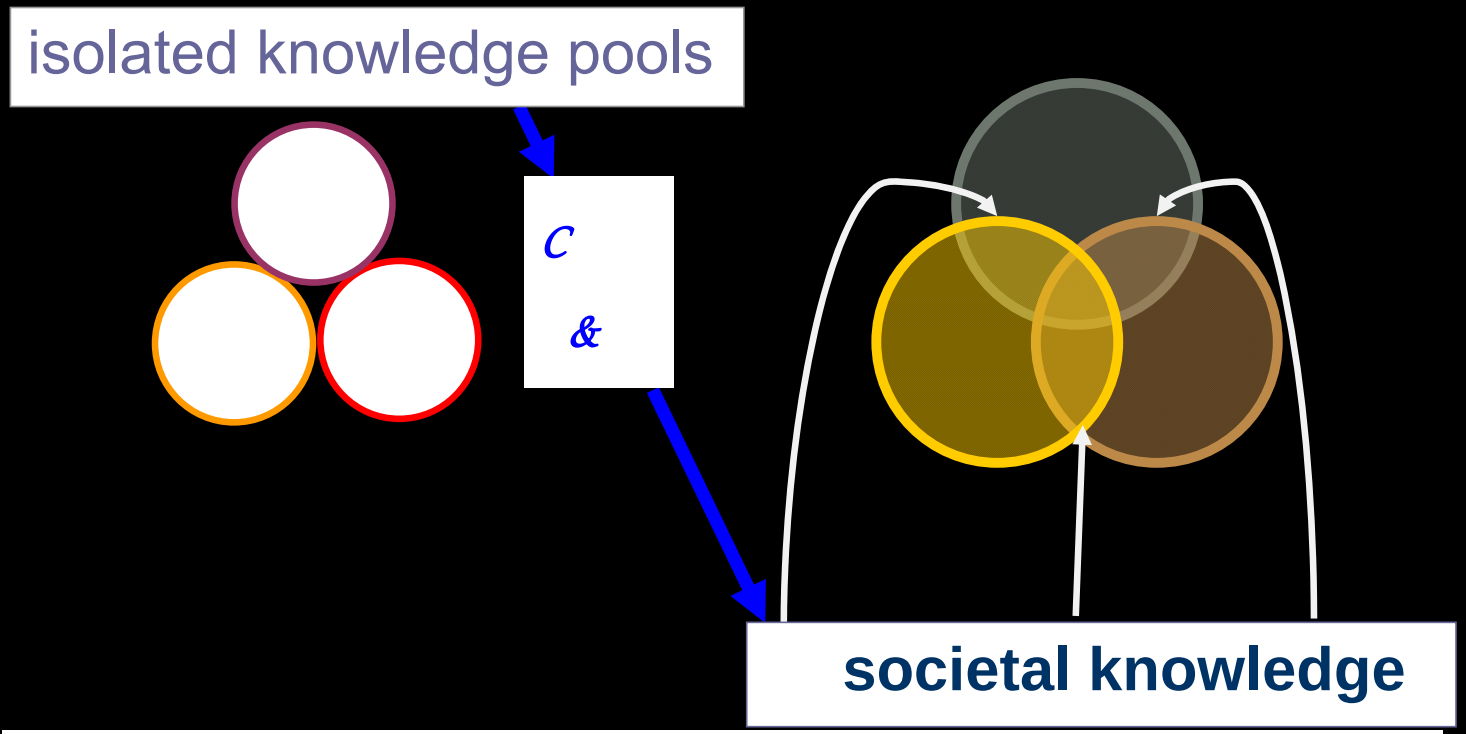
extracting ***information*** *("signals") from data*



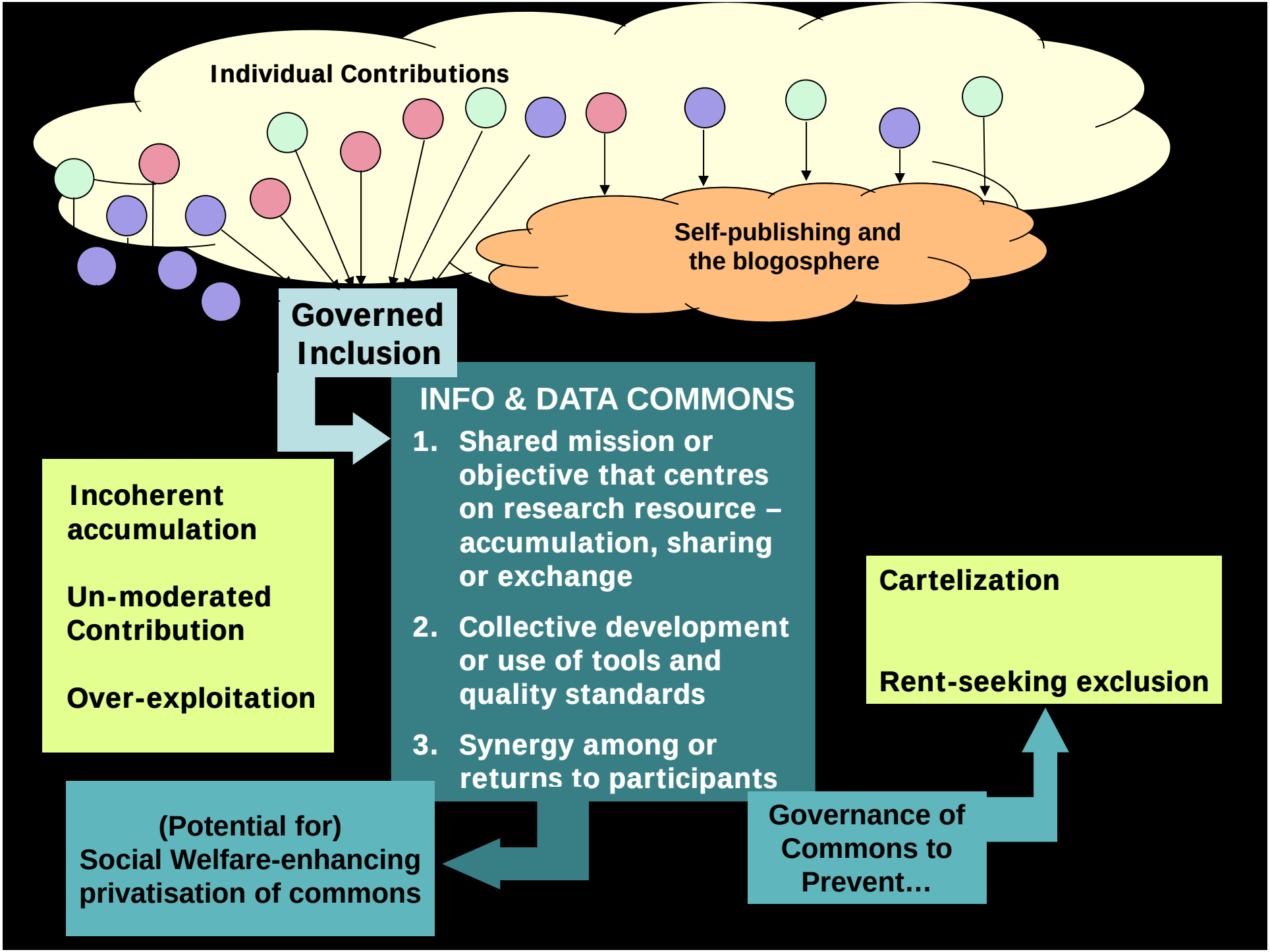
Generating and capturing *data*

Knowledge and Information– Personal and Social

Is social community knowledge the *intersection* or the *union* of the individual members' knowledge?

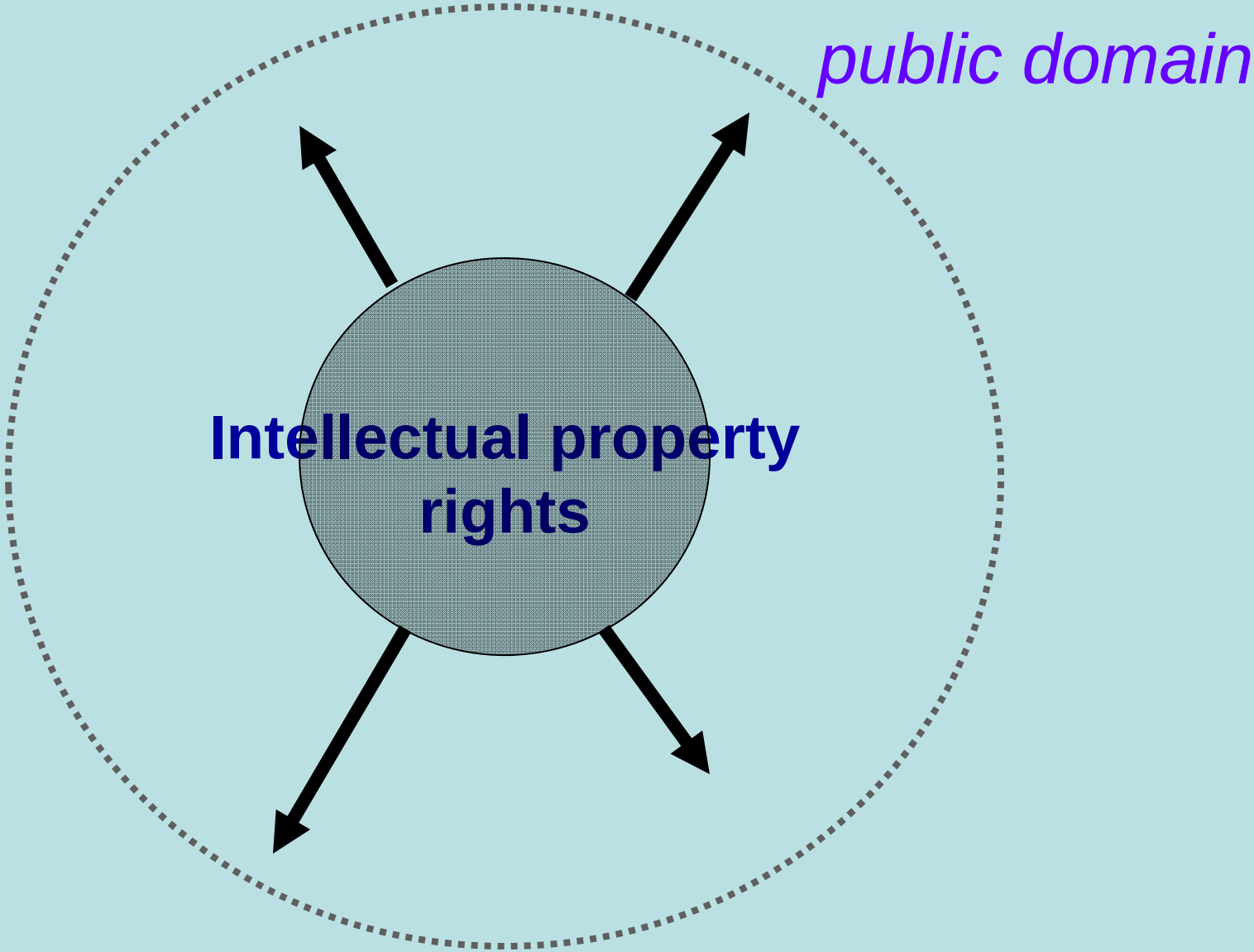


***C**odification and **C**ommunication forms societal (common) knowledge, augmenting individual capabilities with shared "tools"*


Individual Contributions
Self-publishing and the blogosphere
Governed Inclusion
INFO & DATA COMMONS
1. Shared mission or objective that centres on research resource – accumulation, sharing or exchange
2. Collective development or use of tools and quality standards
3. Synergy among or returns to participants
Incoherent accumulation
Un-moderated Contribution
Over-exploitation
Cartelization
Rent-seeking exclusion
(Potential for) Social Welfare-enhancing privatisation of commons
Governance of Commons to Prevent…

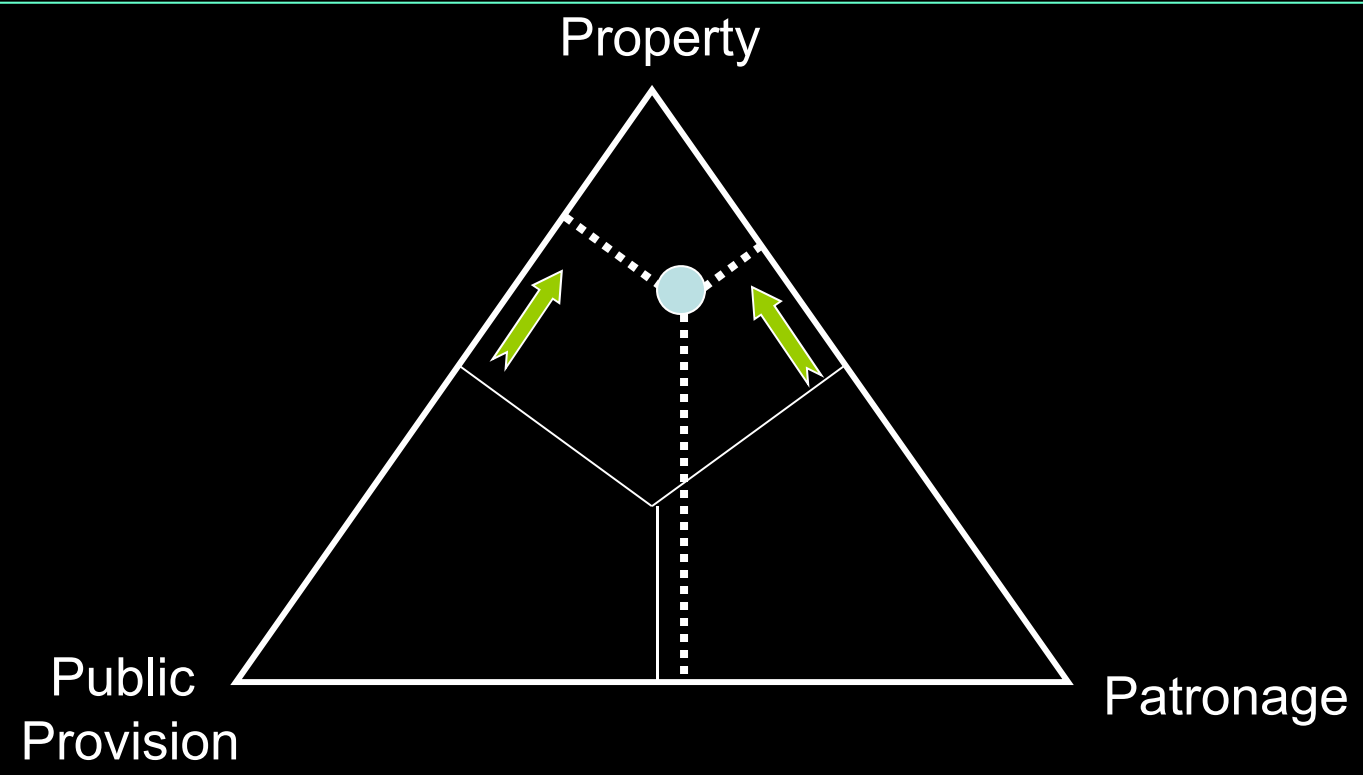
The movement for contractual construction of 'Research Resource Commons' emerged as a reaction to the expansion of property rights protections in digital content.

In considering the role of contractually constructed commons in this movement, one needs to start by acknowledging that the increased use of IPR protections in the past 30 years has posed problems for open collaborative scientific research.


public domain
Intellectual property rights

The "Anti-Commons" is a manifestation of the trends of the past two decades of pressures on "Open Science" --

The balance among the complementary solutions to the appropriability of information as a public good has shifted toward reliance on IPR protection.



Fiscal pressures to "privatization" government information production, reinforced by stronger and more comprehensive IPR protections, and the disruptive effects of ICT innovation, and contributing to a drift toward the "property" pole.

Unintended consequences of stronger IPR protection -- lowering the social rate of return on public R&D

- PROs' engagement in obtaining and exploiting IPR weakens norms of trust and cooperation among researchers (Owen-Smith & Powell, 2001).
- Conflicts over IPR distribution complicates negotiations for joint research projects by firms and universities (Hertzfeld et al, 2006).
- Similar IPR conflicts have even blocked such projects between PROs in developed and developing country PRO's institutions (e.g., U.C. Davis and the collapse of the Andean strawberry project).
- Database utilization encumbered by imposition of "pass-through" IPR licensing conditions – further reinforced by legal protection of encryption – has reduced the research value of repositories that were well annotated by publicly funded research communities (e.g., the Swiss-Prot case).
- **Deep-linking and database federation is impeded by database rights, and copyrights, thereby obstructing exploratory searching of extensive "discovery spaces" (e.g., Cameron, 2003, on genomic and related research domains).**
- **Incompatible, or "non-interoperable" digital rights management (DRM) and "trusted" systems also obstruct broad search of scientific literature, e.g., using semantic web metadata (e.g., on Elsevier's copyright terns, Boyle and Wilbanks, 2006)**
- **"Anti-commons" effects: patent thickets and royalty-stacking – a much discussed problem on which the evidence is mixed (Heller & Eisenberg (1998) vs. Walsh, Arora and Cohen (2003).**

What is the ‘anti-commons problem?

If it exists, isn’t it just about there being too many patents on biomedical research tools?

PEELING THE ONION OF THE "ANTI-COMMONS"

The nature and source of the 'Anti-Commons Problem" — an economist's view:

There are *three layers* of the anti-commons problem, all rooted in the distribution of exploitation rights (and hence exclusion rights) in constituents items in researchers' tool-sets.

Complementarities among elements in the tool-set exacerbate all the problems and costs of the three distinct forms of the "anti-commons":

The anatomy of the Anti-commons—moving from the surface to the economic core:

Layer 1: **Search costs**

Layer 2: **Transactions costs**

Layer 3: **"Multiple-marginalization" and "royalty-stacking"**

"RESEARCH ANTI-COMMONS"-- *PEELING THE ONION*

Layer 1: Search costs, **...**to discover whether tools described in the research literature are privately appropriated, and to whom the property rights were assigned, whether as patents, or as copyright computer code, or as database rights.

Layer 2:Transactions costs, ... strictly these arise when one has identified the owner(s) of the IPR and seeks a license, or an agreement to transfer materials

Non-core "anticommons" problems for biomedical tools:

Eisenberg' s (2001) analysis of the testimony gathered by the NIH Working Group on Research Tools during 1997-98, from representatives of 29 biomedical firms and 32 academic institutions, focused on transaction costs, and "hold-ups" in licensing negotiations; not on multiple-marginalization.

"The exchange of research tools with the biomedical research community often involves vexing and protracted negotiations over terms and value. Although owners and users of research tools usually mange to work out their differences when the transactions matter greatly to both sides, difficult negotiations often cause delays in research and sometimes lead to the abandonment of research plans ….The result has been burdensome and frustrating case by case negotiations over exchanges that in an earlier era might have occurred between scientists without formal legal agreements.

"**….**The foregoing discussion suggests some features of a market for intellectual property that may impede agreement upon terms of exchange, including high transactions costs relative to likely gains for exchange, participation of heterogeneous institutions with different missions, complex and conflicting agendas of different agents within these institutions, and difficulties in evaluating present and future intellectual property rights when profits are speculative and remote."

Source: Rebecca S. Eisenberg, "Bargaining over the transfer of proprietary research tools: Is this market failing for emerging?," Ch. 9 in Expanding the Boundaries of Intellectual Property, Eds. R. Dreyfuss, D. L. Zimmerman and H. First, New York: Oxford University Press, 2001.

THE "ANTI-COMMONS"– *Peeling down to the Core*

Layer 3: Multiple-marginalization and royalty-stacking… Even when there are no strategic "hold-outs", the distribution of exclusion rights to multiple items means that they may be priced in a way that disregards the negative pecuniary externalities of raising the price on any single item.

- When tools are gross complements, rather than substitutes, the resulting inefficiency is the dual of the that produced by ignoring congestions externalities. Here pricing of components ignores the pecuniary externalities on the demand for the project as a whole, resulting sub-optimal use of the entire bundle.
- The severity of the inefficiency increases with the number of tools that are strict complements for the given research project.

LIKELY SITES FOR RESEARCH ANTICOMMONS PROBLEMS

- Biomedical research tools
- Nanotechnology tools
- Scientific software copyrights
- Software patents
- Scientific databases – esp., in genetics, genomics and proteinomics

LIKELY SITES FOR RESEARCH ANTICOMMONS

Biomedical research tools and diagnostics ?

- The research tool that offered commercial opportunities for academic patentees was molecular “targets” for development of drug therapies.
- See Walsh, Arora and Cohen (2004), this has long been an area of concerns: but are the “targets” these really patent complements; are they many such targets in research on particular disease therapies, forming real thickets?
- There are other key tools that were non-exclusively licensed, and were very accessible in the research community: monoclonal antibodies, polymerase chain reaction, restriction enzyme methods where the impacts would be greater as these became basic foundations for a large research field.
- Genetic testing is another field, where royalty-stacking is a problem: See Walsh, Cohen and Cho (2005) and Cho et al. for studies of diagnostic kit patents, especially the Myriad patents: the effects of the suite of tests each patented is that the price is sufficiently high that the number of labs doing them has decreased, and there is negative feedback on the improvement of diagnosic accuracy. This is not strictly a research anti-commons problem and it arises in a final (downstream) service.

Databases are haven't been a central topic of concern in the push-back against the expansion of IPR impediments to open access to research resources…

Initial discussions of the 'anti-commons' obstacles to innovation were focused on patenting of research tools in biomedical sciences.

But the vulnerability and importance of databases to fexploratory research in many science domains deserves greater attention.

LIKELY SITES FOR RESEARCH 'ANTI-COMMONS'

Scientific Databases – Some background on legal protections

After Feist v. Rural Telephone (1991) the U.S. did provide legal protection for property rights in database products *per se*, or other 'works of low authorship'.

Following the EU Database Directive of March 1996, a series of U.S. legislative efforts to introduce parallel *sui generis* database protection measures have failed to report bills out of committee until the most recent Congress, when a compromise bill did reach the floor of the House of Representatives -- and died there.

The cases that have reached litigation in the EU point to one of the potential problem areas affecting scientific database: database rights have substantially greater value when the holder monopolizes the source of the contents, and can extract a rent on that – if sufficient accompanying investment in the database facility is undertaken to satisfy the test applied by the European Court of Justice.

Kamperman-Sanders' (2006) analysis of implications the implementations of the EU Directive, and of litigation and ECJ rulings in BRB v Hills and related European database infringement cases – that have limited the scope of its application by applying a "substantial incremental investment" criterion. Will this induce further expenditures by owners, just in order to qualify?

Protecting future open access to critical data is sometimes possible for a community that is responsible for generating the data and able to act *ex ante* – i.e., before their data is taken into the regime of legal IPR protection:

A combination of technological "self-help" and contract law can be sufficient to do that, as was shown by the *HapMap* community….

Contractual construction of a research commons within the sphere of IPR protection is therefore an *ex post* "corrective" strategy .

PROTECTING ACCESS TO DATABASE RESOURCES IN GENETICS AND GENOMICS – USING CONTACTS: The "*HapMap*" paradigm:

HapMap is an example of an open collaborative research project whose members created a sustainable public domain-like database resource that has been protected against privatizatio by legally enforceable contracts.

The National Human Genome Research Institute (NHGRI) and other national funding agencies launched the *International Halotype Mapping Project* in 2002 (see http://www.genome.gov/10001688).

HapMap's Scientific Purpose

- The haplotype map, or "***HapMap***," exemplifies a database tool that has been created to allow researchers to find genes and genetic variations that affect health and disease. The DNA sequence of any two people is 99.9 percent identical, but the variations may greatly affect an individual's disease risk. Sites in the DNA sequence where individuals differ at a single DNA base are called *single nucleotide polymorphisms* (SNPs). Sets of nearby SNPs on the same chromosome are inherited in blocks, and the pattern of SNPs on a block is called a haplotype. Blocks may contain a large number of SNPs, yet a few SNPs are sufficient to uniquely identify the haplotypes in a block. The *HapMap* is a map of these haplotype blocks; "tag SNPs" are specific SNPs that identify the haplotypes.

- By reducing number of SNPs required to examine the entire genome for association with a phenotype--from the 10 million SNPs that exist to roughly 500,000 tag SNPs–*HapMap* provides a means of greatly reduce the costs and effectiveness of research in the field of genetic medicine. By dispensing with the need to type more SNPs than the necessary "tag SNPs", it aims to increase the efficiency and comprehensiveness of genome scan approaches to finding regions with genes that affect diseases.

The *HapMap* Project's novel anti-privatization tool:

- The ***HapMap Project*** followed the precedents established by the Human Genome Project (HGP), by rejecting protection of the data under copyright or database rights, and establishing a policy requiring participants to release individual geneotype data to all the project members as soon as it was identified.
- It was recognized that any of the teams with access to the database might be able to take that data and, by combining it with their own genotype data, generate sufficient information to file a patent on haplotypes whose phenotypic association with disease made them of medical interest.
- To prevent this, a temporary "click-wrap license" was created – the *IHMP Public Access License* – *which does not assert copyright* on the underlying data, but requires all who accessed the project database to agree not to file patents where they had relied in part on *HapMap* data. This is a "click-wrap" contract!
- The *IHMP-PAL* is another special form of *legal jujitsu*, by which "copy-left" is mutually imposed on database users through an enforceable contract, here *in the absence of IPR ownership*. Technological protection of the database at a level sufficient to compel users to take the "click-wrap" license makes it possible to dispense with the legal protection of asserting copyright in order to use "copyleft" licenses.

A simple heuristic economic model illustrates why there is a special need for *ex ante* or *ex post* strategies (using contract law.

These alternative strategies can be implemented either without or with legal IPR protection, respectively)in order to combat the anti-common's effect especially damaging impacts on exploratory science research projects. The latter already are highly intensive in their reliance on access to multiple data-bases, and expected to become moreso.

"RESEARCH ANTI-COMMONS"–THE GENERALIZED CORE

- Multiple-marginalization resulting from the distributed ownership of patents and copyrights (and other legally protected property rights in information and data) should be seen as only one form of potentially serious impediment to the conduct of exploratory scientific research projects, and some applications oriented research.
- The problems of "patent thickets" are familiar, and *"thickets" of patents that are strong complements in use as research resources* are particularly inefficient from the social welfare viewpoint, complementarities among other kinds of research tools similarly result in resource allocation outcomes that are more inefficient than that which would be produced when essential blocks of property (exclusion) rights are controlled by a single monopoly.
- The generality of this problem can be seen from the effects of multiple-marginalization in degrading the quality of exploratory searches of large and diverse data-fields. So called "Big Data" enthusiasts envisage the latter "discovery spaces" being created by the "federation" of many different, specialized data-bases and particularly powerful for future scientific progess – as has been the case in bio-informatics.
- In the following simple model of a research project, database contents are a critical input in information searches required for efficient discovery.

“RESEARCH ANTI-COMMONS”–THE GENERALIZED CORE

Consider this imple model of a research production project: the output is results R, produced under cost-minimizing conditions on a budget of G

$$G = \sum[p\ \{\ i\ \}]\ [b\{i\}] + X\ ,$$

subject to the constaint of the research production function

$$R = F(\ S\ ,\ X\ )\ ,$$

where

X is a vector of inputs of experimental time and equipment,

S is the output of a *search* activity, according to search function:

$$S = S\ (\ b\{1\},\ b\{2\},\ \ldots.b\{B\}\ )\ ,$$

in which

b{ *i* } is the information extracted from the *i* -th database.

"RESEARCH ANTI-COMMONS"–THE GENERALIZED CORE -3

Modelling assumptions and steps:

1) For simplicity, symmetry of intensity of database use is assumed, and all projects are also assumed to have identical search strategies.

2) From a constant elasticity of substitution (*CES)* production function for "search" – using information extracted from the data-bases as the inputs -- one obtains derived demands for access to database contents, as a function of unit extraction charges, project real budget level and the elasticity of substitution among databases.

3) Assume database owners set profit-maximizing royal rates for data extraction independently (as discriminating monopolists), and solve for the resulting relative prices, and the project's consequent cost-minimizing search, and production decisions.

4) Show that the resulting database royalty charges will be a (symmetric) Nash equilibrium for the set of database owners

"RESEARCH ANTI-COMMONS"– GENERALIZED CORE - *3*

Basic solution results:

- Even if the b{ *i* } are not strict complements, and there is symmetric non-zero elasticity of substitution between them, when database rights are separately owned and priced individually to maximize the owners' separate revenues without taking account of pecuniary spill-overs, the larger the number of databases, B, the more severely degraded will be S.

- Therefore R (research output), for a given project funding level, G, will be reduced – so long as the search activity (S) and the inputs of researcher time, and other tangible resources, (X) are not infinitely substitutable.

- Given the same budget, the research output (*R)* is found to be inferior to that obtained with joint monopoly ownership of databases; the the comparative inefficiency vis-à-vis monopoly increases with the number of databases that need to be accessed for search.

LIKELY SITES FOR "RESEARCH ANTI-COMMONS"

- **Scientific software:**
  A wide range of tools come out of labs, a case of 'user innovation' – but many are not preserved and packaged for wider use; they remain un-portable until commercial entrepreneurs the the complementary resources obtain the rights (often freely) for exploiting them…

- **Software patents --** a double problem:

  (1) The modularity of software gives rise to strong complementarities, and the potential for reuse in new combinations to produce novel functionalities. Software is a good site for the formation of patent thickets: see the evidence from the MPEG and other cases in Clarkson (2005).

  (2) The convergence of information technology with emerging research fields, including biotechnology (bioinformatics) and nanotechnology, means that the ramifications of software thickets extend into promising frontier areas research where new tool-building is likely to go on.

An unusually high potential for patent thickets in Nanotechnology?

Three important structural differences between the emerging science of nanotechnology and other fields of invention raise the potentiality for patent thickets in this arena:

(1) Nanotechnology is almost the first new field in a century in which the basic ideas are being patented at the outset. In many of the most important previous fields of invention -- hardware, software, the Internet, even biotechnology -- the basic building blocks of the field were either unpatented or the patents were made available to all users by government regulation. In others, patents were delayed by interferences for so long that the industry developed free from their influence. In nanotechnology, by contrast, companies and universities alike are patenting early and often.

(2) Nanotechnology is unique in its cross-industry structure. Unlike other new industries, in which the patentees are largely actual or at least potential participants in the market, a significant number of nanotechnology patentees will own rights not just in the industry in which they participate, but in other industries as well, which may significantly affect their incentives to license the patents. Will they be "troll-like" – dormant until a blocking opportunity arises?

(3) A large number of the basic nanotechnology patents have been issued to universities, and while universities have no direct incentive to restrict competition, their interests may or may not align with the optimal implementation of building-block nanotechnology inventions.

*"**The result is a nascent market in which a patent thicket is in theory a serious risk. Whether it will prove a problem in practice depends in large part on how efficient the licensing market turns out to be**."*

--- Source: Mark A. Lemley, "Patenting Nanotechnology," 58 *Stanford Law Review*, [v], 2005-2006: pp.601-631

Digital security technology and modern IP legislation …

… now form an 'unholy trinity" that threatens the future effectiveness of scientific database facilities –- and access to other digital information

The combination of three confluent developments at the end of the 20th century can perversely transform the copyright regime:

- DMCA and EU criminal law sanctions against decryption
- *sui generis* legal protection of database rights
- digital rights management technologies & trusted systems

Together these have the potential to displace the copyright regime as socially designed to balance private property rights against protection of the public domain in data and information.

The result could be a regime of exploitation based upon indefinite possession, greatly attenuated 'fair use', one-way private contracting, and impediments to virtual federation of distributed database contents...

…with unintended 'collateral damage' to science and technology research by restricting access to federated database facilities.

Protecting access to reliable data is only one part of the problem, and by now it is the widely recognized part.

But:
Stengthening researchers' incentives to create transparent, fully documented and dynamically annotated datasets *to be used by others* remains an insufficiently addressed problem

Quality in data is costly, as it is in many things:

To provide others with "good datasets" is costly for those who best know the data and its likely potential uses – those involved in the projects that created the data. As a rule, however, they can ill afford the time and expense involved. . .

When users and beneficiaries at large are unwilling to pay the costs,

we should not be surprised that DIFFICULTIES ENSUE ….

DIFFICULTIES ensue in with the provision of when production of high quality research data for shared use is systematically under-funded:

- Systematic recording of steps in the data-generation process, and subsequent documentation are time-consuming and low priority tasks that typically are deferred to end of project – when funds are exhausted.
- Publicly funded projects rarely provide support for the data editing and documentation activities – so the norm is that datasets that are "under-documented" are shared, by outsiders use them at their risk, and cost.
- The open science reward system has no institutionalized mechanisms that incentivize careful data preservation and documentation. But, since even releasing inadequately "cleaned" and poorly documented datasets may create a "time sink" for investigators (external users find errors and ambiguities, want help to use 'the gift'). Initial refusal to share seems wise.
- Incentive mechanisms would need to begin by defining "data quality dimensions", setting minimum standards, and specifying performance metrics –which will be heterogeneous, as they must be appropriate for the research area of origin and not irrelevant for the intended use.

Toward practical (less radical)solutions:

If we didn't have the present IPR regime, this line of economic analysis might persuade us not to institute it. BUT – the IPR regime has been in existence for a long time and economic activities have orgnized themselves to live with, and try to benefit from it.

The effects of abolishing this "historical legacy" would be very disruptive; arguments for abolition (e.g., those advanced by Boldrin and Levine) typically focus on the benefits to be gained and omit to count the costs.

Those cost would include both the disruption, and the development and adaptation to the new regime that would need to be devised -- because a regime based on secrecy, or technological "self-help" (that would employ encryption to facilitate third degree discriminatory monoply pricing of information access) clearly would be much worse that the status quo.

So, we need to meliorative solutions, offering research communities "better ways of living with IPR" …until it is possible to make fundamental changes in IPR systems, such as replacing tort by liability law.

The contractually constructed quasi-commons (or "club commons) is the immediately feasible remedy for the anti-commons

-- and also for other less serious barriers to collaborative production of information and data resources:

– It makes use of the legal protection afforded by the IPR regime,and its limitations on total and indefinite monopoly ownership;

-- It utilizes contract law to enforce compliance with voluntarity entered agreements to pool IPR under common use or other cross-licensing and "sharing" arrangments among members of t he commons.)

public domain

How can the "tragedy prone commons" be the solution to the "tragedy of the anti-commons"?

To make space in public policy discussions for the "Commons solution" we need to clear away economists' and lawyers' misconceptions about "the Commons", and ***stop textbook repetitions of the travesty of the 'Tragedy',*** like this cautious example – repeating the falsehood without quite endorsing it:

"The *anticommons* is a play on words and refers to the 'tragedy of the commons' which is taught in freshman economics. In the tragedy of the commons peasants in early modern Britain overgrazed shared pastures ('the commons') because the absence of private property eliminated incentives to conserve."
-- Scotchmer (2004:88)

Whereas this is the historical reality:

- Contrary to the historical fantasy of a "common pool problem" promulgated in the influential essay by Garrett Hardin (1968), this "tragedy" never was: from the 13th century onwards, the records of Europe's agrarian communes detail regulations adopted "by common consent" of the villeins (tenants) to control the exercise of rights of common grazing on the fallow fields, the meadows, and the stubble-fields) of the village's arable land. Internal management accompanied exclusion of strangers.

…and the Commons in tangible exhaustible resources still lives!

Collective possession of exhaustible resources did, and does not translate into a chaotic struggle for possession among neighbors, nor does it result in the egalitarian distribution of use-rights.

A growing number of empirical studies --following Ostrom (1990) -- show that common pool resources can be managed successfully under a variety of common property regimes in the contemporary developing world.

Even in western Europe today, such arrangements based upon *de jure* common use rights (*res communas*) that date from the Middle Ages have survived in the Swiss Alps and Northern Italy—e.g., the Magnifica Comunità di Fiemme, in the valley of Aviso (Trento) -- where they still govern the use of tens of thousands of hectares of alpine forests, pasture and meadow land.

What can be done?

-- Creating a "research commons" --*by licensing intellectual property to provide common-use rights has a number of working precedents*:

- Open access publishing of scientific preprints, and self-archived pdfs of published articles
- The Creative Commons ("some rights reserved") approach to licensing of scholarly and creative cultural information products (text, images, sound): offering a menu of standard licenses– http://creativecommongs.org
- Free/Libre and Open Source Software approach ensures access to software tools by unconventional use of copyright licensing terms: GNU GPL ('copyleft' principle) requires distributors of code to do so on the same, open source, royalty free, attribution basis on which they received the code.

SELECTIVE IMPLEMENTATION OF CONTRACTUALLY CONSTRUCTED COMMONS IN INTANGIBLE AND NON-EXHAUSTIBLE RESOURCES: ***EFFICIENT IPR POOLS***

- The case for efficient patent pools [see Shapiro, 2000;Lerner and Tirole, 2002]; rests on overcoming the obstacles to research and innovation posed by the growth of " thickets" and designed complementarities in claims that create blocking patents.
- Defense against anti-trust objections to pooling would be easier where there an empirical procedure for establishing the likelihood that an inefficient patent cluster, i.e., a "thicket" had formed.
- Clarkson (2005) proposes and demonstrates an application of network analysis of patent citations to discover patent "thickets" where complementarities lead to frequent "co-citation".
- Dual pricing policies by foundations running public PRC-i's, are potentially subject to abuse, and competition among the foundations will be limited if complementaries are to be internalized. So anti-trust supervision will be necessary here .

Ex Post Organization of Scientific Research Commons … Biomedical Paradigms

Case 1:Creative Commons' *Neurocommons Project*

http://sciencecommons.org/projects/data/background-briefing/

The NeuroCommons is a proving ground for the ideas behind Science Commons' Data Project. It is built on the legal opportunities created by Open Access to the scientific literature and the technical capabilities of the Semantic Web.

EXECUTIVE SUMMARY

The Neurocommons project, a collaboration between Science Commons and the Teranode Corporation, is building on Open Access scientific knowledge to build a Semantic Web for neuroscience research. The project has three distinct goals:

- **To demonstrate that scientific impact is directly related to the freedom to legally reuse and technically transform scientific information – that Open Access is an essential foundation for innovation.**
- **To establish a framework that increases the impact of investment in neuroscience research in a public and clearly measurable manner.**
- **To develop an open community of neuroscientists, funders of neuroscience research, technologists, physicians, and patients to extend the Neurocommons work in an open, collaborative, distributed manner.**

Case 2: Sage BIONETWORKS' Drug Discovery Commons

CONCLUSION: The argument and policy proposal of the presentation -- in a nutshell

The creation of "scientific research commons" by cooperative pooling and open access cross-licensing of research tool-sets is a practical solution where research progress is impeded by fragmented IPR ownership.

There are circumstances where frontier research projects in academic and/or business entities will be motivated to contract with one another for common-use licensing of the relevant IPR on research tools and data.

Where publically funded research progress can be seen to be blocked by "patent thickets" or individual refusals or license database contents, public authority interventions to compel common-use licensing is socially efficient and warranted.

The public policy proposal -- in a nutshell:

***A policy proposal*: National R&D funding agencies should agree individually and jointly to exercise their respective authority to make grant and contract awards subject to this condition:**

Where anti-commons effects are found by an external review proceedure to have been blocking research progress in a specific domain, compulsory common-use licensing will be imposed on holders of the IPR covering complementary research tools.

Regulations should be set for the irrevocable assignment of such IPR to independently managed, non-profit "public research commons in information" (PRC-i), which should be monitored by competition authorities.

Key Messages – Reprise

- Knowledge, information, intellectual property protection and technological innovation– a tangle of complex, evolving and problematic relationships.
- The periphery and the core of the generalized “anti-commons” threat: ‘recombinant novelty meets distributed exclusion rights to basic research tools’, resulting in “multiple marginalization” threats to the formation of extensive cross-disciplinary “discovery spaces” by systematic federation of specialized databases.
- The contractually constructed commons solution to the “data anticommons” will call for innovations in governance and regulation of these commons as “efficient IPR pools”.
- The “data deluge” and increasing recourse to Big Data raises the importance of “intermediary” functions served by specialized scientific research communities -- in data identification and cataloguing, quality assurance, and maintenance of open access
- Explicit public policy is needed to promote contractually constructed commons in exploratory research assets: neither “bottom up” nor “top down” initiative by alone are likely to suffice.