What Could a Patent Pool Do for the Promise of CRISPR?

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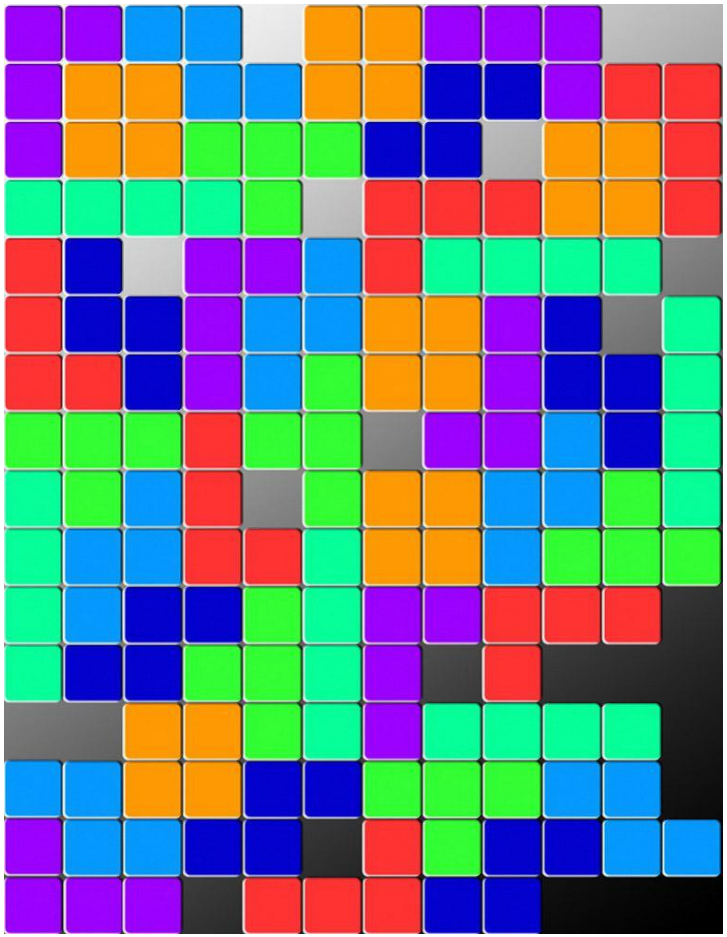
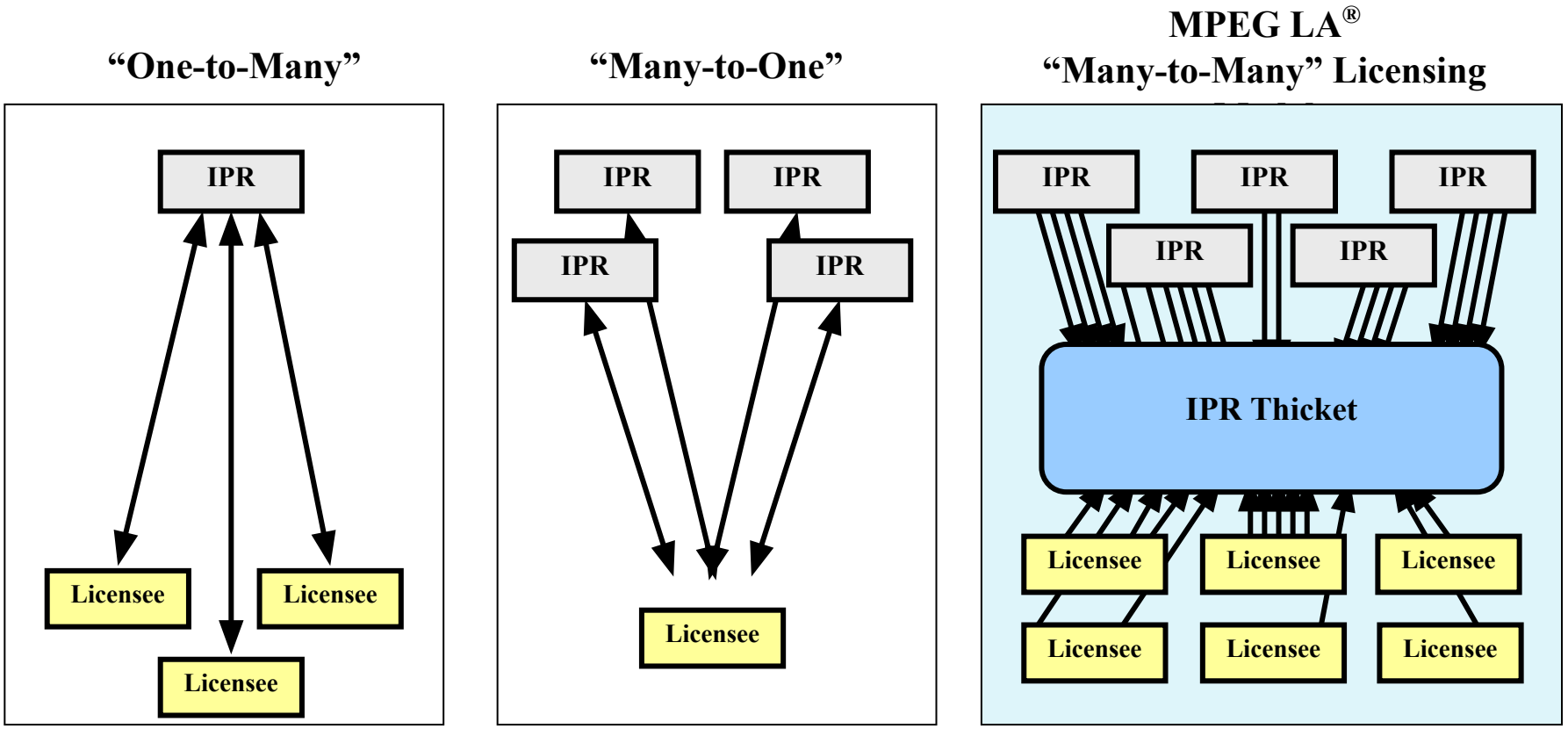
Commercial Development Relies on Patent Protection and Licensing Efficiency



- Patents provide incentive for commercial development of basic scientific discoveries
- Typically there are foundational patents followed by patents on improvements, specific applications, and related technologies
- Oftentimes *complementary patents* are held by multiple, different entities
- Can there be licensing efficiency in a crowded, uncertain and confusing space?

MPEG LA® Licensing Model



MPEG LA pioneered the modern-day patent pool

MPEG-2 Patent Pool

- The MPEG-2 digital video standard faced uncertainty around patent licensing, but the transactional efficiency afforded by the MPEG LA® Licensing Model helped make it the most successful standard in consumer electronics history
  - ~ 10 billion devices
  - ~ 65 billion video discs
  - ~ $5 trillion in product sales

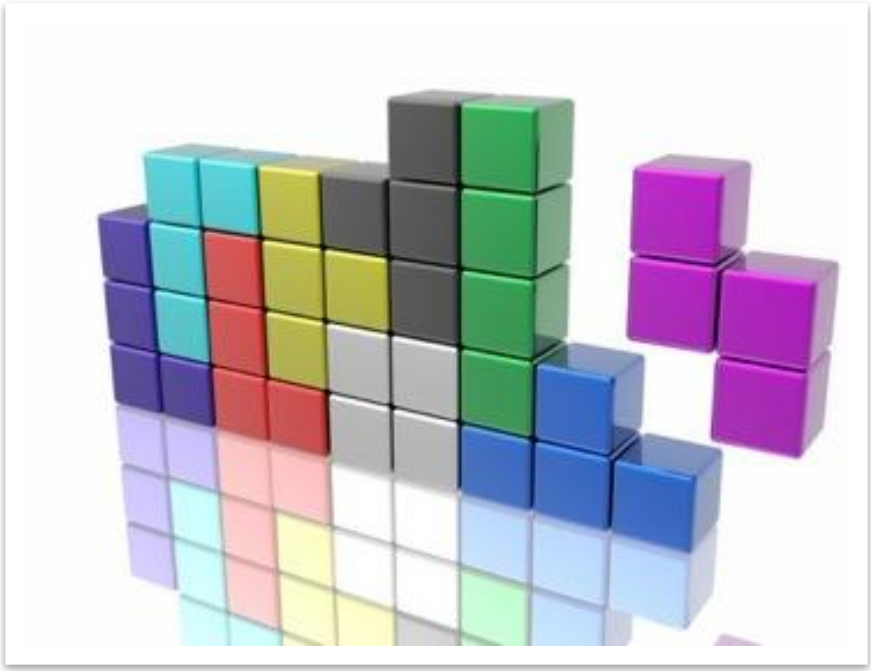
MPEG LA Today

- The solution has become the template
- MPEG LA operates 13 licensing programs in consumer electronics consisting of nearly 15,000 patents in 85 countries with some 245 patent holders and more than 6,000 licensees

CRISPR Patent Landscape is Large and Growing

IPStudies of Switzerland has classified hundreds of patent families directed to CRISPR-Cas (mainly Cas9)

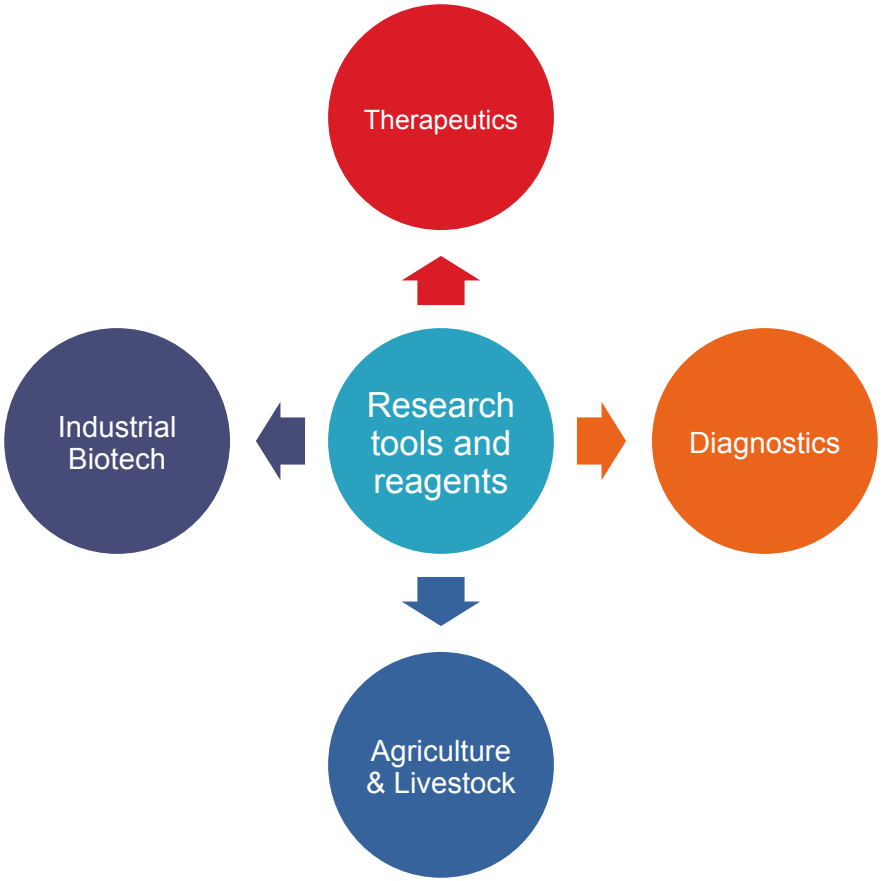
- **Systems**
- **Components**
- **Modified cells/organisms**
- **Methods**
- **Applications**



Patent Assets Snapshot

- **University of California/Charpentier**
  - CRISPR-Cas9 systems featuring single guide RNA for use in any environment
- **The Broad Institute of MIT and Harvard**
  - CRISPR-Cas9 systems for use in eukaryotes
- **Vilnius University**
  - CRISPR-Cas9 systems featuring recombinant Cas9-guide RNA complex (RNP complex)
- **ToolGen Inc.**
  - CRISPR-Cas9 systems for use in eukaryotic and mammalian cells
- **MilliporeSigma**
  - Methods for integrating a donor sequence in a eukaryotic chromosome using CRISPR-Cas9
- **Cellectis**
  - Method of preparing genetically modified T cells for immunotherapy using an RNA-guided endonuclease (expressed from transfected mRNA) and a specific guide RNA (expressed as a transcript from a DNA vector)

CRISPR Markets



CRISPR Patent Pool

A Solution Whose Time Has Come

- Vast potential to improve quality of life
- Increasing volume of patents held by multiple entities covering complementary subject matter
- Worldwide mass market
- Business risks and uncertainty threaten robust development
  - Interferences, oppositions, litigations
  - Freedom to operate will not be possible without multiple licenses
  - Even if multiple licenses were possible, stacking royalties, multiple reporting and diligence obligations will be too burdensome
- Voluntary pool in which stakeholders decide CRISPR's destiny in concert with the market is preferable to solutions imposed from on-high (e.g., compulsory licensing, march-in, regulation)
- Pool balances access by many users with return on investment for innovators – while speeding market development

CRISPR-Cas9 Joint Licensing Platform

Announced December 6, 2016

MPEG LA to Help Solve the CRISPR Puzzle by Making the Pieces Easily Accessible to a Multi-User Market

Call for Patents

Announced 25 April 2017

Patent holders are invited to participate on the ground floor in creating the CRISPR-Cas9 Joint Licensing Platform

http://www.mpegla.com/main/pid/CRISPR/default.aspx

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Addendum

STANFORD UNIVERSITY'S COHEN-BOYER LICENSING PROGRAM

“Gold Standard” for Nonexclusive Licensing of a Platform Technology

- **Cohen & Boyer’s recombinant DNA discoveries in the 1970s**
- **A new technology platform for a wide range of industries**
- **A new paradigm in biotech research**
- **Stanford chose to license the patents nonexclusively – making it easier for numerous small companies to attract funding and strategic alliances – creating an ecosystem to drive innovation forward**

Program Metrics

- **More than $35B in sales of around 2,442 new products**
- **468 Licensees – many of them small startups**
- **Generated $255M in licensing revenue over 25 years**

- Feldman et al., Lessons from the Commercialization of the Cohen-Boyer Patents: The Stanford University Licensing Program, In *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices, available online at www.ipHandbook.org*

Blockbuster Drugs of Top Ten Licensees of Cohen-Boyer

Company	Products
Amgen	Epogen, Procrit[a], Neupogen
Lilly	Humulin[b], Humantrope, Abciximab[c], Humalog
Genentech	Humulin[d], Protropin, Roferon A[e], Activase, Nutropin, Pulmozyme, Nutropin AQ, Actiimune, Kogenate
Schering	Inron A[f]
Johnson & Johnson	Procrit[g]
Merck	Recombivax HB[h]
Abbott	Various in vitro HIV diagnostics
Novo-Nordisk	Novolin
Genetic Institute	Recombinate
Chiron	Proleukin, Betaseron[i]

Partnered with: **a.** Ortho and Johnson and Johnson; **b.** Genentech; **c.** Centocor; **d.** Lilly; **e.** Roche; **f.** Biogen; **g.** Amgen and Ortho; **h.** Biogen; **i.** Berliex