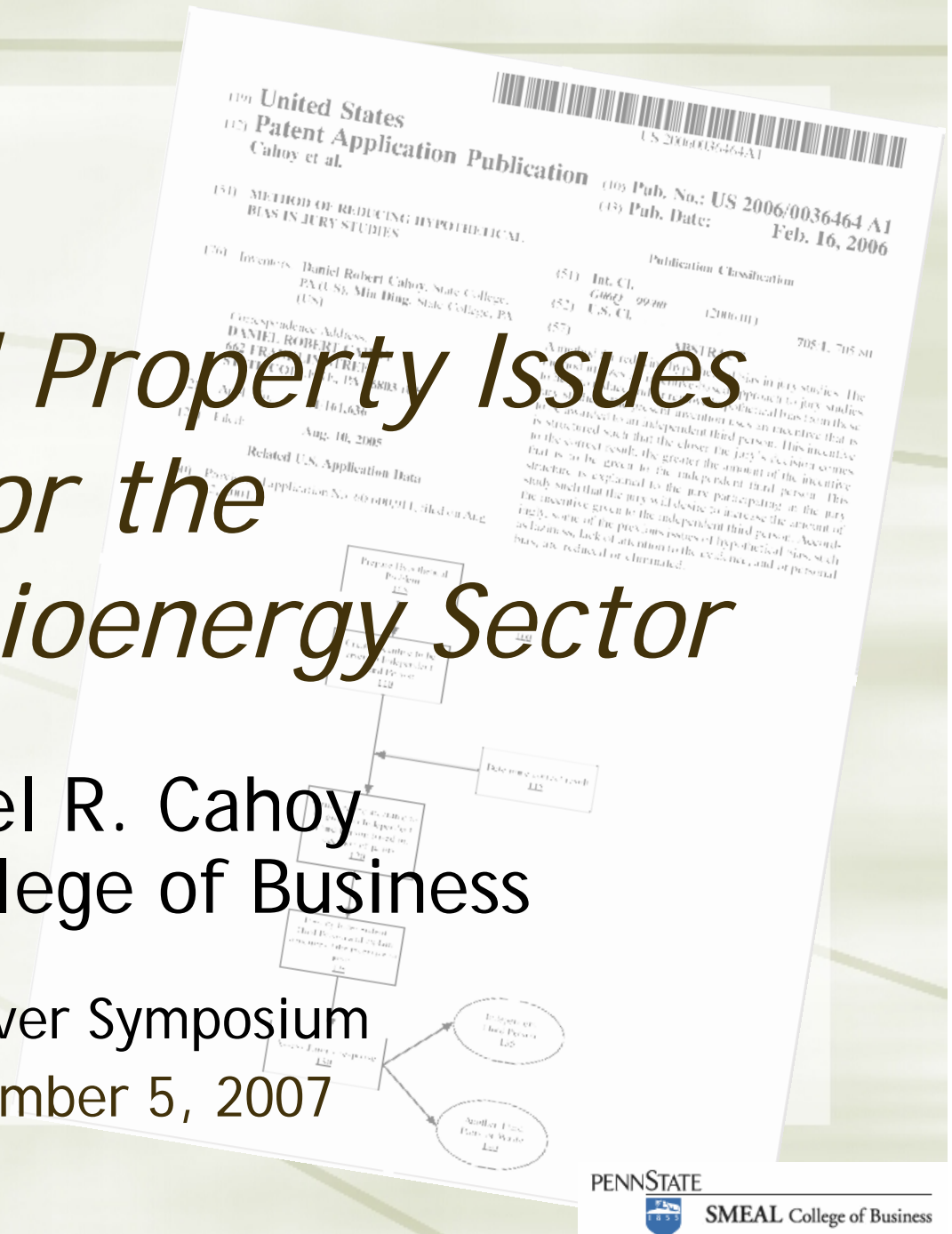


# *Intellectual Property Issues for the Emerging Bioenergy Sector*

Daniel R. Cahoy  
Smeal College of Business

CrossOver Symposium  
September 5, 2007



# Nature of Biofuel IP Rights

- ◆ High technology investment incentives

- ◆ Patents

- ◆ Trade secrets

- ◆ Increasing biofuel IP?

- ◆ A patent gold rush

- ◆ Capture market advantage

- ◆ Future licensing

- ◆ Defensive patenting

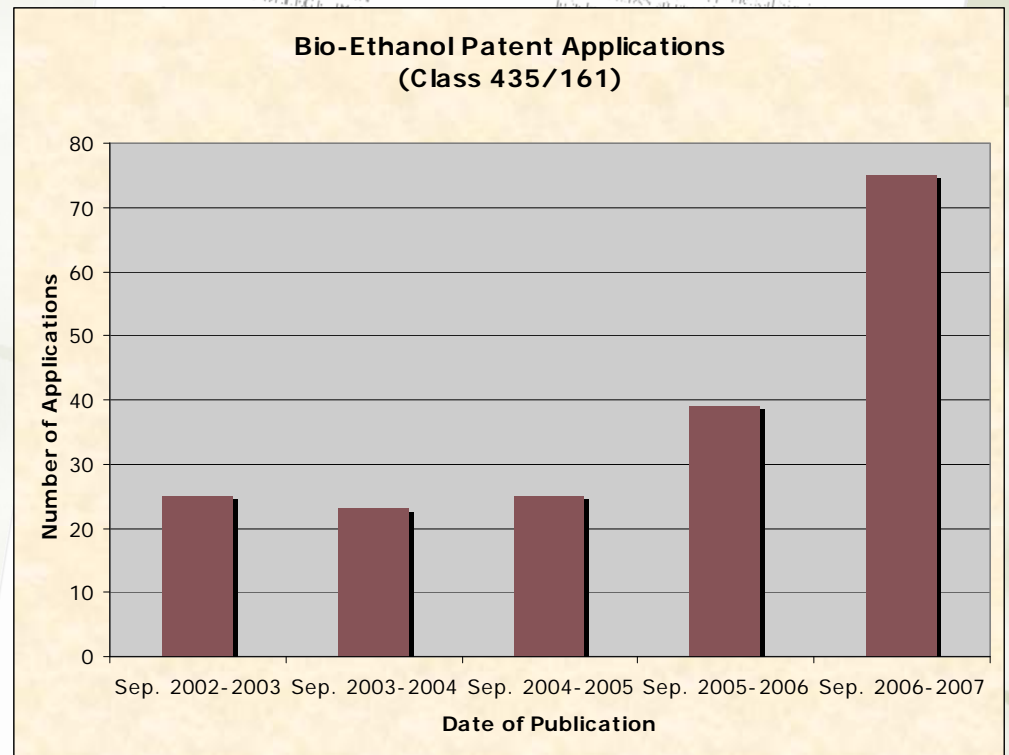
- ◆ Positives to increased "proPERTIZATION"

- ◆ More R&D investment

- ◆ Information dissemination

- ◆ Bargaining Facilitation

- ◆ Negatives?



Source: USPTO published patent application database

# Identifying Biofuel IP Issues

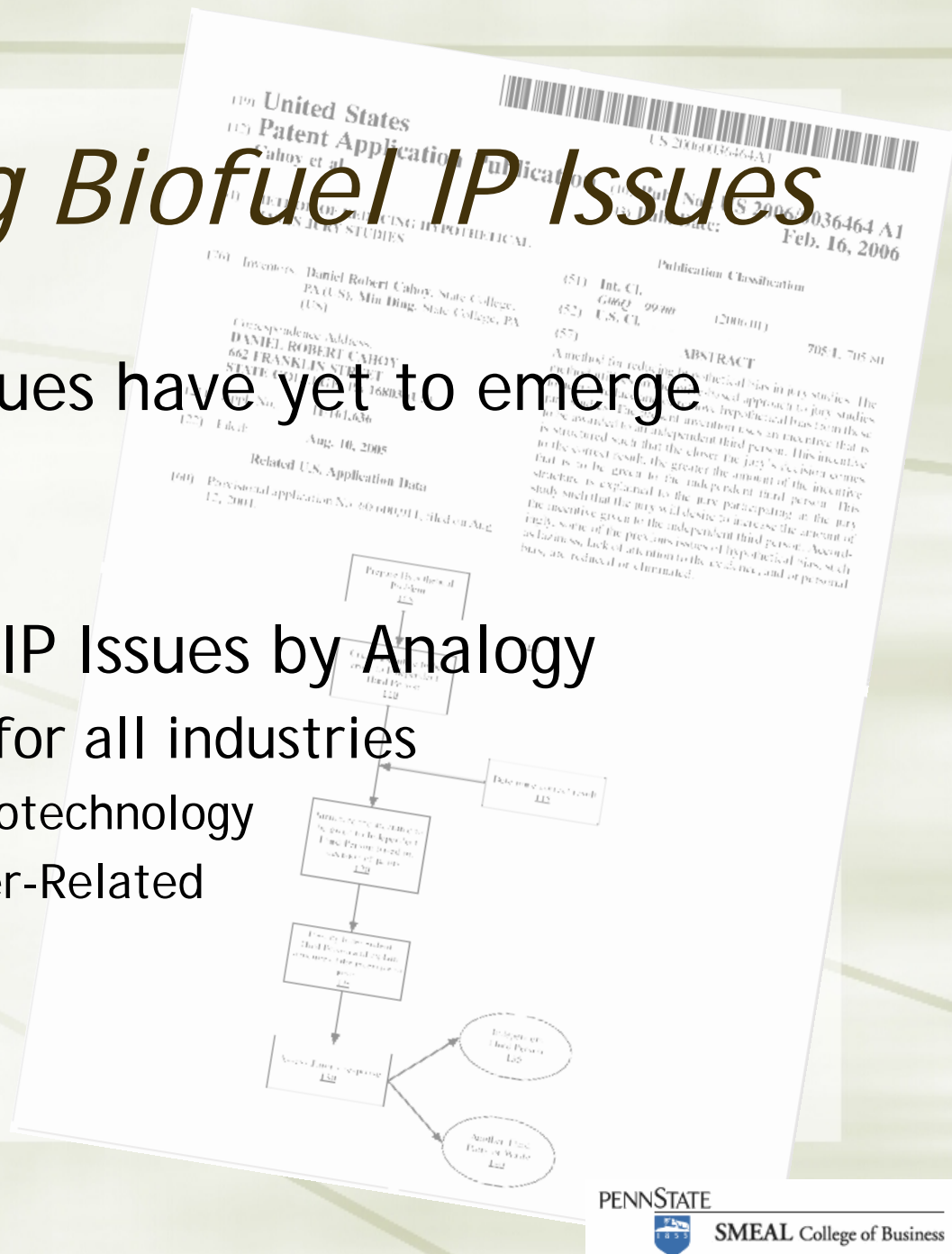
★ Most important issues have yet to emerge

- ★ Economic viability
- ★ Certain players

★ Predicting Biofuel IP Issues by Analogy

★ No general model for all industries

- ★ Pharmaceutical/Biotechnology
- ★ Software/Computer-Related
- ★ Orphan Drugs



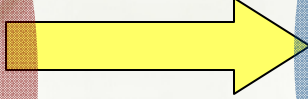


# Areas of Innovation

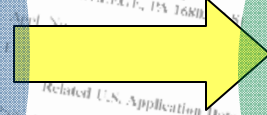


Genetically Modified Feedstocks

Pharma/  
Biotech



Biofuel Processing



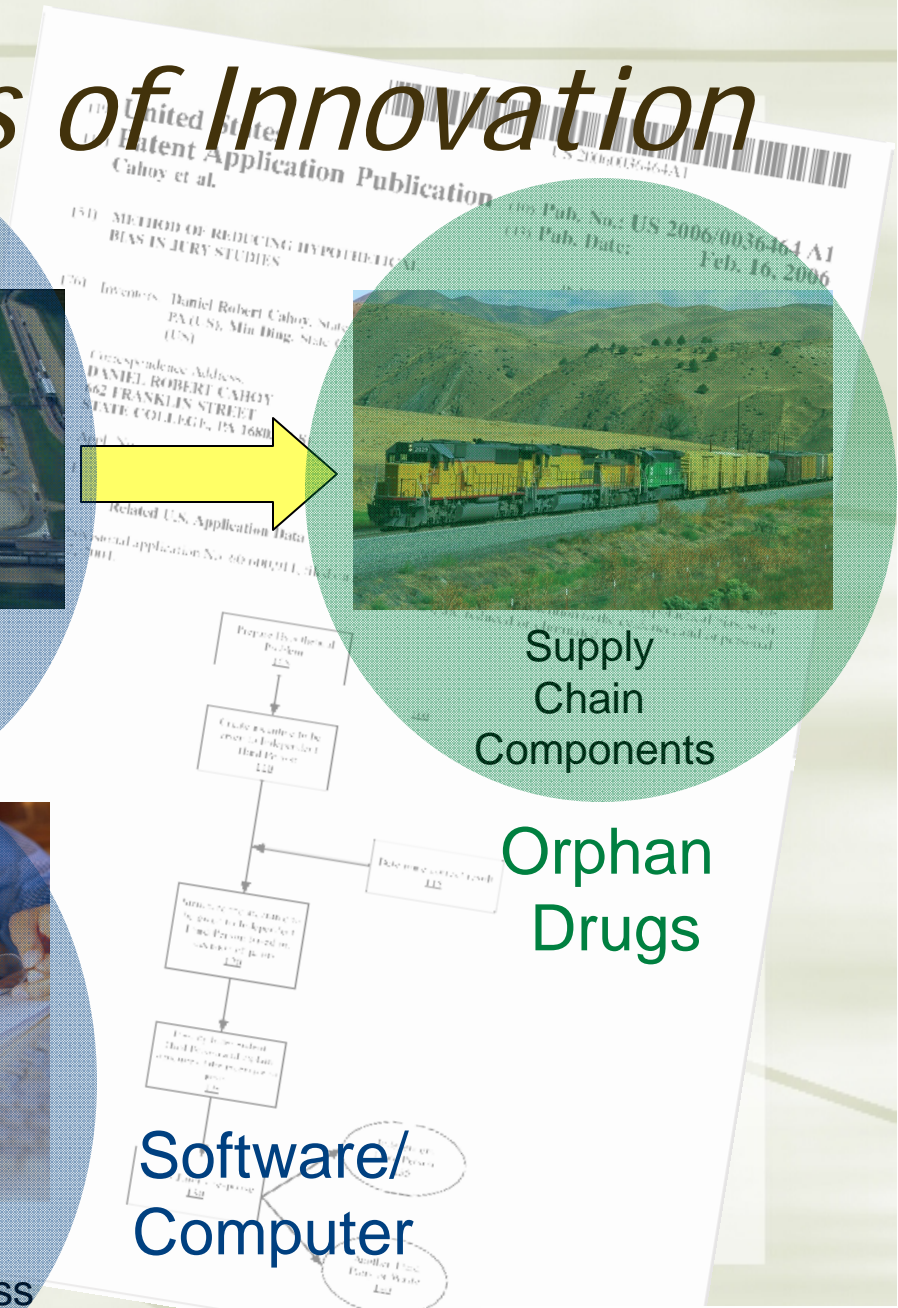
Supply Chain Components

Orphan Drugs



Methods of Doing Business

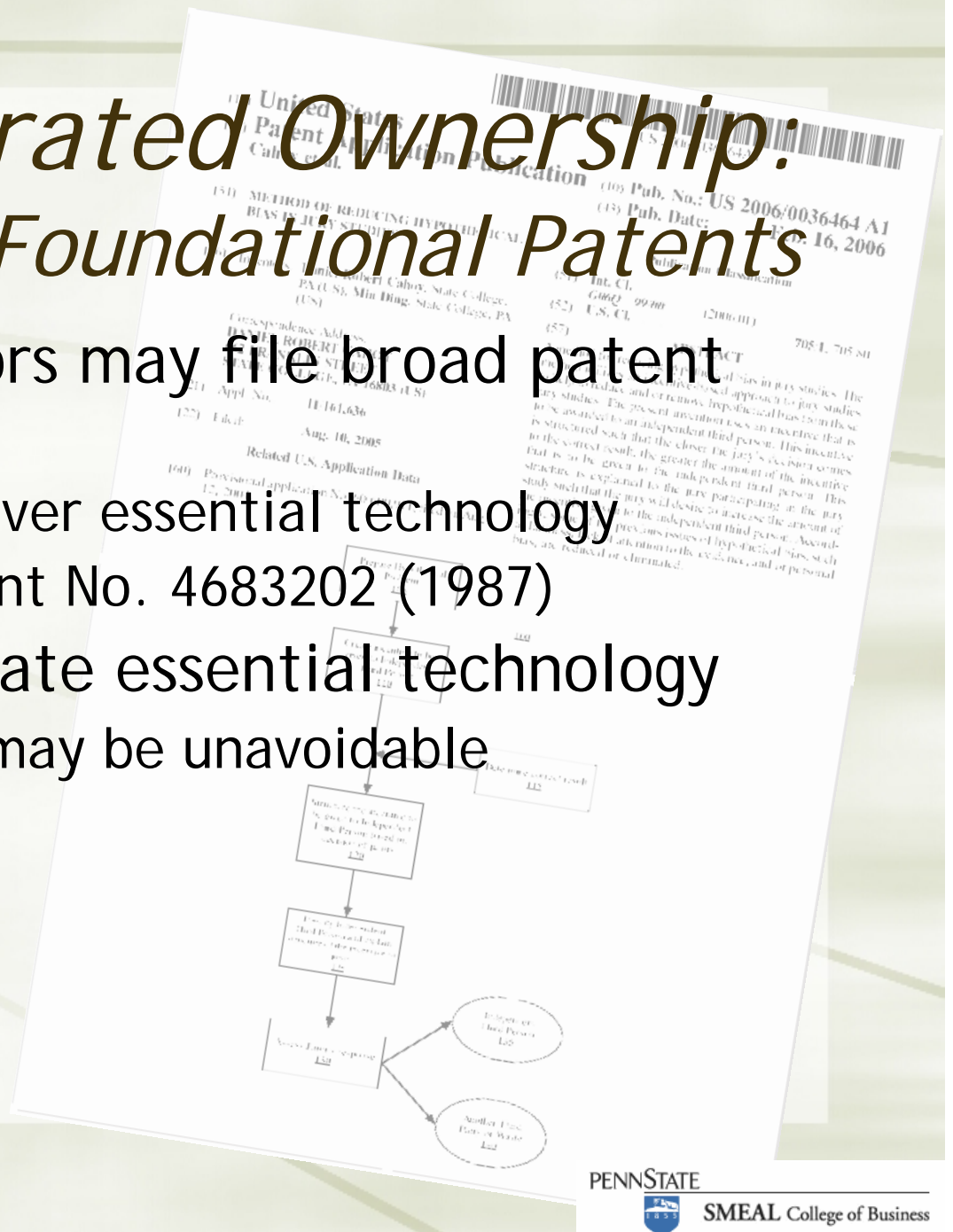
Software/  
Computer





# Concentrated Ownership: Foundational Patents

- ★ Pioneering inventors may file broad patent applications
  - ★ Effective control over essential technology
  - ★ Ex: PCR — US Patent No. 4683202 (1987)
- ★ Standards may create essential technology
  - ★ Patented aspects may be unavoidable
- ★ Issues
  - ★ Refusal to license
  - ★ High license rates
  - ★ Buried technology



# Concentrated Ownership: Patent Walls

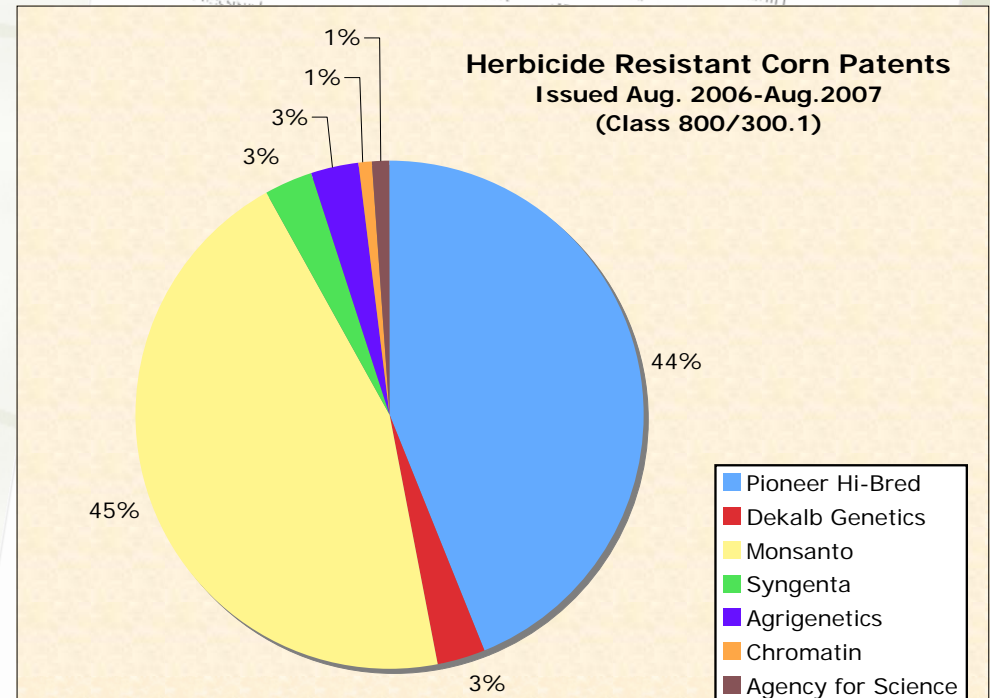
- ◆ Sophisticated firms may attempt to create a wall of patents in technology area

- ◆ Purchasing pioneering patents
- ◆ Overlapping extensions
- ◆ Evergreening

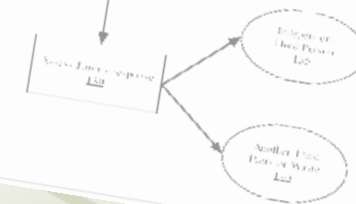
- ◆ Issues

- ◆ Monopoly or oligopoly market conditions
- ◆ Extensions by licensing restrictions

- ◆ *Monsanto v. McFarling*

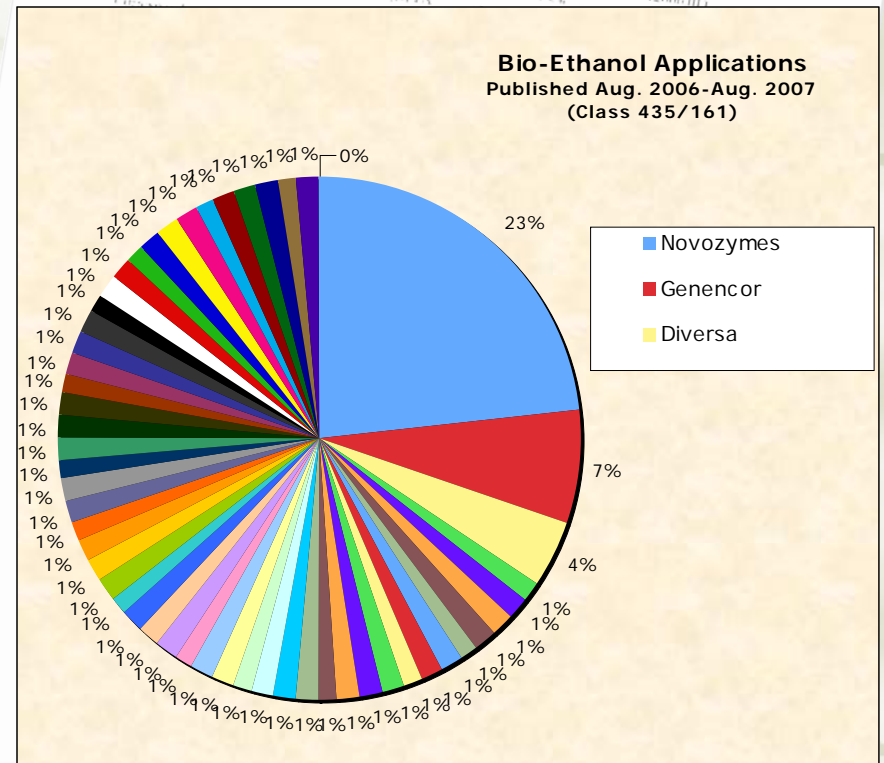


Source: USPTO issued patent database



# Diverse Ownership: Patent Thickets

- ★ May occur when many overlapping patents create a barrier
  - ★ May be difficult to identify all relevant patent owners
- ★ Issues
  - ★ Unanticipated patents hold up innovation
  - ★ License fees can “stack” beyond reasonable marginal costs



Source: USPTO published patent application database



# Identifying Thickets

- ★ Difficult to accomplish on the scale of an entire industry
  - ★ Diverse ownership
  - ★ Varied classes
- ★ Using relational proxies to map thickets
  - ★ Citation connections
  - ★ Conceptual connections
  - ★ Doesn't get at the BCIS question

Figure Redacted

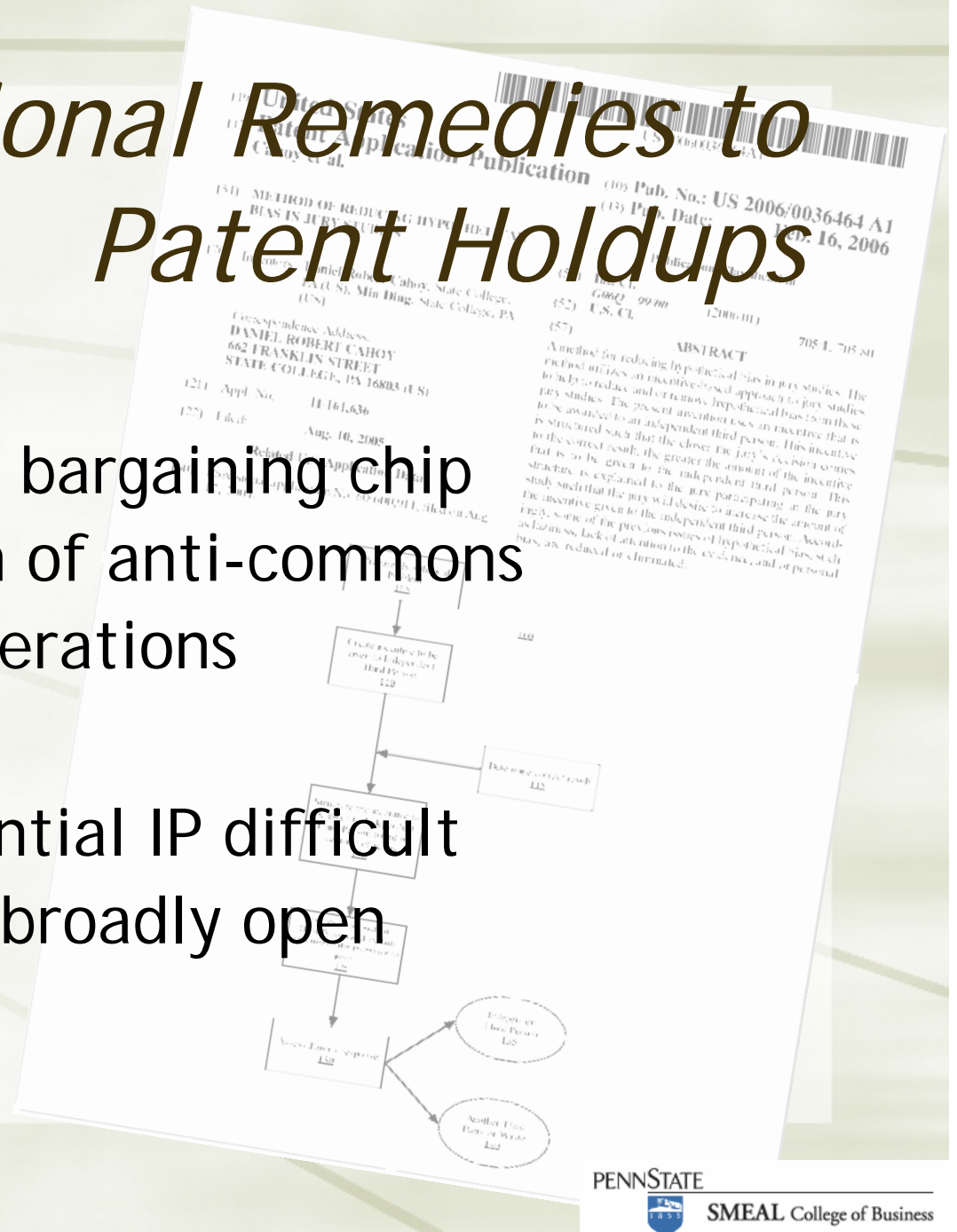
Please contact  
Prof. Cahoy  
for the relevant  
article citation

Growth of Nanotechnology  
Patents, 2000, 2002, 2004  
Clarkson & DeKorte (2006)



# Conventional Remedies to Patent Holdups

- ◆ Cross licensing
  - ◆ Requires patent bargaining chip
  - ◆ Fosters creation of anti-commons
  - ◆ Antitrust considerations
- ◆ Patent Pools
  - ◆ Identifying essential IP difficult
  - ◆ Access must be broadly open

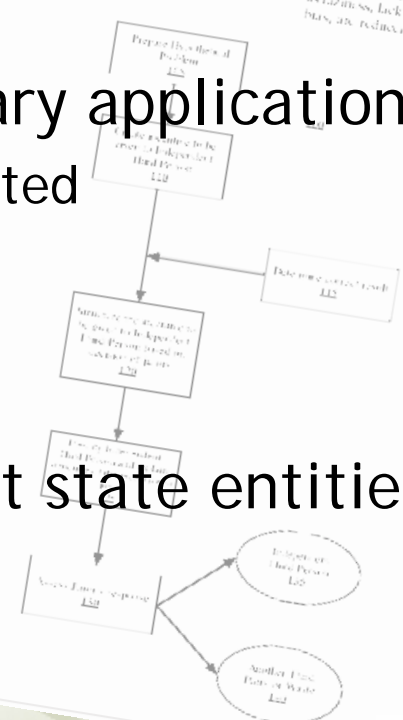


# Unconventional Remedies to Patent Holdups

- ★ Compulsory licensing
  - ★ Government use without permission of patent holder
  - ★ Historic occurrence in military applications
    - ★ Bayh-Dole march-in rights limited
- ★ Patent buy-outs
- ★ State freedom to operate
  - ★ No infringement case against state entities
    - ★ Includes public universities

United States Patent and Trademark Office  
Patent Application Publication  
(10) Pub. No.: US 2006/0036464 A1  
(15) Pub. Date: Feb. 16, 2006  
7054, 705 M1

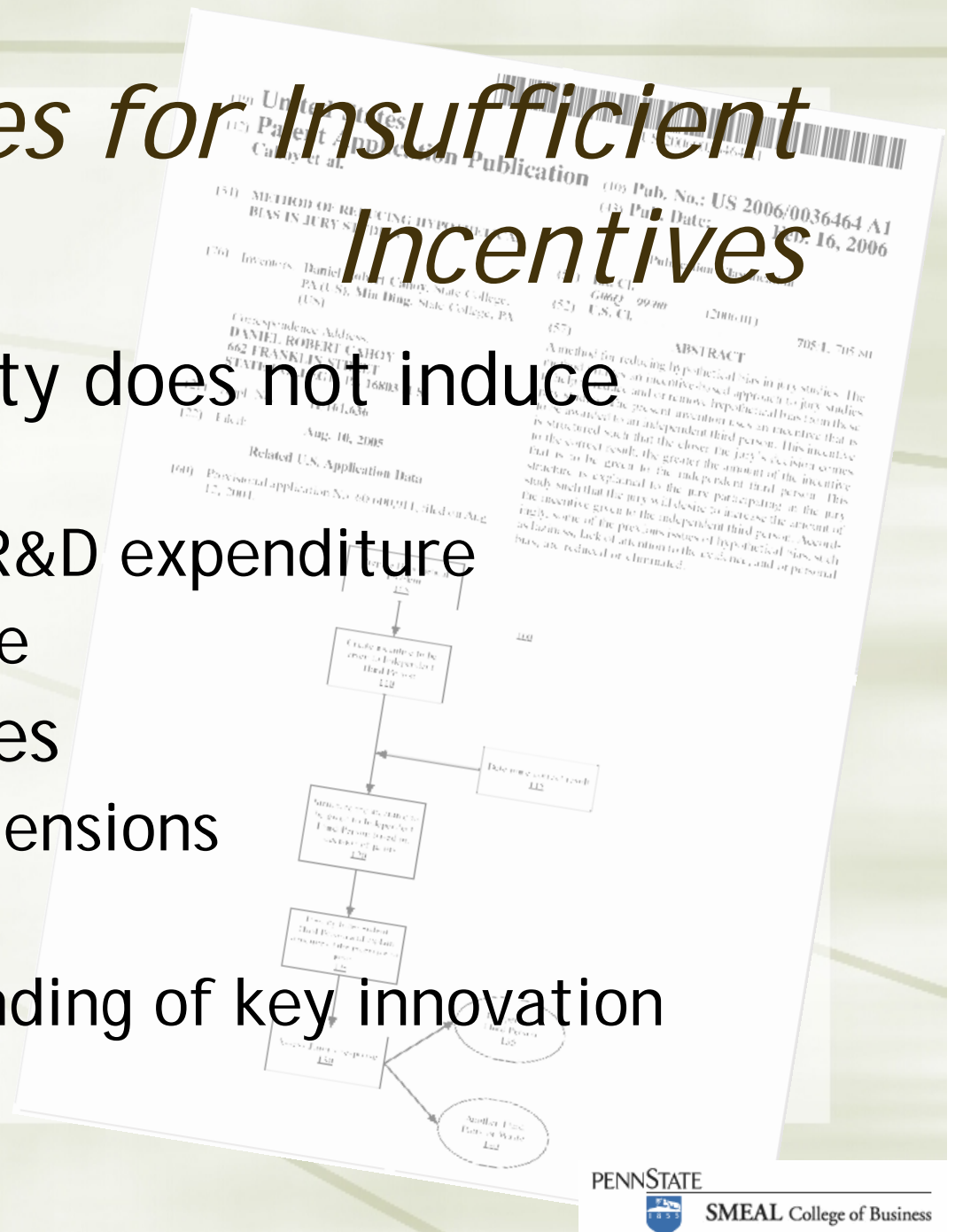
METHOD OF REDUCING HYPOTHETICAL BIAS IN JURY STUDIES  
DANIEL ROBERT CAHOY  
662 FRANKLIN STREET  
STATE COLLEGE, PA 16803 (U.S.)  
Aug. 10, 2005  
11 161,636





# Remedies for Insufficient Incentives

- ◆ Patent exclusivity does not induce research
  - ◆ Will not offset R&D expenditure
  - ◆ Opposing culture
- ◆ Possible remedies
  - ◆ Patent term extensions
  - ◆ Patent prizes
  - ◆ Government funding of key innovation



# Future Research

- ★ Validate analogies to biofuel landscape
- ★ Empirical evaluation of biofuel IP
- ★ Social consequences of current regime
  - ◆ Beyond firms

