KEEPING SECRETS IN THE CAMPUS LAB: LAW, VALUES AND RULES OF ENGAGEMENT FOR INDUSTRY-UNIVERSITY R&D PARTNERSHIPS

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Over the last two decades, the role of private industry in university research has expanded dramatically throughout much of the industrialized world.[1] In the United States, technology transfer

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[1] On the subject of industry-university research collaboration outside of the United States, see, for example, TECHNOLOGY TRANSFER SYSTEMS IN THE UNITED STATES AND GERMANY: LESSONS AND PERSPECTIVES (H. Norman Abramson et al. eds., 1997); Jason Boyarski et al., *Japan Promotes University Technology Licensing,* 12 INTELL. PROP. & TECH. L.J. 28 (2000); Steven Collins & Hikoji Wakoh, *Universities and Technology Transfer in Japan: Recent Reforms in Historical Perspective,* 25 J. TECH. TRANSFER 213 (2000); Yannis Caloghirou et al., *University-Industry Cooperation in the Context of the European Framework Programmes,* 26 J. TECH. TRANSFER 153 (2001) ("The importance of university-industry collaboration has generally increased in the industrialized world since the late 1970s."); Stephen J. Franklin et al., *Academic and Surrogate Entrepreneurs in University Spin-out Companies,* 26 J. TECH. TRANSFER 127 (2001) (examining university spin-off companies in the United Kingdom); Razak Grady & John Pratt, *The UK Technology Transfer System: Calls for Stronger Links Between Higher Education and*

through industry-university research collaboration ("IURC") is ubiquitous and actively encouraged both by university administrators and an array of federal and state government policies.[2] Supporters credit such collaborations with significantly enhancing the technological capacity and economic competitiveness of U.S. firms,[3] encouraging the commercialization of advanced university-generated technology,[4] and helping to underwrite the costs of conducting state-

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Industry, 25 J. TECH. TRANSFER 205 (2000); Douglas H. McQueen & J.T. Wallmark, *University Technical Innovation: Spin-offs and Patents in Goteborg, Sweden, in* UNIVERSITY SPIN-OFF COMPANIES: ECONOMIC DEVELOPMENT, FACULTY ENTREPRENEURS, AND TECHNOLOGY TRANSFER 103 (Alistair M. Brett et al. eds., 1990); Ofer Meseri & Shlomo Maital, *A Survey Analysis of University Technology Transfer in Israel: Evaluation of Projects and Determinants of Success,* 26 J. TECH. TRANSFER 115 (2001); P. O'Brien et al., *University-Industry Strategic Alliance: A British Perspective, in* CHEMICAL SCIENCES ROUNDTABLE, RESEARCH TEAMS AND PARTNERSHIPS: TRENDS IN THE CHEMICAL SCIENCES 28 (1999); Ray Rothwell, *Technology Policy and Collaborative Research in Europe, in* COLLABORATIVE RESEARCH AND DEVELOPMENT: THE INDUSTRY-UNIVERSITY-GOVERNMENT RELATIONSHIP 85 (Albert N. Link & Gregory Tassey eds., 1989).

[2] *See generally* GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE (GUIRR), OVERCOMING BARRIERS TO COLLABORATIVE RESEARCH 5 (1999) [hereinafter GUIRR, OVERCOMING BARRIERS] (noting that "university-industry research collaboration is becoming more frequent and extensive" in the United States); David Blumenthal et al., *Relationships Between Academic Institutions and Industry in the Life Sciences – An Industry Survey,* 334 NEW ENG. J. MED. 368, 369 (1996) [hereinafter Blumenthal et al., *Industry Survey*] (reporting that "over 90% of life-sciences companies in the United States had some relationship with academia" and that more than half supported university research).

[3] *See, e.g.*, COUNCIL ON COMPETITIVENESS, ENDLESS FRONTIER, LIMITED RESOURCES: U.S. R&D POLICY FOR COMPETITIVENESS 3 (1996) (arguing that "R&D partnerships," including IUCR, "hold the key" to "future U.S. economic competitiveness"); Evan W. Berman, *The Economic Impact of Industry-Funded University R&D,* 19 RES. POL'Y 349, 353-54 (1990) (empirical study concluding that industry funding of university research leads to increased overall industry investment in R&D); Michael R. Ward & David Dranove, *The Vertical Chain of Research and Development in the Pharmaceutical Industry,* 33 ECON. INQUIRY 70 (1995) (empirical study quantifying contribution of "basic" university research to the pharmaceutical industry); Lynne G. Zucker et al., *Intellectual Human Capital and the Birth of U.S. Biotechnology Enterprises,* 88 AM. ECON. REV. 290 (1998) (empirical study substantially attributing rise of U.S. biotechnology industry to industry-university research collaborations).

[4] *See, e.g.,* Richard Jensen & Marie Thursby, Proofs and Prototypes for Sale: The Tale of University Licensing 3 (Nat'l Bureau of Econ. Research, Working Paper No. 6698, 1998) (survey concluding that "most university inventions could not be developed independently by either the inventor or the firm"); Gina A. Kuhlman, Comment, *Alliances for the Future: Cultivating a Cooperative Environment for Biotech Success,* 11 BERKELEY TECH. L.J. 311, 344-48 (1996) (detailing social and economic benefits of IUCR in biotechnology industry); *see also* Jeff Gerth & Sheryl Gay Stolberg, *Medicine Merchants: Birth of a Blockbuster,* N.Y. TIMES, Apr.

of-the-art university research.[5] On the other side of the debate, critics of IURC argue that the commercial objectives and interests of private firms are fundamentally inconsistent with the academic values of the university,[6] and that the policies that have been implemented to encourage industry-university research collaboration compromise and undermine the academic mission of the nation's institutions of higher learning.[7]

The task of critically evaluating industry-university research collaboration is complicated by the fact that the term encompasses a

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23, 2000, at A1 (reporting on commercialization of "blockbuster" glaucoma treatment invented at Columbia University and developed by Pharmacia Corporation).

[5] *See generally* Thomas A. Massaro, *Innovation, Technology Transfer, and Patent Policy: The University Contribution,* 82 VA. L. REV. 1729, 1734 (1996) (noting that revenue from inventions arising from industry-university collaboration has supported university medical research for which funding from other sources has not been available).

[6] *See, e.g.*, Charles C. Caldart, *Industry Investment in University Research,* 8 SCI. TECH. & HUM. VALUES 24, 30-31 (positing a fundamental antithesis between the "proper functions of universities" and "the profit motive" and opposing industry-university research collaboration); Rebecca S. Eisenberg, *Academic Freedom and Academic Values in Sponsored Research,* 66 TEX. L. REV. 1363, 1375-77 (1988) [hereinafter Eisenberg, *Academic Freedom*] (arguing that industry-sponsored university research threatens "academic values" by imposing secrecy requirements, creating incentives "for academic researchers to distort their viewpoints . . . in order to please their research sponsors," and distorting "the academic research agenda in favor of research for which funding is available"); Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science,* 94 NW. U. L. REV. 77, 90-94, 110-15 (1999) (positing conflict between norms of science favoring public disclosure of scientific knowledge and commercial norms favoring secrecy and proprietary rights in such knowledge).

[7] *See, e.g.*, Wesley M. Cohen et al., *Industry and the Academy: Uneasy Partners in the Cause of Technological Advance, in* CHALLENGES TO RESEARCH UNIVERSITIES 171, 193-94 (Roger G. Noll ed., 1998) (advocating policy changes to prevent IUCR from undermining the public dissemination of university research); Irwin Feller, *Universities as Engines of R&D-Based Economic Growth: They Think They Can,* 19 RES. POL'Y 335, 343-44 (1990) (opposing IUCR directed toward commercialization of university research, in part, because such collaboration is incompatible with the core activities and norms of academic research); William J. Broad, *As Science Moves Into Commerce, Openness Is Lost,* N.Y. TIMES, May 24, 1988, at C1; Colleen Cordes, *A Quiet Debate Emerges: Can a College's Financial Ties Skew Research Backed by U.S.?,* CHRON. HIGHER EDUC., Jan. 20, 1993, at A22 [hereinafter Cordes, *A Quiet Debate Emerges*]; Colleen Cordes, *Debate Flares Over Growing Pressures on Academe for Ties With Industry,* CHRON. HIGHER EDUC., Sept. 16, 1992, at A26; Richard Florida, *The Role of the University: Leveraging Talent, Not Technology,* ISSUES SCI. & TECH. ONLINE, *at* http://www.nap.edu/issues/15.4/florida.htm (1999) (arguing that IURC secrecy and emphasis on applied research compromises universities' primary missions of disseminating knowledge and cultivating academic talent); *see also* Julie L. Nicklin, *University Deals With Drug Companies Raise Concerns Over Autonomy, Secrecy,* CHRON. HIGHER EDUC., Mar. 24, 1993, at A25.

very broad range of organizational forms and institutional mechanisms for ordering such relationships.[8] And while there has been considerable research and commentary on the subject of IURC, much of the literature focuses on a few policy "inputs"—for example, public laws governing federal funding priorities and intellectual property rights—and quantifiable "outputs" of collaborative research arrangements, such as inventions patented, licenses granted, and royalties collected.[9] As important as these factors are, a critical assessment of IURC also requires an understanding of the actual institutional structures and rules governing industry-university research collaboration.[10] It is, after all, in the organizational structures

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[8] *See generally* INNOVATIVE MODELS FOR UNIVERSITY RESEARCH (C.R. Haden & J.R. Brink eds., 1992); David C. Mowery, *Collaborative R&D: How Effective Is It?,* ISSUES SCI. & TECH. ONLINE, *at* http://www.nap.edu/issues/15.1/mowery.htm (Fall 1998) ("R&D collaboration covers a diverse array of programs, projects, and institutional actors.").

[9] *See, e.g.,* Rebecca S. Eisenberg, *Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research,* 82 VA. L. REV. 1663 (1996) [hereinafter Eisenberg, *Public Research and Private Development*]; Brett Frischmann, *Innovation and Institutions: Rethinking the Economics of U.S. Science and Technology Policy,* 24 VT. L. REV. 347 (2000) (critiquing the Bayh-Dole Act of 1980 and related federal technology transfer policies); Peter Mikhail, Note, Hopkins v. Cellpro: *An Illustration That Patenting and Exclusive Licensing of Fundamental Science is not Always in the Public Interest,* 13 HARV. J.L. & TECH. 375 (2000) (same); Rai, *supra* note 6, at 110-35 (same); *see also* Rebecca S. Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research,* 97 YALE L.J. 177 (1987) [hereinafter Eisenberg, *Proprietary Rights*] (exploring the relationship between commercially-valuable biotechnology research and different forms of intellectual property); Irwin Feller & David Roessner, *What Does Industry Expect From University Partnerships,* XII(1) ISSUES SCI. & TECH. 80 (1995) (presenting survey data suggesting that limited focus on quantifiable "outputs" tends to understate the value of industry-university collaboration to private firms).

[10] *See generally* GUIRR, OVERCOMING BARRIERS, *supra* note 2, at 7 (observing that "further study . . . on the way universities successfully structure technology transfer operations would be useful"); David Blumenthal, *Academic-Industry Relationships in the Life Sciences,* 268 JAMA 3344, 3347 (1992) (noting lack of data regarding "scope, consequences, and management" of industry-university collaborations). Notable exceptions in the literature to the typical focus on federal policy "inputs" and quantifiable "outputs" include D. Fennell Evans & Matthew V. Tirrell, *Research Teams at Universities: The Center for Interfacial Engineering, in* CHEMICAL SCIENCES ROUNDTABLE, RESEARCH TEAMS AND PARTNERSHIPS: TRENDS IN THE CHEMICAL SCIENCES 42 (1999); Todd R. La Porte, *Diluting Public Patrimony or Inventive Response to Increasing Knowledge Asymmetries: Reflections on the University of California, Berkeley-Novartis Agreement, in* NAT'L RES. COUNCIL, CHEMICAL SCIENCES ROUNDTABLE, RESEARCH TEAMS AND PARTNERSHIPS: TRENDS IN THE CHEMICAL SCIENCES 66 (1999); Gary Rhoades & Sheila Slaughter, *Professors, Administrators, and Patents: The Negotiation of Technology Transfer,* 64 SOC. EDUC. 65 (1991) (analyzing the development of technology transfer policies at a major research university).

and institutional rules of research collaboration that universities and private firms address, albeit selectively and imperfectly, the crucial matters of assigning rights and responsibilities regarding inventions and discoveries, allocating the benefits and burdens of collaborative research, and reconciling the different concerns, constraints, and objectives of IURC participants. Thus the structures of industry-university research collaboration reflect the complex interaction of the forces that principally shape such ventures: (1) public and private law; (2) university policies, values, and interests;[11] and (3) the commercial values and interests of private firms.

In this paper, we examine rules and organizational forms for structuring industry-university partnerships, with a focus on the problem of protecting confidential information in the context of IURC. The basic question that informs our consideration of IURC confidential information policies may be stated as follows: Can the academic ethos of open inquiry be reconciled with the interests of private firms in appropriating the value of information by restricting its diffusion? We conclude that arrangements can be crafted to accommodate substantially both sets of concerns and thus to secure the benefits of IURC without imposing prohibitive costs on either side of the industry-university partnership.

The paper is organized around a case study of the confidential information policies of the "Netcentricity Laboratory" (or "Net Lab"); a center recently established at a major U.S. university to enable researchers to apply advanced computer simulation and visualization technologies to the analysis of the most complex supply chain management problems.[12] We offer the Net Lab case neither as an "ideal type," nor as a "cautionary tale," but rather as a vehicle for the exploration of the interaction of law, interests, and values in industry-university research collaboration. The study therefore focuses, in

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[11] The phrase "*university* policies, values, and interests" is employed here as a shorthand for the values and interests of the university community as a whole. We acknowledge, however, that the values and interests of administrators, faculty and other university stakeholders often diverge in practice.

[12] *See* discussion *infra* Part III.A. A general description of the Net Lab is posted on the Website of the University of Maryland's Robert H. Smith School of Business, *at* http://www.rhsmith.umd.edu/netcentricity/what.htm (last visited May 25, 2001); *see also* Rosemary Faya Prola, *The E-Powered Supply Chain,* 3 SMITH BUS. 7 (2001) (discussing Net Lab's role in developing capacity for real time coordination of supply chain management over the Internet).

significant part, on the *process* of policy development within the university, in an effort to illuminate the "black box" of organizational structures and institutional rules that lies between the more familiar policy "inputs" and quantifiable "outputs" noted earlier.

The structure of the paper is as follows: Part I reviews the historical background of U.S. industry-university research collaboration and identifies the critical challenges universities face in managing such relationships. Part II outlines some of the most common structures of industry-university collaboration and explores current university approaches to the protection of confidential information in IURC. Part III presents the case study of the "Netcentricity Laboratory" and its policies for protecting confidential information in industry-university collaboration. Part IV offers concluding observations.

I. BACKGROUND

A. Government, Industry & Universities in the National Innovation System

The three major players in U.S. research and development,[13] or what some have called the "national innovation system,"[14] are private

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[13] While there are no universally-accepted definitions of "research" and "development," the National Science Foundation has defined "basic research," "applied research," and "development" as follows:

> *Basic research.* The objective of basic research is to gain more comprehensive knowledge or understanding of the subject under study, without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interest.
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> *Applied research.* Applied research is aimed at gaining the knowledge or understanding to meet a specific, recognized need. In industry, applied research includes investigations oriented to discovering new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.
>
> *Development.* Development is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

NAT'L SCI. BD., SCIENCE & TECHNOLOGY INDICATORS 4-9 (1998). It should be noted, however, that in practice the lines between "basic research," "applied research," and "development" are quite indistinct.

[14] *See, e.g.*, David C. Mowery & Jane Oxley, *Inward Technology Transfer and Competitiveness, in* TECHNOLOGY, GLOBALISATION AND ECONOMIC PERFORMANCE 138, 154 (Daniele Archibugi & Jonathan Michie eds., 1997) (noting that scholars have defined "national innovation system" as "the network of public and private institutions within an economy that fund and perform R&D, translate the results of R&D into commercial innovations, and

firms, universities, and the federal government. Currently, industry, academia, and the federal government spend approximately 76%, 11%, and 7%, respectively, of the total dollars invested in research and development, "R&D," in the United States.[15] Since the 1970s, the percentage of *total* U.S. R&D funded by the federal government has been declining, while the percentage funded by private industry has been increasing.[16] However, the federal government still provides most, approximately 60%, of the funding for *university* research and development.[17] Private companies currently fund about 7% of all university research.[18] While this percentage is modest in comparison to the federal share, it amounts, nevertheless, to billions of dollars[19] and reflects a dramatic increase in recent years.[20]

The current university research environment, and particularly the role of private firms in that environment, has been substantially shaped by economic and legal developments that began in the early1980s.[21] At that time, U.S. companies, responding to a variety of competitive pressures, began shedding much of their in-house research capacity.[22] At roughly the same time, however, advanced technology was becoming a significantly more important competitive

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effect the diffusion of new technologies"); Richard R. Nelson & Nathan Rosenberg, *Technical Innovation and National Systems, in* NATIONAL INNOVATION SYSTEMS: A COMPARATIVE ANALYSIS 4, 5 (Richard R. Nelson ed., 1993) (national innovation system understood as "a set of institutional actors that, together, plays the major role in influencing innovative performance").

[15] NAT'L SCI. BD., NATIONAL PATTERNS OF R&D RESOURCES: 2000 DATA UPDATE, Table 1A, *at* http://www.nsf.gov/sbel/srs/nsf01309/start.htm (last visited May 25, 2001) [hereinafter NATIONAL PATTERNS].

[16] NAT'L SCI. BD., SCIENCE & TECHNOLOGY INDICATORS 6-8 to 6-9 (2000) [hereinafter SCIENCE AND TECHNOLOGY INDICATORS 2000].

[17] *Id.* 6-5.

[18] *Id.* 6-9.

[19] Industry support accounted for about $2.3 billion of the $30.1 billion spent on R&D by all U.S. colleges and universities in 2000. NATIONAL PATTERNS, *supra* note 15, at Table 1A.

[20] Industry funded less than 3% of all university R&D in 1970, and approximately 4% in 1980. *Id.*

[21] *See generally* David C. Mowery, *America's Industrial Resurgence: How Strong, How Durable?* 15 TECH. 41 (1999); Richard S. Rosenbloom & William J. Spencer, *The Transformation of Industrial Research*, 12 ISSUES SCI. & TECH. 68 (1996).

[22] *See generally* GUIRR, OVERCOMING BARRIERS, *supra* note 2, at 22; Roli Varma, *Changing Research Cultures in U.S. Industry,* 25 SCI. TECH. & HUM. VALUES 395 (2000).

factor in many industries.[23] Companies therefore looked to various forms of collaboration with other firms, and with universities, in order to meet their R&D requirements.[24]

The 1980s also saw important changes in federal research policy, including major legislative initiatives designed to facilitate the commercialization of technology developed through federally-funded research. Although there was no uniform technology transfer policy for all federal agencies, it had been common in the era prior to 1980 for the federal government to retain title to patents arising from federally-funded research, whether performed in a federal research facility or in a university.[25] While non-exclusive licenses were theoretically available to practice many federal patents, firms had relatively little incentive to invest in developing technologies that could be licensed by any competitor.[26] At a time of growing concern regarding the international economic competitiveness of U.S. firms, Congress concluded that many potentially valuable technologies, that had been invented with taxpayer support, were not being developed

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[23] *See* Fumio Kodama & Lewis M. Branscomb, *University Research as an Engine for Growth: How Realistic is the Vision?, in* INDUSTRIALIZING KNOWLEDGE: UNIVERSITY-INDUSTRY LINKAGES IN JAPAN AND THE UNITED STATES 3, 8-9 (Lewis M. Branscomb et al. eds., 1999) (noting that high-growth industries such as microelectronics, software, and biotechnology are "directly dependent on the latest research ideas").

[24] *See generally* CONGRESSIONAL RESEARCH SERVICE, R&D PARTNERSHIPS AND INTELLECTUAL PROPERTY: IMPLICATIONS FOR U.S. POLICY 2, 3 (2000) *at* http://www.cnic.org/nle/st-19.html [hereinafter R&D PARTNERSHIPS] ("Companies are increasingly looking to the academic community for research assistance."); Varma, *supra* note 22, at 396 ("As companies are curtailing in-house basic research, they are relying on universities to maintain it."). This trend has continued up to the present. Gene Bylinsky, *Look Who's Doing R&D,* FORTUNE, Nov. 27, 2000, at 232B; Terry Costlow, *Industry R&D Sweeps College Campuses,* ELEC. ENGINEERING TIMES, Nov. 29, 1999, at 151. *See generally* PricewaterhouseCoopers, *Strategic Alliances Come Up 7's For Technology Business: 77% Involved; Average Participant Active in 7, PricewaterhouseCoopers Finds,* TECH. BAROMETER (Feb. 14, 2001), *at* http://barometersurveys.com/pr/te010214.html.

[25] *See generally* COUNCIL ON GOVERNMENTAL RELATIONS, THE BAYH-DOLE ACT: A GUIDE TO THE LAW AND IMPLEMENTING REGULATIONS 2 (1999), *available at* http://www.cogr.edu/ [hereinafter BAYH-DOLE ACT]; Steven L. Bertha, *Intellectual Property Activities in U.S. Research Universities,* 36 IDEA 513, 515 (1996); Eisenberg, *Public Research and Private Development, supra* note 9, at 1671-77; Mary Eberle, Comment, *March-In Rights Under the Bayh-Dole Act: Public Access to Federally Funded Research,* 3 MARQ. INTELL. PROP. L. REV. 155, 157 (1999);

[26] *See generally* Bertha, *supra* note 25, at 514; James V. Lacy et al., *Technology Transfer Laws Governing Federally Funded Research and Development,* 19 PEPP. L. REV. 1, 9-10 (1991).

into commercial products, in part, because neither federal agencies, universities, nor private firms had the appropriate incentives to shepherd federally-funded research results out of the laboratory and through the product development process.[27]

With the enactment of the Patent and Trademark Act Amendments of 1980, popularly known as the "Bayh-Dole Act," Congress radically altered the incentive structure for those performing federally funded research outside of the federal government.[28] Under the statute, ownership of patentable inventions arising from federally-

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[27] *See generally* U.S. GENERAL ACCOUNTING OFFICE, TECHNOLOGY TRANSFER: ADMINISTRATION OF THE BAYH-DOLE ACT BY RESEARCH UNIVERSITIES 3 (1998) [hereinafter GAO REPORT] ("[B]y the late 1970s there was a growing dissatisfaction with federal policies related to the patenting of the scientific knowledge resulting from the [federally-supported] research."); Linda R. Cohen & Roger G. Noll, *Privatizing Public Research: The New Competitiveness Strategy, in* THE MOSAIC OF ECONOMIC GROWTH 305 (Ralph Landau et al. eds., 1996); Rai, *supra* note 6, at 95-97; R&D PARTNERSHIPS, *supra* note 24, at 2-5 (reviewing legislative history and rationale for the Bayh-Dole Act); BAYH-DOLE ACT, *supra* note 25, at 2 (same); COUNCIL ON GOVERNMENTAL RELATIONS, UNIVERSITY TECHNOLOGY TRANSFER QUESTIONS AND ANSWERS (1993), *at* http://www.cogr.edu/ (visited Mar. 18, 2001) ("Hundreds of valuable patents were sitting unused on the shelf because the Government, which sponsored the research that led to the discovery, lacked the resources and links with industry needed for development and marketing of inventions."); *see also* Sheila Slaughter & Gary Rhoads, *The Emergence of a Competitiveness Research and Development Coalition and the Commercialization of Academic Science and Technology,* 21 SCI. TECH. & HUM. VALUES 303 (1996) (arguing that Bayh-Dole emerged from a political process in which concern with economic competitiveness overtook the Cold War as the principal driver of federal research policy).

[28] Act of Dec. 12, 1980, Pub. L. No. 96-517, 94 Stat. 3015-28 (*codified, as amended*, 35 U.S.C. §§ 200-212, 301-307 (2001)) (commonly known as the "Bayh-Dole Act"); *see also* Rights to Inventions Made By Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts, and Cooperative Agreements, 37 C.F.R. § 401 (2001) (Department of Commerce regulations governing implementation of Bayh-Dole Act provisions). Bayh-Dole was part of a broader shift in federal research policy that would encourage the transfer of intellectual property rights to inventions arising from federally-funded research. In the same year, Congress also enacted the Stevenson-Wydler Act authorizing federal laboratories to transfer technology developed in the laboratory to non-Federal entities. Stevenson-Wydler Technology Innovation Act of 1980, Pub. L. No. 96-480, 94 Stat. 2311-20 (codified as amended at 15 U.S.C. §§ 3701-14 (2000)); *see also* CONGRESSIONAL RESEARCH SERVICE, PATENT OWNERSHIP AND FEDERAL RESEARCH AND DEVELOPMENT (R&D): A DISCUSSION ON THE BAYH-DOLE ACT AND THE STEVENSON-WYDLER ACT (2000), *at* http://cnie.org/nle/st-66.html (last visited July 12, 2001). For a recent evaluation of the administration of Bayh-Dole, see generally GAO REPORT, *supra* note 27.

funded research would be vested in the entities performing the research, including universities.[29] This legislative policy shift was paralleled by a series of federal judicial decisions in the 1980s that significantly broadened the category of patentable inventions and strengthened the legal protections accorded to holders of intellectual property rights.[30] Thus, at roughly the same time universities were permitted to claim intellectual property rights to the fruits of federally-funded research as a matter of course, the universe of potentially patentable research results expanded and the potential value of intellectual property increased.

B. Evolving Role of University Research and the Challenges of Collaboration

In the environment that has been shaped by the legal and economic developments of the 1980s, the role of the research university in the national innovation system has changed significantly.[31] Universities now patent far more technology than they did a generation ago: The number of patents issued to U.S. universities has risen from approximately 250 each year in the early 1970s[32] to 3079 in 1999.[33] Concurrently, transfer of university-generated technology to the private sector, through licensing, start-up companies, and other forms of industry-university R&D collaboration, has also substantially

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[29] The government retained a royalty-free license to practice, or have practiced on its behalf, the invention made or "first actually reduced to practice" with government support. 35 U.S.C. § 202 (2000).

[30] *See generally* CONGRESSIONAL RESEARCH SERVICE, AN EXAMINATION OF THE ISSUES SURROUNDING BIOTECHNOLOGY PATENTING AND ITS EFFECT UPON ENTREPRENEURIAL COMPANIES (2000) (reviewing legal developments regarding patentability of biotechnology inventions); Rai, *supra* note 6, at 100-104 (reviewing the expansion and strengthening of patent rights under the decisions of the Supreme Court and the U.S. Court of Appeals for the Federal Circuit beginning in 1980); Lawrence Schlam, *Compulsory Royalty-Free Licensing as an Antitrust Remedy for Patent Fraud: Law, Policy and the Patent-Antitrust Interface Revisited,* 7 CORNELL J.L. & PUB. POL'Y. 467, 473 (1998) (noting that the Federal Circuit affirmed district court decisions finding patents valid 89% of the time from 1982 through 1987, compared with 30-40% affirmance rates before the establishment of the Court of Appeals for the Federal Circuit).

[31] For a useful survey of the role of U.S. research universities since the Second World War, see ROGER L. GEIGER, RESEARCH AND RELEVANT KNOWLEDGE: AMERICAN RESEARCH UNIVERSITIES SINCE WORLD WAR II (1993).

[32] SCIENCE & ENGINEERING INDICATORS 2000, *supra* note 16, 6-56.

[33] ASS'N OF UNIV. TECH. MANAGERS, AUTM LICENSING SURVEY: FY 1999 SURVEY SUMMARY at 2, 34 (2000) [hereinafter AUTM SURVEY].

increased, particularly in research-intensive industries such as biotechnology, information technology, and pharmaceuticals.[34]

These developments have created new opportunities for universities while also giving rise to tensions and ambiguities regarding the role of the university in society. On the one hand, universities are, with relatively few exceptions, public or non-profit institutions dedicated principally to education and academic research. On the other hand, universities have become important commercial actors in markets for technology.[35] Although universities continue to generate a vast amounts of research that is not at all connected to industry-university partnerships, a significant share of university research is now developed in collaborative relationships wherein universities have become – to varying degrees and in many different forms – the business partners of private firms. For universities, the potential benefits of such partnerships include: (1) access to industry resources including financial support and advanced technology; (2) superior training and placement opportunities for students; (3) the stimulation of exposure to current industry problems; and (4) income from commercially valuable inventions.[36] For industry, such partnerships can offer: (1) access to advanced academic research, expertise, and prestige; and (2) opportunities for recruiting highly-qualified students.[37] For society as a whole, IURC collaboration can generate

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[34] *See id.;* SCIENCE & ENGINEERING INDICATORS 2000, *supra* note 16, 6-56–6-58.

[35] *See generally* Derek Bok, *Universities: Their Temptations and Tensions,* 18 J. C. & U.L. 1, 14-19 (1992) (discussing the emergence of the "commercialized university"); Kenneth W. Dam, Intellectual Property and the Academic Enterprise 2 (Univ. of Chicago John M. Olin Law & Econ. Working Paper, No. 68, 1999), *available at* http://www.law.uchicago.edu/Publications/Working/index.html (arguing that U.S. research universities "have become, at least in some areas of science and technology, economic enterprises as well as centers for teaching and research").

[36] For discussion of the benefits of IURC for universities, see generally COUNCIL ON GOV'T RELATIONS: A REVIEW OF INDUSTRY-UNIVERSITY RESEARCH RELATIONSHIPS (1996), *available at* http://www.cogr.edu/ [hereinafter COGR, REVIEW] (noting, *inter alia*, that IURC enhances graduate education and increases academia's awareness of industry problems).

[37] For discussion of the benefits of IURC for industry, see generally Jerome H. Grossman et al., *Contributions of Academic Research to Industrial Performance in Five Industry Sectors,* 26 J. TECH. TRANSFER 143 (2001) (reviewing benefits of various forms in industry-university collaboration in the aerospace, financial services, medical devices, network systems and communications, and transportation, distribution, and logistics services); COGR, REVIEW, *supra* note 36 (noting, *inter alia*, that IURC provides industry with access to basic research and

jobs and other forms of economic development,[38] as well as improved products, such as advanced pharmaceuticals and medical technologies.[39]

While the potential benefits are enormous, entering into collaborative research and development relationships with industry partners is not without risks and costs for universities. Thus the establishment of effective legal and institutional structures for such collaboration presents a complex set of challenges. At the risk of some oversimplification, these challenges may be summarized for analytical purposes

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offers "a means of monitoring new developments in science and technology"); Richard Zeckhauser, *The Challenge of Contracting for Technological Information,* 93 PROC. NAT'L ACAD. SCI. USA 12,743, 12,746 (1996) ("Companies sponsor university research and receive in return subtle information about what fields and researchers are promising and on what types of technologies might prove feasible.").

[38] *See, e.g.*, BANKBOSTON, MIT: THE IMPACT OF INNOVATION 2 (1997) (estimating that in 1997, companies founded by MIT faculty and graduates employed 1.1 million people and accounted for $232 billion annually in sales worldwide); Berman, *supra* note 3; Douglas W. Jamison & Christina Jansen, *Technology Transfer and Economic Growth,* 12 J. ASS'N U. TECH. MANAGERS (2000), *available at* http://www.autm.net/pubs/journal/00/techtransfer.html (arguing that "federal programs -- such as the Bayh-Dole Act of 1980 -- that increase the pay-off from research and development funding (R&D), can be effective agents of economic growth."); Peter B. Kramer et al., *Induced Investments and Jobs Produced by Exclusive Patent Licenses – A Confirmatory Study,* 9 J. ASS'N U. TECH. MANAGERS (1997), *available at,* http://www.autm.net/pubs/journal/97/5-97.html (estimating that exclusive licenses of university patents induced $4.6 billion in private investment and created 27,000 research & development jobs); James D. Adams et al., Industry-University Cooperative Research Centers (Nat'l Bureau of Econ. Research, Working Paper No. 7843, 2000) (finding that industry-university cooperative research centers contribute to increased patenting and research expenditures by industrial laboratories).

[39] *See generally* NATHAN ROSENBERG ET AL., SOURCES OF MEDICAL TECHNOLOGY: UNIVERSITIES AND INDUSTRY (1995); Kuhlman, *supra* note 4 (IURC role in establishing and sustaining the biotechnology industry); Donald G. Rea & Harvey Brooks, *The Semiconductor Industry – Model for Industry/University/Government Cooperation,* 40 RES. TECH. MGMT. 46 (1997); Lucien P. Randazzese, *Exploring University-Industry Technology Transfer of CAD Technology,* 43 IEEE (INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS) TRANSACTIONS ON ENGINEERING MGMT. 393 (1996); Ward & Dranove, *supra* note 3 (reviewing the contributions of university research to the pharmaceutical industry); Zucker et al., *supra* note 3 (IURC role in establishing and sustaining the biotechnology industry); *see also* Edwin Mansfield, *Academic Research Underlying Industrial Innovations: Sources, Characteristics, and Financing,* 77 REV. ECON. & STAT. 55 (1995); Edwin Mansfield, *Academic Research and Industrial Innovation,* 20 RES. POL'Y 1 (1990); Nathan Rosenberg & Richard R. Nelson, *American Universities and Technical Advance in Industry,* 23 RES. POL'Y 323 (1994) (noting the contributions of basic academic research to industrial development).

as follows: The first and perhaps most fundamental challenge is to structure collaborative relationships to allow universities to maintain control over the research agenda.[40] In this context, control over the university research agenda means that the university's decision to enter into industry-university collaborative relationships is principally based on its independent judgment that the questions to be pursued have intellectual merit, as opposed to entering into collaborations based on other considerations.[41] The second broad challenge is to allocate the benefits and burdens of industry-university collaboration to accommodate the sometimes conflicting goals of furthering the university's core academic mission, while offering sufficient economic incentives to all participants.[42] This second challenge subsumes decisions regarding research funding, intellectual property rights, and the allocation of licensing income and other financial benefits.[43] A third major challenge for universities in creating legal and institutional structures for industry-university R&D collaboration is to maintain a university research environment that is consistent with the

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[40] We use the term "research agenda" broadly to mean the questions that the university deems worthy of academic inquiry. While there are a great variety of valid research agendas (even within individual universities), the limits of which are not concretely defined in many cases, the class of intellectually worthy subjects for research is not, for most research universities, limitless.

[41] *See generally* William L. Baldwin, *The U.S. Research University and the Joint Venture: Evolution of an Institution,* 11 REV. INDUS. ORG. 629, 651 (1996) (noting concern that the trend toward increased IURC may divert universities away from pursuit of important basic research); Bok, *supra* note 35, at 17-18 (noting concern that the trend toward increased IURC may divert universities away from pursuit of important basic research); Caldart, *supra* note 6, at 26 (raising concern that "industry investment in university research will reduce the university's traditional autonomy over its activities, and thus could operate as a constraint on the exercise of academic freedom"); Robert M. Rosenzweig, *Universities Change, Core Values Should Not,* 16 ISSUES SCI. & TECH. ONLINE (1999), *at* http://www.nap.edu/issues/16.2/rosenzweig.htm (same); Cordes, *A Quiet Debate Emerges*, *supra* note 7, at A22; Nicklin, *supra* note 7, at A25.

[42] *See generally* COGR, REVIEW, *supra* note 36 ("In research relationships with industry, universities must carefully guard their ability to disseminate knowledge to students and the public. Nevertheless, corporate sponsors need to be assured that the results of the research they fund at universities will be available to them for commercial exploitation.").

[43] *See generally* Baldwin, *supra* note 41, at 651 ("Among the new or exacerbated problems that university participants in joint R&D ventures face are . . . decisions made jointly with profit-seeking firms as to how to exploit the results of the venture; . . . [and] sharing in the profits and risks.").

research university's academic mission.[44] A key element of this third challenge is managing actual and perceived conflicts between the relatively "open" research culture of academia and the more secretive research culture of the private sector.[45]

II. STRUCTURES FOR INDUSTRY-UNIVERSITY COLLABORATION

A. Four Organizational Models for IURC

Although industry-university research collaboration takes many different forms,[46] for purposes of the present discussion, we identify four general models for structuring such relationships. Some of the most frequently used organizational forms for industry-university collaboration are university-to-industry technology licensing; industry-sponsored university research; and "spin-off" companies established for the purpose of commercializing university-generated

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[44] *See generally* Bok, *supra* note 35, at 3 ("The principal work of [university] presidents, provosts, and deans is to maintain an environment that fosters learning and discovery."); Wade L. Robinson & John T. Sanders, *The Myths of Academia: Open Inquiry and Funded Research,* 19 J.C. & U.L. 227, 233 (1992) ("It would seem that a university's goals of being an open forum and at the forefront of knowledge cannot be met without compromise, given the necessity for outside funding to pursue research.").

[45] *See generally* Baldwin, *supra* note 41, at 651; Sheila Slaughter & Gary Rhoades, *Renorming the Social Relations of Academic Science: Technology Transfer,* 4 EDUC. POL'Y 341 (1990) (expressing concern that increasingly influential norms of secrecy and ownership have compromised the university research environment); GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE, OPENNESS AND SECRECY IN RESEARCH: PRESERVING OPENNESS IN A COMPETITIVE WORLD 2-3 (1997), *available at* http://www4.nationalacademies.org/pd/guirr.nsf/238912d6ec6e95b4852566f2006da6f5/6b115e90e851bb34852568bd006067f7?OpenDocument [hereinafter GUIRR, OPENNESS AND SECRECY]("Preserving a balance between openness and proprietary control [in IURC] is vital."); Rosenzweig, *supra* note 41, at 5 (questioning whether faculty and administrators seeking research funding can be "counted on to assert the university's commitment to the openness of research processes and the free and timely communication of research results").

[46] *See generally* COGR, REVIEW, *supra* note 36 (listing six models of IURC: (1) sponsored research, (2) collaborative research, (3) consortia, (4) technology licensing, (5) start-up companies, and (6) exchange of research materials); George M. Low, *The Organization of Industrial Relationships in Universities, in* PARTNERS IN THE RESEARCH ENTERPRISE: UNIVERSITY-CORPORATE RELATIONS IN SCIENCE AND TECHNOLOGY 68, 71-74 (Thomas W. Langfitt et al. eds., 1983) (listing eight types of industry-university research linkages: (1) faculty consulting, (2) research grant and contracts, (3) major contracts, (4) affiliate programs, (5) university consortia, (6) industry cooperatives, (7) exchange of people, and (8) incubators and research parks).

innovations. A much less common, but influential, structure for industry-university collaboration is the "idea lab" model for the ongoing exchange of developing insights and ideas among university researchers and private firms.[47]

1. University-to-Industry Technology Licensing

Technology licensing is the most common and straightforward type of industry-university research collaboration.[48] In the typical licensing relationship, the university enters into an arm's-length commercial contract granting a private firm the right to use knowledge – typically, but not invariably, in the form of a patented invention – that has emerged from the work of university researchers. In return for granting the license, the university is compensated through royalty payments or some other transfer of value.[49] Depending on the policy of the individual university, portions of the licensing revenue may be distributed to the faculty inventors of the licensed technology, or otherwise allocated to support further research.[50]

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[47] In practice, these categories are not mutually exclusive and "hybrid" versions are common. For example, sponsored research and spin-off company structures for IURC typically include technology licensing relationships.

[48] The 139 U.S universities responding to the Association of University Technology Managers' FY 1999 licensing survey reported having executed a total of 3119 licenses and options in that year. AUTM SURVEY, *supra* note 33, at 13, Table S-10. One of the most famous and most successful examples of university-to-industry licensing is the patented Cohen-Boyer recombinant DNA process; a source of millions of dollars in annual licensing income for Stanford University and the University of California since the 1970s. *See* GAO REPORT, *supra* note 27, at 18; OFFICE OF TECH. ASSESSMENT, COMMERCIAL BIOTECHNOLOGY: AN INTERNATIONAL ANALYSIS 411 (1984).

[49] In addition to, or in lieu of traditional royalty compensation, licensee payments to the university-licensor may consist of fixed fees, agreements to sponsor university research, or equity. *See* Richard Jensen & Marie Thursby, Proofs and Prototypes for Sale: The Tale of University Licensing 1 (Nat'l Bureau of Econ. Research, Working Paper No. 6698, 1998). The University of Maryland's licensing policy contemplates compensation for the University in the forms of "up-front payments, purchases of tangible research property, option fees, license fees and royalties . . . ." Univ. of Maryland, Office of Technology Commercialization, *Information for Industry Licensing Inventions*, available at http://www.otc.umd/industry/licensing.html (last visited May 30, 2001).

[50] For example, under the University of Maryland's policy, patent licensing revenue is allocated according to the following formula: (a) 30% of gross licensing income is retained by the University's Office of Technology Commercialization for operating expenses; (b) the first $5,000 in net income is paid to the inventor(s); (c) 50% of net licensing income above the first $5,000 also goes to the inventor(s); and (d) the balance is distributed to the

These licensing arrangements are, in part, an outgrowth of Bayh-Dole Act provisions allowing universities to patent the results of federally-funded research.[51] As noted earlier, Bayh-Dole has facilitated the creation of technology markets in which universities essentially broker faculty inventions to private firms. In addition to providing a substantial source of revenue for some universities,[52] such licensing relationships can facilitate the commercial development of university-generated technologies that might otherwise languish unused.[53] Compared with some other models of collaboration, moreover, industry-to-university technology licensing generally requires less ongoing coordination with industry partners. Since the "collaboration" between the university and the private firm is sequential, rather than simultaneous, the university is not obliged to establish and administer an ongoing industry-university relational structure for conducting the research, which, under this model, is completed

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inventor(s)' department. Univ. of Maryland, Office of Technology Commercialization, Royalty Distribution Policy, available at http://www.otl.umd.edu/Inventors/Royalty/Policy.html (last visited May 25,2001).

[51] *See generally Biotechnology Development and Patent Law, Hearings,* 102nd Cong., 1st Sess. 48 (1991) (statement of Dr. Bernadine Healy, former director of the National Institutes of Health) (arguing that the Bayh-Dole Act is responsible for the development of the U.S. biotechnology industry); BAYH-DOLE ACT, *supra* note 25, at 6-7 (crediting Bayh-Dole with spurring "[u]niversity patenting and licensing efforts" that "have fostered the commercialization of many new technological advances that impact the lives of millions of people across the nation"); Bertha, *supra* note 25, at 515 (attributing explosion in university technology transfer to the Bayh-Dole Act); Massaro, *supra* note 5 at 1731, 1734-35 (arguing that, with regard to medical research, Bayh-Dole has been successful in stimulating research investment and commercialization of university-generated knowledge). *But see* Rebecca Henderson & Adam B. Jaffee, *Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988,* 80 REV. ECON. & STAT. 119 (1998) (attributing increase in university patenting to greater industry funding of university research and more active university technology transfer efforts, as well as Bayh-Dole Act); Richard R. Nelson, *Observations on the Post-Bayh-Dole Rise of Patenting at American Universities,* 26 J. TECH. TRANSFER 13 (2001) (arguing that economic factors other than the Bayh-Dole Act substantially account for the increase in university patenting and technology licensing after 1980).

[52] In 1999, the 139 U.S. universities responding to the AUTM's annual licensing survey reported earning a total of $641,000,108 in licensing income. AUTM SURVEY, *supra* note 33, at 34. However, a relatively small number of U.S. universities tend to earn a disproportionately high share of total university licensing revenues. In 1998, for example, the leading recipient of licensing income for the year – Columbia University – earned $95.8 million. *See* Richard Gawel, *Licensing Agreements Put Columbia U. In The Green,* 47 ELECTRONIC DESIGN 32F (1999).

[53] *See supra* notes 26-30 and accompanying text.

before the licensing relationship begins. On the other hand, the licensing model sacrifices whatever benefits may accrue from joint participation in the research process. Some licensing arrangements, however, entail ongoing involvement by university researchers in the development and commercialization of licensed technology.[54]

2. Industry-Sponsored University Research

In this increasingly common form of industry-university collaboration, the university devotes expertise and resources to solving a research problem in exchange for funding from a private firm, or combination of firms.[55] Such agreements often include terms entitling the sponsor to license the results of the research collaboration.[56] These projects can complement the university research mission while providing valuable services to private firms. At the same time, some research-for-hire arrangements may raise concerns regarding control over the research agenda, the allocation of burdens and benefits of IURC, and the effects of such collaborations on the university research environment.[57]

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[54] *See, e.g.*, Sandra W. Key et al., *Collaboration Announced to Develop and Commercialize Proprietary Technology,* AIDS WKLY. PLUS, May 24, 1999, at 9 (including joint venture established pursuant to which a private company licenses university biotechnology, sponsors continuing university research, and involves university researchers role in the further development of the technology toward commercial use).

[55] *See generally* John F. Hesselberth, *Technology Transfer From Academia: Prescription for Success and Failure, in* TECHNOLOGY TRANSFER IN CONSORTIA AND STRATEGIC ALLIANCES 151 (David V. Gibson & Raymond W. Smilor eds., 1992) (describing Du Pont's experience with IURC).

[56] A model sponsored research agreement, drafted by the Government-Industry-University Research Roundtable, addresses the sponsor's right to license research results in the following provision:

> University grants Sponsor the first option, at Sponsor's sole selection, for either a non-exclusive, royalty-free license or, for consideration, an exclusive license with a right to sublicense on terms and conditions to be mutually agreed upon. The option shall extend for a time period of [_____] from the date of termination of the Agreement.

GOVERNMENT-INDUSTRY-UNIVERSITY RESEARCH ROUNDTABLE, SIMPLIFIED AND STANDARDIZED MODEL AGREEMENTS FOR INDUSTRY-UNIVERSITY COOPERATIVE RESEARCH, art. 8.1 (1988) [hereinafter GIURR MODEL AGREEMENT].

[57] *See generally* Samuel B. Guze, *The Monsanto-Washington University Biomedical Research Agreement, in* PARTNERS IN THE RESEARCH ENTERPRISE 53 (Thomas W. Langfitt et al. eds, 1983); La Porte, *supra* note 10; Reginald Rhein, *NIH Finds Scripps-Sandoz Deal Unusual for Sponsored Research Agreement,* BIOTECH. NEWSWATCH, Feb. 7, 1994, at 1.

3. Spin-Off Companies

Another widespread form of industry-university collaboration is the spin-off company.[58] Such companies are often established as vehicles for the commercialization of university-generated technologies.[59] In a typical spin-off company scenario, university researchers develop an invention that is commercially promising, but requires the collaboration of the researchers and a private firm to develop the invention into a commercially-viable form.[60] Some institutions have adopted policies to encourage faculty members to establish spin-off companies based on their research efforts. Professors at Carnegie-Mellon University, for example, are allowed to retain their university offices and make limited use of university facilities during the start-up phase

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[58] *See generally* ANGUS LIVINGSTONE, REPORT OF UBC SPIN-OFF COMPANY FORMATION AND GRANTS 9, http://www.uilo.ubc.ca/Technology%20Transfer%20&%20Commercialization/Spinoff%20Companies/spin.htm (last ed Jun. 26, 2001) (defining "spin-off company" broadly as "a new enterprise created either to (1) license a [university] technology, (2) fund [university] research . . . with the aim of developing technologies for license by the company, or (3) provide a service which was originally offered through an existing [university] department").

[59] *See* AUTM SURVEY, *supra* note 33, at 34 (defining "spin-off companies" for purposes of its Licensing Survey as "companies that were dependent upon licensing the institution's technology for initiation"). U.S. universities responding to the Association of University Technology Managers' FY 1999 Licensing Survey reported a total of 275 spin-off companies established in that year. *Id.* Among the most prominent university spin-off companies to emerge in recent years is Netscape Communications Corporation (now a subsidiary of AOL Time-Warner). The Netscape *Navigator* was a commercial refinement of the *Mosaic* Web browser that had been developed by Marc Andreesen (who went on to become co-founder of Netscape) and others at the University of Illinois' National Center for Supercomputing Applications. *See generally* MICHAEL A. CUSUMANO & DAVID B. YOFFIE, COMPETING ON INTERNET TIME: LESSONS FROM NETSCAPE AND ITS BATTLE WITH MICROSOFT 3, 20, 44 (1998). Genentech Corporation, co-founded by a University of California biotechnology researcher, is another prominent example of a major U.S. corporation that began as a university spin-off.

[60] *See generally* Ilze Krisst, *How University Research Results Become a Business: The Case of the University of Connecticut, in* UNIVERSITY SPIN-OFF COMPANIES: ECONOMIC DEVELOPMENT, FACULTY ENTREPRENEURS, AND TECHNOLOGY TRANSFER 153 (Alistair M. Brett et al. eds., 1991); Elias G. Carayannis et al., *High-Technology Spin-Offs from Government R&D Laboratories and Research Universities,* 18 TECHNOVATION 1 (1998) (reviewing case studies of spin-off companies); Raymond W. Smilor et al., *University Spin-Out Companies: Technology Start-Ups from UT-Austin,* 5 J. BUS. VENTURING 63 (1990) (studying University of Texas at Austin spin-offs).

of their spin-off companies.[61] Other universities encourage spin-offs by agreeing to defer licensing royalties or to accept equity in lieu of royalties.[62]

4. Idea Labs

The "idea lab" model, which is exemplified by the Massachusetts Institute of Technology's Media Laboratory, describes both a structure for IURC as well as an institutional platform that allows for a variety of different IURC structures for different projects to coexist under the administrative supervision of a single university research center.

Under the "idea lab" IURC structure, private firms pay the university not for specific "deliverables" under a research contract, but rather for the opportunity to follow the ongoing work of certain university researchers and, in some cases, to license the results of their research.[63] Although the MIT Media Lab is a prominent example of the "open-ended-exchange-of-ideas" model for industry-university collaboration, such arrangements are very much the exception. If successful, this type of collaboration can provide unrestricted industry support for ongoing academic research, while generating value for private firms in the form of ideas and inventions drawn from the minds of talented faculty members working at the cutting edge of university research.[64] This model may also confer benefits upon companies in the form of recruiting opportunities and the association with prestigious academic research. However, for many private firms,

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[61] Interview with Duane A. Adams, Vice Provost for Research, Carnegie Mellon University, (Mar. 13, 2001).

[62] *See generally* Meg Wilson & Stephen Szygenda, *Promoting University Spin-offs through Equity Participation, in* UNIVERSITY SPIN-OFF COMPANIES: ECONOMIC DEVELOPMENT, FACULTY ENTREPRENEURS, AND TECHNOLOGY TRANSFER *supra* note 60, at 153.

[63] At the MIT Media Lab, "affiliate" sponsors pay $100,000 per year for the right to follow the "overall work of the Laboratory." *See* MIT Media Laboratory Overview, http://www.media.mit.edu/Information/Overview/ (last visited May 9, 2001). "Consortium" sponsors pay between $200,000 and $250,000 per year to participate in a "consortium" that "connects a group of sponsors with a group of Laboratory faculty and research staff focused on a common agenda." *Id.* Sponsors of Media Lab consortia receive royalty-free licenses "to all work developed in the Laboratory during their sponsorship years." *Id.*

[64] *See generally* STEWART BRAND, THE MEDIA LAB: INVENTING THE FUTURE AT M.I.T. (1988) (surveying background and R&D activities of the Media Lab).

the potential benefits of the MIT Media Lab collaborative model may be too uncertain and remote to justify a significant investment of resources.

In addition to IURC structured according to the distinctive open-ended-exchange-of-ideas model, the MIT Media Lab also administers more conventional IURC relationships, such as sponsored research arrangements.[65] Thus, the Media Lab offers an example of a university research center in which a range of different types of IURC structures can coexist. Significantly, for purposes of the present research, the Media Lab served as one of the principal models for the University of Maryland's Netcentricity Laboratory that is the subject of the case study set forth in Part III of this paper.[66]

B. Confidential Information Rules for IURC

1. Basis for Concern

One of the most frequently-cited problems of structuring and administering industry-university research collaboration is the treatment of confidential and proprietary information in the university research environment.[67] The issue typically arises when university participants in collaborative research are asked to restrict the dissemination of information that industry partners wish to protect from unauthorized disclosure.[68] Such information can include, for example: (1) confidential and proprietary technical knowledge, materials, or research tools that companies disclose to university

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[65] *See* MIT Media Laboratory Overview, *supra* note 63.

[66] *See* Interview with Thomas Corsi, Professor of Logistics, University of Maryland at College Park, and Co-Director, Supply Chain Management Center (Mar. 14, 2001) (stating that the Media Lab was the model for the Net Lab).

[67] *See, e.g.*, Wesley M. Cohen et al., *supra* note 7, at 193-94; Bartlett Giamatti, *Free Market and Free Inquiry: The University, Industry, and Cooperative Research, in* PARTNERS IN THE RESEARCH ENTERPRISE: UNIVERSITY-CORPORATE RELATIONS IN SCIENCE AND TECHNOLOGY 3, 9 (Thomas W. Langfitt et al. eds., 1983), Donald R. Fowler, *University-Industry Research Relationships: The Research Agreement,* 9 J.C. & U.L. 515, 523 (1982-83) (noting that the matter of publication of research results is "an area identified by many people responsible for university research as the most difficult in working out research arrangements between university and industry"); Nicklin, *supra* note 7, at A25; Rosenzweig, *supra* note 41.

[68] *See generally* April Burke, *University Policies on Conflict of Interest and Delay of Publication,* 12 J.C. & U.L. 177 (1985); Michael S. Gilliand, *Joint Venturing University Research: Negotiating Cooperative Agreements,* 40 BUS. L. 971 (1985); Fowler, *supra* note 67.

research partners, but not to the general public; (2) data provided by the industry; (3) data generated jointly in the course of research collaboration; or (4) inventions, or other commercially-valuable results, arising from collaborative research.

For many, the protection of confidential and proprietary information in the university research environment brings into conflict two fundamentally antithetical sets of values and interests: the academic versus the commercial. From this perspective, the academic norm of "openness" is juxtaposed against the commercial norm of "secrecy."[69] "Openness" is associated with academic freedom, the disinterested pursuit of truth,[70] and the widest possible dissemination of knowledge.[71] Commercial "secrecy" is associated with narrowly-framed and result-oriented inquiry, the pursuit of profit, and restrictions on the disclosure of commercially-valuable or otherwise commercially-sensitive information.[72]

While the conflict between academic "openness" and commercial "secrecy" is often overstated in discussions of IURC, there can be

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[69] The norm of secrecy, like the propensity to patent useful knowledge, follows from the commercial imperative to appropriate the value of R&D. *See generally* Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development,* 3 BROOKINGS PAPERS ECON. ACTIVITY 783 (1987). On the tension between the academic norms of openness and industry norms of appropriation and secrecy, see generally Eisenberg, *Academic Freedom, supra* note 6, at 1375-77; Eisenberg, *Proprietary Rights, supra* note 9, at 197-98; Yves Fassin, *Academic Ethos Versus Business Ethics,* 6 INT'L J. TECH. MGMT. 533 (1991); Rai, *supra* note 6, at 90-94, 110-15. *But see* F. Scott Kieff, *Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science – A Response to Rai and Eisenberg,* 95 NW. U. L. REV. 691 (2001) (arguing that there is no inconsistency between the norms of science and the appropriation of the value of biotechnology research through patenting research results).

[70] *See generally* Martin Kenney, *The Ethical Dilemmas of University-Industry Collaborations,* 6 J. BUS. ETHICS 127, 129 (1987) (stating that university faculty members are morally obligated "to seek and teach the truth").

[71] *See generally* ROBERT K. MERTON, THE SOCIOLOGY OF SCIENCE: THEORETICAL AND EMPIRICAL INVESTIGATIONS 273-75 (Norman W. Storer ed., 1973); Kenney, *supra* note 70, at 129 ("[T]he professor must make the results of research freely available to all"); Rai, *supra* note 6, at 90 ("One central element of the scientific ethos that promotes the sharing of information in the public domain is the view that scientific knowledge is ultimately a shared resource.").

[72] *See generally* Cohen et al., *supra* note 7, at 186 ("Firms . . . prefer less disclosure of research finding to increase the appropriability of the profits of any process or product innovations that may grow out of the research."); Caldart, *supra* note 6, at 27, 30-31; Kenney, *supra* note 70, at 129 ("The primary and overriding duty for an industrial concern is to make a profit.").

little doubt that the research cultures of universities and private firms can differ.[73] In the university research culture, academics have strong professional incentives to publish research results as quickly and as widely as possible.[74] Academic rewards, such as promotion and recognition, flow to those who publish first on questions that are generally agreed upon among the researcher's peers to have intellectual merit.[75] For industry research, by contrast, merit is ultimately measured by the market. Researchers are rewarded for results that show commercial promise and eventually find their way into successful products.[76] Timely publication of research results may, under some circumstances, be of value to the industrial researcher.[77] But the highest priority for industrial innovation is to confer competitive advantage in markets for the sale of commercial products. Thus

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[73] *See generally* Harvey Brooks & Lucien P. Randazzese, *Industry-University Relations: The Next Four Years and Beyond, in* INVESTING IN INNOVATION: CREATING A RESEARCH AND INNOVATION POLICY THAT WORKS 361, 377 (Lewis M. Branscomb & James H. Keller eds., 1999) ("Industry often perceives an interest in limiting the disclosure of results from university research that it supports; this places its research style in conflict with the more open culture of universities."). Although university and corporate research cultures differ, particularly at the margins of the continuum running from the most theoretical "basic research" to straight product "development," they also share a great deal of common ground. As set forth in greater detail below, this common ground offers a basis for concluding that the perceived conflict between academic "openness" and commercial "secrecy" can be effectively managed without sacrificing the fundamental interests of industry or the academy. *See infra* Part II.B.3.d and accompanying notes.

[74] *See generally* Partha Dasgupta & Paul A. David, *Information Disclosure and the Economics of Science and Technology, in* ARROW AND THE ASCENT OF MODERN ECONOMIC THEORY 519, 528 (1987) (contrasting the "social imperative" among academic scientists to disclose fully research results and inventions, with the norm among industry technology developers to refrain from fully disclosing research results and inventions); MERTON, *supra* note 71, at 302 ("In the organized competition to contribute to man's scientific knowledge, the race *is* to the swift, to him who gets there first with his contribution in hand."); Dianne Rahm, *US Universities and Technology Transfer: Perspectives of Academic Administrators and Researchers,* INDUSTRY & HIGHER ED. June 1994, at 72, 73.

[75] *See generally* C. Alan Garner, *Academic Publication, Market Signaling, and Scientific Research Decision,* 17 ECON. INQUIRY 575 (1979); Diana Hicks, *Published Papers, Tacit Competencies and Corporate Management of the Public / Private Character of Knowledge,* 4 INDUS. & CORP. CHANGE 401 (1995); Paula E. Stephan, *The Economics of Science,* 34 J. ECON. LITERATURE 1199 (1996).

[76] *See generally* Dasgupta & David, *supra* note 74, at 523 ("Roughly speaking, the [academic] scientific community appears concerned with the *stock* of knowledge and is devoted to furthering its growth, whereas the [industrial] technological community is concerned with the private economic *rents* that can be earned from that stock.").

[77] *See infra* Part II.B.3.d and accompanying notes.

private firms employ mechanisms, principally secrecy and the assertion of intellectual property rights, to appropriate the value of their research and to keep commercially-valuable information out of the hands of competitors.[78] In the public debate over IURC, many academics and university administrators have raised concerns that the use of such appropriation mechanisms in the university research context may compromise the academic norm of "openness," limit the free exchange of ideas and information, and undermine the university's role as the disinterested discoverer and disseminator of intellectually-important knowledge.[79]

2. University Confidential Information Policies

Although there has been little systematic study of confidential information practices in industry-university research collaborations, a general sense of university policies can be gleaned from the limited empirical literature and the formal policy statements of university administrators.[80] Typically, university research policy statements reject secrecy as a matter of principle and insist on the freedom of university researchers to publish any research results of intellectual

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[78] *See generally* Levin et al., *supra* note 69; Richard Zeckhauser, *The Challenge of Contracting for Technological Information,* 93 PROC. NAT'L ACAD. SCI. USA 12,743 (1996).

[79] *See generally* GUIRR, OVERCOMING BARRIERS, *supra* note 2, at 17 (observing that "publication delays and non-disclosure requirements may impair the openness of the university research environment"); David Blumenthal, *Academic-Industry Relationships in the Life Sciences,* 268 JAMA 3344, 3347 (1992) ("[A]n increase in secrecy is one of the most feared consequences of [academic-industry relationships]."); Rahm, *supra* note 74, at 76 (reporting that in response to a survey on IURC issues, "nearly 38% of [university] administrators [surveyed] remark that firms they have dealt with have placed restrictions on researchers sharing information regarding R&D breakthroughs with . . . colleagues in an attempt to protect the secrecy of a potential commercial product"); Sheila Slaughter & Gary Rhoads, *supra* note 45, at 341 (maintaining that "[I]n accepting the conditions of private work in terms of secrecy and ownership – and in reaping the increased benefits of such work – entrepreneurial faculty have generated and heightened tension with their peers and their graduate students.").

[80] *See generally* Blumenthal et al., *Industry Survey, supra* note 2 (reporting results of survey of senior executives of life sciences companies); Blumenthal, *supra* note 79; David Blumenthal et al., *University-Industry Relationships in Biotechnology: Implications for the University,* 232 SCI. 1361 (1986) [hereinafter Blumenthal et al., *Industry-University Research Relationships*]; Brooks & Randazzese, *supra* note 73, at 377-80 (reviewing the literature on information disclosure restrictions in IURC); Dianne Rahm, *supra* note 74, at 72 (reporting results of survey of university administrators and researchers).

merit, including those generated through industry-university collaboration.[81] Nevertheless, most universities accept some restrictions on the disclosure of some types of information.[82] Perhaps the most common of these restrictions is delaying the publication of research results to allow the university or its industry partners time to file for patent protection.[83] While less prevalent than publication delays to

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[81] *See, e.g.*, COLO. STATE UNIV., TALKING TO POTENTIAL COMMERCIAL SPONSORS ABOUT RESEARCH, CLINICAL TRIALS, OR SERVICE AGREEMENTS (2000), http://www.research.colostate.edu/policy/ (visited May 26, 2001) ("Freedom to publish results of work by our faculty and students is an inviolable principle at CSU."); DUKE UNIV., UNIVERSITY-INDUSTRY GUIDELINES 3 (1995), http://www.ors.duke.edu/policies/unvind.htm. ("[U]niversity researchers must be free to publish their research results."); THE UNIV. OF N.C., UNIVERSITY RELATIONS WITH PRIVATE ENTERPRISE (1995), http://www.ncsu.edu/roe/policy/university.html ("Faculty and students must have the right to disseminate freely and openly their research findings, and research sponsors may not abridge this basic right."); STANFORD UNIV., RESEARCH POLICY HANDBOOK (1996), http://stanford.edu/dept/DoR/rph/2-6.html ("[T]he principle of openness in research – the principle of freedom of access by all interested persons to the underlying data, to the processes, and to the final results of research – is one of overriding importance.").

[82] *See generally* GIURR, OPENNESS AND SECRECY, *supra* note 45, at 3-5.

[83] *See* Blumenthal et al., *Industry Survey*, *supra* note 2, at 371 (reporting that publication delays to allow time to file patent applications are "standard practice at most academic institutions"); Burke, *supra* note 68 at 186-88 (same); Gilliand, *supra* note 68, at 981-82. It should be noted in this context that an invention is ineligible for patent protection if it is described in a publication more than one year prior to the filing of a patent application. Patent Act, 36 U.S.C. § 102(b) (2000).

A model publication delay provision for IURC, drafted by the Government-Industry-University Research Roundtable, reads as follows:

> Sponsor recognizes that under University policy, the results of University Project must be publishable and agrees that Researchers engaged in Project shall be permitted to present at symposia, . . . professional meetings, and to publish in journals, theses or dissertations, or otherwise of their own choosing, methods and results of Project, provided, however, that Sponsor shall have been furnished copies of any proposed publication or presentation at least [___] months in advance of the submission of such proposed publication or presentation to a journal, editor, or other third party. Sponsor shall have [___] months, after receipt of said copies, to object to such proposed presentation or proposed publication because there is patentable subject matter, which needs protection. In the event that Sponsor makes such objection, said Researcher(s) shall refrain from making such publication or presentation for a maximum of [___] months from the date of receipt of such objection in order for University to file patent application(s) . . . directed to the patentable subject matter contained in the proposed publication or presentation.

GOVERNMENT-INDUSTRY-UNIVERSITY RESEARCH ROUNDTABLE, SIMPLIFIED AND STANDARDIZED MODEL AGREEMENTS FOR INDUSTRY-UNIVERSITY COOPERATIVE RESEARCH, art. 6.1 (1988) [hereinafter GIURR MODEL AGREEMENT].

file patent applications, universities also agree in some cases to delay publication of research results beyond the time needed for patent filings,[84] or to treat collaborative research results as proprietary information that cannot be published *at all* without the consent of the industry sponsor.[85]

In addition to publication delays, many universities enter into, and/or permit faculty researchers to enter into, non-disclosure agreements ("NDAs") with industry research partners.[86] Under these arrangements, which are modeled on private law mechanisms to protect commercially-valuable information in employment and business-to-business relationships,[87] academic researchers agree to

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[84] *See* Blumenthal et al., *Industry Survey, supra* note 2, at 371 (reporting that 56% of life science company executives surveyed said that industry-sponsored university research is "often or sometimes . . . 'kept confidential to protect its proprietary value beyond the time required to file a patent'").

[85] *See id.* (reporting that 24% of university biotechnology researchers surveyed said that they had conducted research that was the property of the sponsor and which "could not be published without the sponsor's consent"); Rahm, *supra* note 74, at 76 (reporting that 79% of university administrators and 59% of university researchers surveyed stated that "firms they have dealt with have sought to prohibit or delay researchers from publishing research results coming from university-firm interactions"). An alternative version of the GIURR Model Agreement publication delay provision allows for delayed publication of patentable subject matter *or* "Confidential Information of Sponsor contained in the proposed publication or presentation," and directs the university and the sponsor to negotiate "an acceptable version" before publication or presentation can occur. *See* GIURR MODEL AGREEMENT, *supra* note 83, app. I, art. 6.1.

[86] *See generally* Gilliand, *supra* note 68, at 978-79.

[87] In the employment context, a non-disclosure agreement is a promise by an employee to refrain from disclosing any trade secrets or other confidential information to which the employee has access during his or her employment. *See generally* Zahodnick v. Int'l Bus. Mach. Corp., 135 F.3d 911 (4th Cir. 1997) (reviewing claim of former employer against former employee alleging breach of nondisclosure agreements). Non-disclosure agreements are also commonly used to protect confidential information in a broad range of business negotiations and relationships. *See, e.g.*, STEPHEN ELIAS, PATENT, COPYRIGHT & TRADEMARK: A DESK REFERENCE TO INTELLECTUAL PROPERTY LAW 41 (1996) (sample nondisclosure agreement drafted for purposes of product evaluation); *see also* Hannon Armstrong & Co. v. Sumitomo Trust & Banking Co., 973 F.2d 359 (4th Cir. 1992) (reviewing action against investor for breach of nondisclosure agreement); Carol M. Bast, *At What Price Silence: Are Confidentiality Agreements Enforceable?* 25 WM. MITCHELL L. REV. 627, 629-54 (1999) (surveying the law governing confidentiality agreements); Alan E. Garfield, *Promises of Silence: Contract Law and Freedom of Speech*, 83 CORNELL L. REV. 261, 268-76 (1998) (same); David L. Hoffman & Robert J. Lauson, *Practice Tips Tailoring Nondisclosure Agreements to Client Needs*, L.A. LAW., Oct. 23, 2000, at 57, 57 ("Nondisclosure agreements, also known as NDAs or confidentiality agreements, are vital to the exchange of technological and business

refrain from disclosing confidential information to third parties.[88]

3. Irreconcilable Research Cultures?

Having reviewed some of the principal concerns regarding secrecy in IURC, as well as the primary mechanisms for protecting confidential information, it is appropriate to examine the argument, noted earlier, that there is a fundamental conflict between academic "openness" and commercial "secrecy," and that information restrictions adapted from the commercial research culture are antithetical to the university research culture.[89] While a comprehensive examination of this issue is beyond the scope of the present paper, we can identify four principal reasons for viewing the claim of fundamental irreconcilability with skepticism.

a. *Not All Confidential Information Is Created Equal:*

Although the IURC debate tends to focus on restrictions of the disclosure of research *results*, a significant portion of the material that is protected in IURC arrangements – particularly by non-disclosure agreements -- consists not of research results at all, but of trade secrets and other confidential information disclosed to university researchers by industry research partners, but not to the general public.[90] The

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ideas."); William L. Kochen, *Securing a Secret Trust,* 38 SECURITY MGMT. 142 (1994) (reviewing law and business practices regarding nondisclosure agreements).

[88] A model IURC non-disclosure provision drafted by the Government-Industry-University Research Roundtable reads, in relevant part, as follows:

> Anything in this Agreement to the contrary notwithstanding, any and all knowledge, know-how, practices, process, or other information . . . disclosed or submitted in writing or in other tangible form which is designated as Confidential Information to either party by the other shall be received and maintained by the receiving party in strict confidence and shall not be disclosed to any third party . . . . The parties may disclose Confidential Information to employees requiring access thereto for the purposes of this Agreement provided, however, that prior to making any such disclosures each such employee shall be apprised of the duty and obligation to maintain Confidential Information in confidence . . . .

GIURR MODEL AGREEMENT, *supra* note 83, app. I, art. 1.1.

[89] *See supra* Part II.B.1 and accompanying notes.

[90] *See generally* Brooks & Randazzese, *supra* note 73, at 379 (noting difference between collaborative research results and the proprietary information of firms participating in IURC, and further noting the fact that the empirical literature makes no such distinction).

distinction bears emphasis because there is no necessary inconsistency between protecting such information and the academic imperatives to pursue and publish original research of intellectual merit.[91] The academic norm of "openness," moreover, offers no philosophical justification for a "freedom" to publish, or otherwise disclose, proprietary knowledge of private firms that predates, or is otherwise separate from, the jointly-developed fruits of IURC.

b. *Secrecy in University Research Is Not Unique to IURC*:

When considering the place of confidential information policies in the university research culture, it is also important to acknowledge that, IURC aside, secrecy is a familiar and generally-accepted part of that culture. For example, names of university research subjects and interviewees are routinely withheld to protect their privacy.[92] University researchers agree in some cases to refrain from revealing certain information in a public figure's private papers as a condition of gaining access to other materials of scholarly significance.[93] Academics exercise discretion to delay or avoid presenting new ideas, methodologies, or the results of research in progress in order to keep information from rivals in the race to publish, or to reserve material for future projects.[94] Indeed, even peer review of submissions to

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[91] *See* Fowler, *supra* note 67, at 525 (arguing that protecting a company's confidential information "is an entirely different matter from agreeing to delay or to keep confidential the results of a research project, and therefore, the overriding principles of publishing research do not apply"). Some have suggested, based on anecdotal evidence, that confidentiality agreements for industry-provided inputs are as threatening to the academic research environment as confidentiality provisions relating to IURC research results. *See, e.g.*, Steven A. Rosenberg, 334 NEW ENG. J. MED. 392 (1996) (in an untitled commentary, a National Cancer Institute official condemns industry-university confidentiality agreements for both research results and industry-provided research inputs); Lawrence K. Altman, *Medical Research Hurt By Secrecy, Official Says,* N.Y. TIMES, Feb. 10, 1996, at 9. However, such arguments tend to weigh the perceived costs of confidentiality agreements, while failing to consider the *net* benefits of industry contributing proprietary inputs to the university research enterprise that would be otherwise unavailable. These arguments also fail to address the legitimate intellectual property rights of industry research partners.

[92] Nicholas H. Steneck, *Whose Academic Freedom Needs to be Protected? The Case of Classified Research,* 11 BUS. & PROF. ETHICS J. 17, 24 (1992).

[93] *Id.*

[94] *See generally* Sissela Bok, *Secrecy and Openness in Science: Ethical Considerations,* 7 SCI. TECH. & HUMAN VALUES 32, 34-37 (1982); Hicks, *supra* note 75, at 408.

academic journals – a confidential process that can go on for many months after potentially significant research has been completed – can be understood as an academy-sanctioned publication delay.[95]

In each of the above-mentioned circumstances, information restrictions in the university research culture are accepted because they are generally thought to serve a "greater good" that is of value to the academic mission of the university. Withholding the names of research subjects can be justified as a necessary concession to help persuade people to participate in important human research studies. Strategic delay or withholding of information by academics is protected under the rubric of the academic freedom of the individual researcher to judge when and what to offer for publication.[96] Publication delay for peer review is justified as the price to be paid for assuring that the research published by academic journals is of intellectual merit. The point here is not that secrecy is, or should be, a pervasive element of the university research culture. It is, rather, that quite apart from IURC, university researchers regularly and appropriately employ information restrictions based on a calculation that the net benefits of such restrictions for the academic enterprise outweigh the costs. It follows that the same cost/benefit calculus should apply to the evaluation of the information restrictions that accompany IURC.

c. *Universities Are Capable of Protecting Their Interests:*

One of the premises of the fundamental irreconcilability argument is that universities are unable or unwilling to protect their values and interests in collaborative relationships with industry.[97] However, this premise seems questionable in light of the university's bargaining position and the record of IURC to date.

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[95] *See* Steneck, *supra* note 92, at 24.

[96] Of course, the academic freedom to delay or refrain from publishing important research results can be abused. This potential for abuse is generally accepted, however, as a tolerable aspect of an otherwise salutary deference to the judgment of the individual researcher.

[97] *See, e.g.*, Eisenberg, *Academic Freedom*, *supra* note 2, at 1374 (arguing that university "[f]aculty members who are financially dependent on research sponsors may not be counted on to uphold academic values on their own"); Kenney, *supra* note 70, at 130, 134 (suggesting that because universities are not well-equipped to protect their values and interests in IURC, "national guidelines" are needed to prevent the "destruction of the values of the university").

Universities have considerable leverage in the negotiation of collaborative relationships with industry. Private firms typically enter into IURC not because of eleemosynary impulses, but in pursuit of the commercially-valuable knowledge and other resources universities have to offer.[98] It will be recalled, moreover, that although industry support of university research has been increasing rapidly in recent years, it still amounts to just seven percent of all university R&D expenditures.[99] To be sure, all other things being equal, most schools are likely to welcome industry resources and participation in the university research enterprise. Moreover, the aggregate seven percent figure may understate the importance of industry support in many specific cases. Nevertheless, because they offer something of considerable value to industry partners, and ninety-three percent of university R&D funds come from sources other than industry, most research universities are in a position to negotiate terms for IURC that are substantially consistent with their institutional values and interests.[100]

Consider the record of IURC to date. Although there has been no shortage of expressions of concern regarding information restrictions in IURC, among thousands of industry-university collaborations, there have been very few documented cases of important collaborative research results being held in secret to the detriment of the academy or the public-at-large.[101] To be sure, this may simply reflect

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[98] *See supra* Part I.A and accompanying notes.

[99] *Id.*

[100] *See generally* Brooks & Randazzese, *supra* note 73, at 379 ("[I]n the spectrum of research universities and firms, the best seem quite capable of protecting their traditional values of openness, with only modest concessions to the practical needs of industry, while other institutions are quite willing to undertake more proprietary work which calls for more traditional industrial restraints on disclosure."); Blumenthal et al., *Industry-University Research Relationships, supra* note 80, at 1366 ("Most universities are in a strong bargaining situation with respect to potential industrial sponsors.").

[101] *See generally* David Blumenthal et al., *Withholding Research Results in Academic Life Science: Evidence From a National Survey of Faculty*, 227 JAMA 1224, 1227 (1997) (concluding on the basis of a national survey of 2167 life science academics: "our findings suggest that data withholding is not widespread"). Of the 2167 respondents surveyed by Blumenthal et al., 19.8% reported having delayed the publication of research results by at least six months, at least once during the previous three years. *Id.* at 1226. Of the 410 respondents reporting such delays, 46% reported that the delays were to allow time to file patent applications, while 28% reported delays "to slow dissemination of undesired results." *Id.*; *see also* Rhein, *supra* note 57, at 1 (an NIH official, reporting on a study of 375 government-funded research collaboration agreements, concluded that "[f]or the most part, we did not find unreasonable

difficulties in detecting and reporting such circumstances. Moreover, the reported cases of inappropriate disclosure restrictions raise quite legitimate concerns.[102] But the very small number of cases is at least consistent with the interpretation that IURC confidential information policies have not, in practice, excessively restricted the diffusion of collaborative research results on a regular basis. That is to say, the record supports the inference that universities have generally been able to negotiate IURC agreements without, so to speak, "giving away the academic store."

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restrictions, publication delays or constraints of university researchers from consulting or collaborating with other parties.").

[102] In one recent case, Immune Response Corporation ("IRC") sponsored clinical trials at the University of California at San Francisco to evaluate a medication -- "Remune" -- the company had developed for the treatment of AIDS. After UCSF researchers concluded that Remune was not an effective treatment for the disease, IRC tried to persuade the lead researcher not to publish an article reporting the unfavorable results of the clinical trials. The company stated that it opposed the publication because the researchers omitted favorable data and disclosed proprietary information they had agreed to keep confidential. When the UCSF researchers published the article over IRC's objections, the company brought an action for damages against the researchers and the University before the American Arbitration Association. *See* J. O. Kahn et al., *Evaluation of HIV-1 Immunogen, an Immunologic Modifier, Administered to Patients Infected with HIV Having 300 to 549 x10(6)/L CD4 Cell Counts: A Randomized Control Trial,* 284 JAMA 2193 (2000); Katherine S. Mangan & Goldie Blumenstyk, *Company Seeks $10-Million From Scientist and University,* CHRON. HIGHER ED., Nov. 17, 2000, at A48; Karen Young Kreeger & Paula Park, *When Corporations Pay for Research,* SCIENTIST. COM (May 28, 2001), http://www.the-scientist.com/yr2001/may/prof_010528.html. In another case, also involving a UCSF research team, another pharmaceutical company – Boots – sponsored a university study to determine whether three cheaper drugs were the bioequivalents of Boots' market-leading hypothyroidism drug, Synthroid. After the UCSF research team determined that the three other drugs could be effectively substituted for Synthroid at a savings of hundreds of millions of dollars per year in health care costs, Boots asserted its contractual right to bar publication of the research results. In contrast to the IRC case, the University of California refused to defend the researchers who had conducted the study and the research results were never published. *See* Ralph T. King Jr., *Bitter Pill: How a Drug Firm Paid for University Study, Then Undermined It,* WALL ST. J., Apr. 25, 1996, at A1. Significantly, the agreement that the UCSF researchers had entered into with Boots, which stated that the research results could not be published without the company's written consent, violated the University's policies regarding sponsored research. *Id.* Thus the principal problem revealed in the UCSF/Boots case would appear to lie not with the university's confidential information policies, but rather in the failure of a university researcher to follow those policies.

d. *Industrial and academic cultures' common ground:*

A final point that bears particular emphasis in the evaluation of arguments positing a fundamental divergence between the academic and commercial research cultures is that, with regard to the diffusion of research results, the two cultures have more in common than is often assumed.[103] As noted earlier, although academic researchers have powerful incentives to publish research quickly and widely, scholars also exercise discretion in deciding how much to publish and when. On the other side of the academic/industry divide, industrial researchers often have strong incentives to publish and, in fact, contribute extensively to the academic literature, particularly in science and engineering.[104]

Given the commercial imperative to appropriate the value of knowledge for competitive advantage, why would companies want to publish research results? The explanation lies in the crucially important "market signaling" function of publication. First, firms publish, in part, to compete more effectively in the market for highly-skilled employees. Publication helps a company attract and retain talented employees by signaling that the firm is doing important R&D

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[103] *See generally* Dasgupta & David, *supra* note 74, at 524-25; Hicks, *supra* note 75, at 406 ("[I]n many areas neither science and technology, nor corporate and academic research interests can be clearly distinguished."); Stephan, *supra* note 75, at 1209 (noting that "the research of some scientists and engineers in companies like IBM, AT&T, and Du Pont is virtually indistinguishable from that of their academic counterparts"); DONALD E. STOKES, PASTEUR'S QUADRANT: BASIC SCIENCE AND TECHNOLOGICAL INNOVATION (1997) (discussing the nature and significance of "use-inspired basic research," which straddles the traditional division between "pure basic" and "pure applied" research).

[104] *See generally* Hicks, *supra* note 75, at 402-03 (noting that private firms publish extensively in the science and technology research journals, with some companies contributing "as much to the public literature as medium-sized universities"); Stephan, *supra* note 75, at 1210 (reporting that industry produces one-sixth of the articles published in chemistry and physics and one-fourth of the engineering and technology literature); Iain Cockburn & Rebecca Henderson, Public-Private Interaction and the Productivity of Pharmaceutical Research 14 (Nat'l Bureau of Econ. Research, Working Paper No. 6018, 1997) (noting that in the 1970s, some pharmaceutical firms "began to actively encourage publication and to hire researchers at the leading edge of their fields with the promise that they would reward them to continue doing cutting edge scientific research").

work of intellectual merit.[105] Second, and more importantly, firms publish in order to establish and maintain reputations that facilitate their participation in the informal market for the exchange of valuable tacit knowledge.[106] Particularly where sophisticated technology is concerned, many firms require not only the types of explicit knowledge that can be written in an article or a patent application, but also on tacit knowledge that may be of equal value.[107] A key source of such tacit knowledge for companies is the exchange of know-how through informal networks of researchers with complementary areas of expertise.[108] In these informal networks, researchers understandably prefer to share their valuable tacit knowledge today with organizations that are likely to be in a position to offer valuable tacit knowledge reciprocally tomorrow.[109] By publishing in scholarly journals, firms signal that they possess valuable tacit knowledge and that they are therefore worthy players in the ongoing exchange of such knowledge across organizational boundaries.[110]

Of course, this is not to say that firms have an interest in publishing *all* of their research results. Companies are obliged to "manage the process" of selective disclosure "by establishing procedures to reconcile publication with appropriation."[111] Nevertheless, contrary to the notion of academic "openness" fundamentally opposing commercial "secrecy," the market signaling functions of publication can offer material incentives for private firms to support the publication of the results of IURC.

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[105] *See* Hicks, *supra* note 75, at 413; Stephan, *supra* note 75, at 1209 ("The reputation of the lab, which is directly related to publication activity, also affects the ability of the company to hire scientists and engineers.").

[106] Hicks, *supra* note 75, at 414-21.

[107] *Id.* at 413-14; *see also* Eric von Hippel, *Cooperation Between Rivals: Informal Know-how Trading,* 16 RES. POL'Y 291 (1987).

[108] *See* von Hippel, *supra* note 107, at 294-96; G. E. Pake, *Business Payoff from Basic Science at Xerox,* 29 RES. MGMT. 35 (1986); S. Schrader, *Informal Technology Transfer Between Firms: Cooperation through Information Trading,* 20 RES. POL'Y 153 (1991).

[109] *See* von Hippel, *supra* note 107, at 292-95.

[110] *See* Hicks, *supra* note 75, at 414-21.

[111] *Id.* at 409. Publications can inform the world that a firm knows how to make a better mousetrap without providing competitors with instructions for constructing that mousetrap on their own. *See* Stephan, *supra* note 75, at 9 ("[P]ublication is not synonymous with replicability").

III. THE "NETCENTRICITY LABORATORY" CASE STUDY

This part of the paper presents the University of Maryland's Netcentricity Laboratory as an example of a structure for industry-university collaborative research. The principal focus of the discussion is the set of confidential information policies developed to address the challenges of Net Lab collaboration with private firms and the process that led to their adoption.[112] These policies, which establish formal rules and procedures to prevent the unauthorized disclosure of the confidential and proprietary information of the Net Lab and its research partners, are assessed in relation to the three major university challenges identified in Part II of this paper:[113] (1) to structure and manage collaborative relationships that allow the university to maintain control over the direction of its research activities; (2) to allocate the benefits and burdens of industry-university collaboration to serve the university's academic mission, while offering sufficient economic incentives to participants; and (3) to reconcile the different research cultures of universities and industry and thereby maintain a university research environment that is consistent with the university's academic mission.

A. The Net Lab Platform for Industry-University Research Collaboration

1. Creating the Net Lab

The Netcentricity Laboratory is a high-technology research and teaching facility recently established at the University of Maryland at College Park's Robert H. Smith School of Business ("Smith School") for the primary purpose of fostering, extending, and sharing the Smith School faculty's expertise in the study of supply chain management.[114] The concept of "Netcentricity" integrates advanced supply

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[112] The discussion of the internal policy development process that led to the Net Lab's confidential information policies is substantially based on in-depth interviews with the principal participants among the faculty and administrators of the Smith School. To protect the privacy of the participants and the integrity of the policy development process, interviewees are not cited by name or position.

[113] *See supra* notes 41-46 and accompanying text.

[114] *See Smith School Launches Netcentricity Laboratory,* OUTLOOK, Mar. 27, 2001, at 5; *see also* SANDOR BOYSON ET AL., LOGISTICS AND THE EXTENDED ENTERPRISE (1999) (survey of current corporate supply chain management practices); Rosemary Faya Prola, *The E-Powered Supply Chain,* 3 SMITH BUS. 8 (2001) (defining "supply chain management" as "the integrated

chain analytical tools with the burgeoning potential of Internet-based communications technology; technology that promises to revolutionize the management of the distribution channel by electronically linking all of the key actors in the supply chain in real time.[115] The idea for the Netcentricity Laboratory emerged in 1999, when several faculty members associated with the Smith School's Supply Chain Management Center ("SCMC")[116] began planning a facility that would allow researchers to use the most sophisticated computer hardware, software, communications, and visualization technologies to model supply chain management problems.[117]

The principal technological infrastructure of the Net Lab facility consists of six servers,[118] nine workstation computers, a large plasma display for visual presentations, and an array of application software programs, all housed in a suite of rooms at the Smith School. The Lab's software resources include enterprise resource planning (ERP), supply chain management, voice recognition, search engine, and Web portal applications. While most of the software programs are available for sale or license to the general public, some of the most sophisticated applications are not. These have been provided to the Lab pursuant to special agreements with the developers, some of which obligate the Net Lab to take reasonable precautions to avoid

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management of the entire distribution channel from raw materials to ultimate customer across firms").

[115] *See generally* Sandor Boyson & Thomas Corsi, *The Real-Time Supply Chain*, 5 SUPPLY CHAIN MGMT. REV. 44 (2001); WHATIS.COM: IT-SPECIFIC ENCYCLOPEDIA, http://whatis.techtarget.com (last visited Jun. 4, 2001) (defining "real time" as "a level of computer responsiveness that a user senses as sufficiently immediate or that enables the computer to keep up with some external process").

[116] The Supply Chain Management Center ("SCMC") is a research center within the Smith School that sponsors supply chain management research and teaching, and also provides consulting services to private firms and government clients. *See generally* Robert H. Smith School of Business, Supply Chain Management Center Brochure [hereinafter SCMC Brochure] ("The mission of the Supply Chain Management Center . . . is to exploit advanced technologies for supply chain applications and to facilitate economic growth in the State of Maryland and in the National Capital Region as a whole.").

[117] Interviews with Smith School faculty members (May 16, 2001).

[118] The Net Lab supplements these on-site servers with several others that are maintained in another location on the University of Maryland's College Park campus.

the disclosure of confidential and proprietary information relating to the software products.[119]

The capabilities of the Net Lab facility have been summarized as follows:

> The new laboratory provides a multi-media environment capable of effectively demonstrating and customizing an integrated real-time supply chain architecture and applications suite for individual or aligned groups of businesses and organizations. This laboratory provides a test bed for various organizations to validate supply chain practices in the context of moving toward a Net-centric economy. These organizations include not only traditional industries and businesses but also government agencies at the local, state and national levels. This environment can support advanced planning and optimization systems, enterprise resource (ERP) systems, logistics execution systems, and middleware.[120]

The cost of equipping the Lab, including the value of hardware and software donated by industry suppliers, was approximately $6 million.[121] The principal funders of the facility are Sun Microsystems, the National Science Foundation, the Defense Advanced Research Projects Agency ("DARPA"), the University of Maryland, and the State of Maryland.[122] Thus the facility is funded not by a single institution or sector, but jointly, from a *combination* of government, university, and industry sources. Nevertheless, approximately eighty percent of the resources required to establish the Lab were provided by private firms in the form of in-kind contributions of computer hardware and software.[123] Without the commitment of substantial industry resources, the Netcentricity Laboratory would not have been established.[124]

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[119] *See, e.g.*, Manugistics, Inc., *Software Demonstration Agreement for Manugistics Supply Chain Software* (Jan. 29, 2001) ("During and subsequent to the term of this AGREEMENT, LICENSEE shall not disclose CONFIDENTIAL INFORMATION, nor the results of any testing of SOFTWARE to any third party.") (on file with the authors).

[120] SCMC Brochure, *supra* note 116.

[121] Interviews with Smith School faculty and administrators (May 16, 18, 2001).

[122] *Id.*

[123] To put this figure in perspective, the resources provided by private firms to equip the Net Lab in 2000 accounted for approximately 25% of *all* corporate support for the University of Maryland at College Park in that year. *Id.*

[124] *Id.*

2. The Work of the Net Lab

The work conducted in the Net Lab reflects the academic and service missions of the University of Maryland and the Smith School of Business.[125] The facility is currently used for government-sponsored academic research,[126] industry-sponsored research, teaching, faculty consulting, and a joint project with a European university to develop supply chain visualization software products both for educational and commercial use.[127] The Lab serves the Smith School's education mission as a state-of-the-art classroom facility for graduate-level classes on supply chain management, while the resources of the Lab are also being used to develop computer-based supply chain management courses for Smith School graduate students and for executive education. The sponsored research projects that make use of the Lab's resources include supply chain management studies commissioned by corporate and government clients and the development of an advanced Web portal for the State of Maryland's Department of Budget and Management.[128]

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[125] Like other universities, the University of Maryland seeks to foster excellence in research, education and service to the community. The Smith School's mission also entails helping to improve the quality of business management. *See generally* Robert H. Smith School of Business, *About the Smith School of Business: Identity and Mission, at* http://www.rhsmith.umd.edu/pr/smithschoolboilerplate.doc (last visited July 2, 2001) ("Through its education, research, executive development, and corporate partner programs, the Smith School of Business is an invaluable resource for business, government, and alumni.").

[126] The academic research conducted in the Lab includes a "Scalable Supply Chain Infrastructure" study funded by the National Science Foundation ("NSF") to develop optimization software for supply chain planning. *See* Prola, *supra* note 13, at 9-11; *see also The Impact of Scalable Supply Chain Infrastructures,* 1 RESEARCH@SMITH 2 (2001) (describing NSF-funded study) (booklet on file with authors).

[127] Memorandum of Understanding Between University of Maryland, Robert H. Smith School of Business Supply Chain Management Center and Delft University of Technology, Delft Institute for Information Technology in Service Engineering (July 30, 2000) (on file with the authors).

[128] *See* Supply Chain Management Center, *Fact Sheet* (undated document on file with authors).

Figure 1

Representative Net Lab Projects / Relationships		
PROJECT	PRINCIPALS	PROJECT / PARTNERSHIP TYPE
Scalable[129] Supply Chain Infrastructures study	Smith School faculty / NSF	Academic research funded by National Science Foundation (University / Federal government)
Study of Netcentricity	Smith School faculty / DARPA	Sponsored research for federal agency (University / Federal government)
Developing software for supply chain education	Smith School faculty / Technical University of Delft (The Netherlands)	International academic R&D partnership to develop educational software products (University / University)
Development of "eMaryland" internet portal	Smith School faculty / Sun Microsystems / Maryland State government	Sponsored R&D for state government, working with industry partner (University / Industry / State agency as sponsor)
Net Lab designated Sun "iForce Ready Center"[130]	Smith School faculty / Sun Microsystems	Agreement to offer advanced IT analysis services to third parties as part of a corporate network (University / Industry)

B. Formulating Confidential Information Policies

In its first few months of operation, access to the Net Lab was unrestricted and there was no formal policy regarding the protection of confidential information. Soon after it became fully operational, a

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[129] For a definition of "scalable," see COMPUTERUSER, HIGH-TECH DICTIONARY, *at* http://www.computeruser.com/resources/dictionary/definition.html?lookup=4986 (last visited June 4, 2001) (defining "scalable" as "[a]ble to be changed in size or configuration to suit changing conditions").

[130] For a discussion of Sun Microsystems' iForce Initiative, see generally *Global iForce Initiative Industry Profile,* http://www.sun.com/aboutsun/media/presskits/iforce/iforce_profile.html (last visited June 27, 2001); *see also* Sun Microsystems Corp., *Authorized iForce Ready Center Agreement* (May 14, 2001) (on file with authors).

debate arose within the Smith School over the regulation of access to the Net Lab and the treatment of confidential materials generated or used in the facility. On one side of the controversy, some faculty members argued that existing and future collaborations with private firms and others outside of the University would be untenable unless the School established a formal set of rules and procedures, modeled on private sector practices, to protect confidential materials against unauthorized disclosure. The proposed confidential information policies would consist of a regime for restricting access to the Net Lab to authorized personnel, non-disclosure agreements, and pre-publication review procedures for writings and presentations based on work conducted in the Lab. Faculty members on the other side of the internal debate maintained that such procedures were both unnecessary and antithetical to the academic mission and research culture of the School.

1. The Net Lab Legal Environment

A key consideration in the confidential information policy development process at the Smith School was the Net Lab's legal environment. For purposes of the present discussion, that legal environment consists of: (1) federal research legislation and agency policies; (2) federal intellectual property statutes and case law; (3) state statutes regulating the conduct of the University as a legal entity; (4) state contract law and the Net Lab's actual and potential contractual relationships; and (5) state statutory and common law governing trade secrets. Among these disparate elements, state contract and trade secret law emerge as the most consequential for day-to-day operation of the Net Lab and its confidential information policies.

a. *Federal Law*:

The Net Lab, like many other structures for industry-university research collaboration, operates in an environment shaped, in part, by federal research policy and intellectual property law. As noted earlier, the National Science Foundation provided a portion of the funding for the establishment of the Lab.[131] The NSF also funds ongoing research projects conducted in the facility.[132] As discussed in

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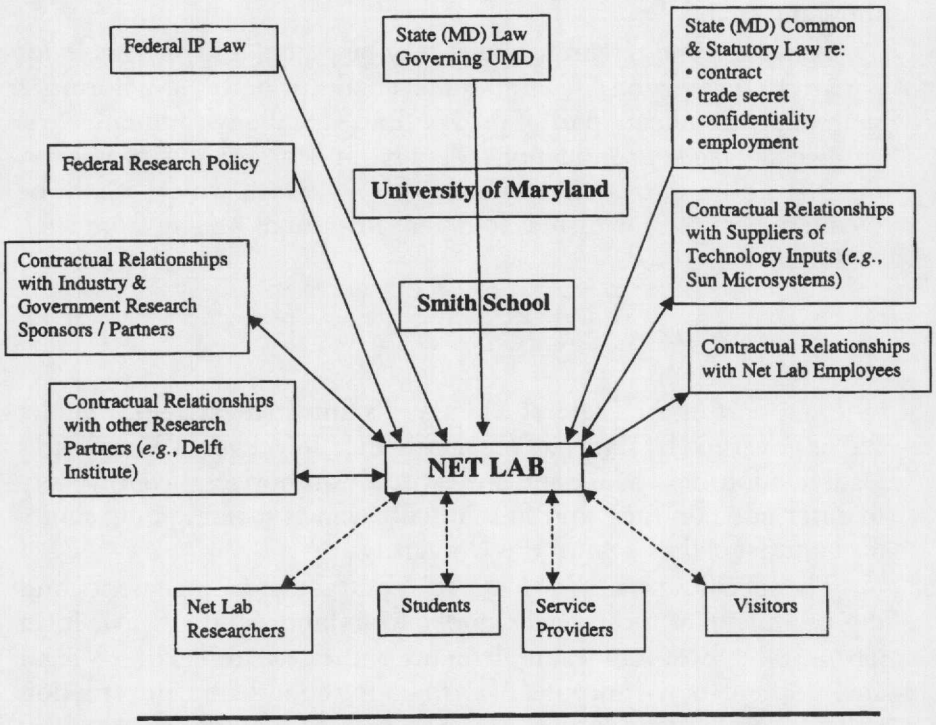
[131] *See supra* Part III.A.1 and accompanying notes.

[132] *See The Impact of Scalable Supply Chain Infrastructures*, *supra* note 126; Prola, *supra* note 12.

Figure 2

NET LAB LEGAL ENVIRONMENT



greater detail below, NSF support for the Lab raises questions regarding the compatibility of federally-funded academic research activities and more commercially-oriented industry-university research collaborations that may be taking place at the same time, in the same facility.[133]

Because some research results may be patentable or eligible for copyright protection, federal intellectual property law forms a potentially significant part of the Net Lab's legal environment.[134] As a university facility conducting federally-funded research, moreover, the Net Lab is also subject to the Bayh-Dole Act, which, it will be recalled, permits universities to patent inventions arising from such research.[135]

b. *State Law*:

As a part of the State of Maryland's university system, the Net Lab is governed by state law regulating the University of Maryland's legal relationships. Maryland law expressly authorizes the University to enter into contracts and substantially waives sovereign immunity for contract claims against the University.[136]

The specific terms of the Net Lab's contractual arrangements, and the treatment of those terms under Maryland contract law, form perhaps the most important elements of the research center's legal environment for the purposes of formulating confidential information policies. As noted earlier, some research materials—primarily advanced computer software—are provided to the Lab subject to contractual provisions prohibiting their disclosure to third parties.[137] These research materials, which are in some cases integral to the

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[133] *See infra* Part III.B.2.b and accompanying notes.

[134] *See* Patent Act, 35 U.S.C. §§101-103 (2000); Copyright Act, 17 U.S.C. §§ 101-104 (2000).

[135] *See supra* Part I.A and accompanying notes; *see also* James V. Lacey et al., *Technology Transfer Laws Governing Federally Funded Research and Development,* 19 PEPP. L. REV. 1 (1991); Lawrence Rudolph, *Overview of Federal Technology Transfer,* 5 RISK: HEALTH SAFETY & ENV'T 133 (1994).

[136] *See* MD. CODE ANN., § 12-104(b) (2001) (University of Maryland system authority to enter into contracts); MD. CODE ANN., § 12-201(a) (2001) (partial sovereign immunity waiver for contract actions).

[137] *See supra* Part III.A.1 and note 119.

work of the Lab, would not be available to Smith School researchers absent contractually-binding agreements to maintain their secrecy. To date, the Net Lab has not entered into any IURC agreements expressly restricting the disclosure of the results of collaborative research.[138] However, the Net Lab anticipates entering into industry-university research partnerships that are likely to generate commercially-valuable and/or commercially-sensitive results, and the experience of other universities suggests that the Lab may be asked by future industry research partners to agree to enforceable contractual provisions restricting the disclosure of some of those results.[139]

Trade secret law constitutes another important element of the Net Lab's legal environment for the purposes of formulating confidential information policies.[140] In Maryland, as in other states, commercially-valuable information is entitled to trade secret protection only if the holders of the information take reasonable precautions to maintain its secrecy.[141] Although this research has revealed no reported Maryland

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[138] Of the confidential information provisions in the Net Lab's current external agreements, the one that most closely resembles IURC restrictions on the disclosure of research results is contained in the Memorandum of Understanding with the Delft Institute. *See supra* Part III.A.2 and note 127. Under that agreement, Net Lab researchers and their Delft Institute counterparts are obligated to protect confidential information associated with the joint development of educational software products. However, the Delft arrangement may be distinguished from IURC in that it is an agreement with another *university*, rather than with a private firm, and it concerns the development of software programs that will be marketed as proprietary products of the two universities, rather than collaborative research.

[139] *See generally* Rahm, *supra* note 74, at 76.

[140] A "trade secret" is defined under Maryland law as follows:

> "Trade secret" means information, including a formula, pattern, compilation, program, device, method, technique, or process, that:
>
> (1) Derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and
>
> (2) Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.

MD. CODE ANN., § 11-1201 (2001) (Maryland Uniform Trade Secrets Act); *see also* Thomas F. Cotter, *Conflicting Interests in Trade Secrets,* 48 FLA. L. REV. 591 (1996); Steven D. Maurer & Michael T. Zugelder, *Trade Secret Management in High Technology: A Legal Review and Research Agenda,* 11 J. HIGH TECH. MGMT. RES. 155 (2000); Peter B. Swann, Note, *Maryland's Uniform Trade Secrets Act,* 49 MD. L. REV. 1056 (1990).

[141] To qualify for trade secret protection under the Maryland Uniform Trade Secrets Act, information must be "the subject of efforts that are reasonable under the circumstances to maintain its secrecy." *See* MD. CODE ANN., § 11-1201(e)(2) (2001).

cases specifically addressing confidential information policies in IURC,[142] decisions from other jurisdictions suggest that industry-university agreements regarding the confidentiality of research materials or jointly-developed research results are subject to the general standards developed in business-to-business and employment disputes involving confidential and proprietary information.[143] The standards applied in such disputes would also likely apply to the construction and enforcement of non-disclosure agreements between

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[142] *Cf.* Optic Graphics, Inc. v. Agee, 591 A.2d 578 (Md. Ct. Spec. App. 1990), *cert. denied*, 598 A.2d 465 (1991) (applying Maryland Uniform Trade Secrets Act in dispute between private firm and former employee). *See generally* Swann, *supra* note 140, at 1060-69 (reviewing MUTSA and related common law).

[143] Universities are often parties to what are essentially commercial disputes involving rights to valuable knowledge used in, or arising from, university research activities. In such cases, universities typically invoke and are generally subjected to the same legal standards that govern the conduct of private firms and persons in commercial disputes, although some public universities may avoid liability in some cases by asserting the defense of sovereign immunity. *See, e.g.*, The Johns Hopkins Univ. et al. v. Cellpro, Inc., 152 F.3d 1342 (Fed. Cir. 1998) (patent infringement action by university and its licensees against private firm); Sadwick v. Univ. of Utah, 2001 WL 741285 (D. Utah 2001) (university professor, having served as principal investigator for sponsored research project, sued university to establish inventorship and for misappropriation of research results); Kucharczyk v. The Regents of the Univ. of Cal., 48 F. Supp. 2d 964 (N.D. Cal. 1999) (dispute between university inventors of MRI technology and the university regarding distribution of licensing revenue), *dismissed*, 1999 U.S. Dist. LEXIS 7782 (N.D. Cal. May 18, 1999); Dieter v. Regents of the Univ. of Cal., 963 F. Supp. 908 (E.D. Cal. 1997) (former graduate student claiming that university had misappropriated his work and infringed patent); Univ. of Colo. Found., Inc. v. Am. Cyanamid, 880 F. Supp. 1387 (D. Colo. 1995) (action by university claiming, *inter alia*, conversion and breach of confidentiality obligation after university faculty conducted sponsored research for a private firm and the firm patented and published certain research results); Brown v. Regents of the Univ. of Cal., 866 F. Supp. 439 (N.D. Cal. 1994) (action by university researcher to correct inventorship on university patent), *appeal dismissed, remanded*, 47 F.3d 1179, 1994 U.S. App. LEXIS 40845 (Fed. Cir. 1994). It should be noted that federal intellectual property disputes with state universities are subject to the Supreme Court's recent decision in *Florida Prepaid Postsecondary Education Expense Board v. College Savings Bank*, in which the Court held that Congress can not abrogate a state's right to raise sovereign immunity as a defense to the enforcement of federal intellectual property claims. 119 S. Ct. 2199 (1999); *see also* Peter S. Menell, *Economic Implications of State Sovereign Immunity from Infringement of Federal Intellectual Property Rights,* 33 LOY. L.A. L. REV. 1399 (2000). However, the decision does not affect cases governed by state law and it is not yet clear what, if any, use state universities will make of the ruling.

the Net Lab and researchers, students, or staff members.[144] If a researcher or staff member entered into an NDA with the Net Lab and then caused the disclosure of confidential information, whether the proprietary information of industry partners or that of the Lab, liability would presumably depend, in part, on whether the researcher or staff member had adhered to the terms of the NDA and whether the Net Lab had taken reasonable precautions to prevent the disclosure.[145]

1. The Internal Debate

Having outlined the Net Lab's legal environment, we turn to a review of the internal debate over the Lab's confidential information policies. The following discussion considers the principal issues in that debate in relation to the three major challenges universities face in industry-university research collaboration: (1) to maintain control over the direction of university research; (2) to allocate the benefits and burdens of industry-university collaboration to serve the university's primary academic mission, while offering sufficient economic incentives to participants; and (3) to maintain a university research environment that is consistent with the university's academic mission.[146]

a. *Direction of Research*:

Of the three major challenges of industry-university collaboration, the issue of control over the direction of university research was the least controversial in the Net Lab policy development process. Although there was some concern that policies adopted to facilitate

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[144] *See* Bd. of Regents of the State of Fla. v. Taborsky, 648 So. 2d 748 (Fla. Dist. Ct. App. 1994) (enjoining former University of South Florida student, who had been a research assistant on an IURC project, from using or disclosing the contents of research notebooks he had taken in violation of a confidentiality agreement with the University's industry research partner).

[145] *See generally* Structural Dynamics Research Corp. v. Eng'g Mech. Research Corp., 401 F. Supp. 1102, 1117 (E.D. Mich. 1975) (reviewing measures taken by firm to preserve the secrecy of confidential information); Swann, *supra* note 140, at 1065-66 (reviewing standards for reasonable efforts to maintain the confidentiality of information under Maryland trade secret law).

[146] *See supra* notes 40-45 and accompanying text.

relationships with private firms might have the unintended effect of crowding out other research, there was, significantly, no suggestion that embracing industry-university collaboration would result in a suspension of independent judgment that would lead to less meritorious research.

b. *Allocation of Costs and Benefits of Research Collaboration*:

The question of how to allocate the costs and benefits of industry-university research collaboration emerged as a significant, if ultimately manageable, issue in the process of developing policies for the Net Lab.[147] Here it is important to recall that the University of Maryland, of which the Net Lab is a part, is a public university that is substantially supported by the State of Maryland.[148] And, as mentioned earlier, a portion of the cost of establishing and administering the Net Lab was funded by grants from the National Science Foundation. So when the Net Lab enters into a collaborative relationship with a private firm, the State of Maryland and the federal government are contributing some "public resources" to the venture.

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[147] This issue has been framed by some as a challenge to avoid "the use of public resources for private gain." *See, e.g.*, Office of the President of the Univ. of Cal. at Berkeley, *Statement on Licensing Policy* (1989), http://otl.Berkeley.edu/Guidelines.html. However, such a formulation seems both unworkable and inconsistent with federal research policy. Indeed, it may be more accurate to say that Congress and many of the states have struggled instead with the question of how *best* to use public resources for private *and* public gain. *See generally* DAVID C. MOWERY & NATHAN ROSENBERG, PATHS OF INNOVATION: TECHNOLOGICAL CHANGE IN 20TH-CENTURY AMERICA 23-26 (1998) (noting close ties between universities and industrial research before World War II); Nathan Rosenberg & Richard R. Nelson, *The Roles of Universities in the Advance of Industrial Technology, in* ENGINES OF INNOVATION: U.S. INDUSTRIAL RESEARCH AT THE END OF AN ERA 87, 88-92 (Richard S. Rosenbloom & William J. Spencer eds., 1996) (reviewing history, dating from the nineteenth century, of U.S. universities addressing the practical problems of agriculture and industry); COUNCIL ON GOV'T RELATIONS: A REVIEW OF INDUSTRY-UNIVERSITY RESEARCH RELATIONSHIPS (1996), http://www.cogr.edu/ (noting long history of industry-university cooperation in the United States).

[148] *See* Univ. of Md., Univ. Communications Newsdesk, *Quick Facts*, http://www.inform.umd.edu/CampusInfo/Departments/InstAdv/newsdesk/quickfacts.html (last visited July 2, 2001) (stating that state appropriation of $333.1 million accounts for roughly one-third of the total FY 2001 budget of $960.6 million for the University of Maryland at College Park).

A specific "public resources" question that arose during the Net Lab policy development process was whether NSF-funded academic research could or should be conducted simultaneously in the same facility with industry-sponsored research and development. Regarding this question, two arguments were raised during the internal debate. The first argument was that, because the NSF contributed to the establishment and maintenance of the Net Lab, industry-sponsored research conducted in the same facility would effectively receive an inappropriate federal subsidy. The second, closely-related, argument was that NSF funds that had been awarded for the pursuit of "open" academic research should not be used to defray the costs of confidential commercial research. While there are no statutory provisions or regulations directly addressing these concerns, the NSF's recent policy statements make several relevant points that may guide analysis. First, NSF strongly encourages the publication and diffusion of the results of research it funds.[149] Second, the agency does not normally make grants for commercial product development.[150] Third, it is NSF's stated policy to encourage industry-university research collaborations.[151] There is nothing in the NSF policy suggesting that NSF-funded academic research is incompatible with industry-

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[149] The National Science Foundation's position on dissemination of its grantees' research results is set forth in the agency's Grant Proposal Guide as follows:

> NSF advocates and encourages open scientific communication. NSF expects *significant findings from supported research and educational activities* to be promptly submitted for publication . . . . NSF program management will implement these policies, in ways appropriate to field and circumstances . . . . Adjustments and, where essential, exceptions may be allowed to safeguard the rights of individuals and subjects, the validity of results and the integrity of collections, or to accommodate legitimate interests of investigators.

NAT'L SCI. FOUND., FY 2001 GRANT PROPOSAL GUIDE, http://www.nsf.gov/pubs/2001/nsf012/nsf0102_6.html#VIH (emphasis added).

[150] *Id.* ("NSF does not normally support . . . the development of products for commercial marketing."); *see also* CONGRESSIONAL RESEARCH SERVICE, U.S. NATIONAL SCIENCE FOUNDATION: AN OVERVIEW (2000); Erich Bloch, *The NSF Role in Fostering University-Industry Research Relationships,* E-29 IEEE TRANSACTIONS ON EDUC. 51 (1986).

[151] NAT'L SCI. FOUN., *supra* note 149 ("NSF is interested in supporting projects that couple industrial research resources and perspectives with those of universities.").

sponsored research, or that NSF-funded research cannot be conducted in a facility that is also used for IURC projects.[152]

Significantly, there was no internal debate to speak of at the Smith School over the allocation of intellectual property rights to inventions produced in industry-university collaborations using the Net Lab. This is in sharp contrast to the vigorous debate over the distribution of such benefits in much of the commentary on industry-university research collaboration.[153] Although these issues could resurface later as points of conflict between Net Lab researchers and the University, or between the University and corporate research partners, ownership of patents and copyrights arising from university researchers' inventions and the distribution of licensing income was treated by the Net Lab constituencies at the Smith School as a settled matter of University policy.[154]

c. *Nature of the Research Environment*:

By far the most contentious set of issues in the internal debate over Net Lab policy at the University of Maryland concerned the nature of the research environment, and how that environment might be adversely affected by procedures proposed to facilitate industry-university collaboration by protecting confidential information. For the Net Lab to continue its existing industry-university relationships and enter into new collaborations with other firms, a clear confidential information policy was needed. Having already entered into several agreements promising to protect the confidential information of some research partners, the Net Lab was obliged either to adopt a program of reasonable precautions to protect such information or to inform its industry partners that the Lab would not accept responsibility for maintaining the secrecy of confidential information.

A threshold concern of those who opposed the adoption of private-sector-type policies to protect confidential information was the scope of such policies. Specifically, there was substantial debate over

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[152] If NSF funded the *entire* cost of establishing and maintaining the Lab, the question might be somewhat closer. In this case, however, NSF has funded a significant, but by no means preponderant, share of the Net Lab's costs.

[153] *See generally* Eisenberg, *Public Research and Private Development*, *supra* note 9; Frischmann, *supra* note 9; Rai, *supra* note 6.

[154] *See supra* notes 49-50 and accompanying text.

the definition of "confidential information" for purposes of the proposed nondisclosure agreements,[155] and some objected that researchers would encounter practical difficulties in distinguishing "confidential information" from information they would remain free to disclose.[156] A second concern focused on the question of who would be bound to protect the confidential information disclosed in the Net Lab. The application of a nondisclosure regime to Net Lab staff was not controversial. But what about faculty members who conduct research in the Lab, but are not employed by the Lab? What, if any, nondisclosure obligations should apply to graduate students conduct-

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[155] The definition of "confidential information" that was ultimately adopted is similar to definitions used in commercial settings. It reads as follows:

> 4. "Confidential Information", as used in this Agreement means all information, other than generally available public information, involving or derived from, directly or indirectly, the [Smith School Supply Chain Management] Center's Net Lab facility and operations, research projects, or its books, records, product or service descriptions, software, video or audio tapes, technical plans or drawings, patent applications, copyright applications, trademark applications, graphics, or other written documents of any kind, including information relating to the methods, business practices, finances, technical or business know-how, or other intellectual property, of suppliers, licensors, licensees, research or product development partners, or customers of the Center.
>
> 5. "Confidential Information" shall not include information which (a) was in User's possession before its receipt from the Center, (b) is disclosed to User without restriction on disclosure by a third party who has the lawful right to make such disclosure, (c) is developed by User independently and without the benefit of information disclosed under this Agreement, or (d) is in the public domain.

Supply Chain Management Center, Robert H. Smith School of Business, *Netcentricity Laboratory Confidentiality and Non-Disclosure Agreement* (undated document on file with the authors).

[156] Courts have struggled with disputes regarding the permissible scope of nondisclosure agreements in the business employment context. While agreements obligating employees to refrain from disclosing *non-proprietary* information are generally unenforceable, some highly specialized non-proprietary information can be protected under limited circumstances. *See generally* Campbell Soup Co. v. Conagra, Inc., 801 F. Supp. 1298, 1306 (D. N.J. 1991) (holding that nondisclosure obligations may extend to information that does not qualify for trade secret protection, but is, nevertheless, "highly specialized, current information not generally known in the industry, [and] created and stimulated by the research environment furnished by the employer") (citation omitted), *vacated and remanded on other grounds*, 977 F.2d 86 (3d Cir.1992); Ingersoll-Rand Co. v. Ciavatta, 542 A.2d 879, 892-95 (N.J. 1988) (same); *see also* Robert Unikel, *Bridging the "Trade Secret" Gap: Protecting "Confidential Information" Not Rising to the Level of Trade Secrets,* 29 LOY. U. CHI. L. J. 841 (1998).

ing research?[157] Should nondisclosure agreements extend to one-time visitors to the Lab; students who visit the Lab only for class under the supervision of faculty members; or visitors who come to the Lab for a purpose – such as a consultation or service call – that legitimately exposes them to confidential information?[158]

Further concerns were expressed by Smith School faculty members regarding specific proposed confidential information rules and procedures. Objections were raised, for example, to requiring faculty members and other researchers to execute formal nondisclosure agreements ("NDAs"), and to submit writings based on Net Lab research to a review committee in order to prevent the disclosure of confidential information in publications. Objections were also raised to proposals – again, modeled on private sector procedures – to implement sign-in procedures and to issue identification badges that would indicate the level of Lab access to which the wearer was entitled.[159] Opponents of these security measures argued that implementing such procedures would chill academic freedom and obstruct the free flow of information that was required for excellence and productivity in academic research. Proponents argued that: (1) restricting the disclosure of a discrete subset of the information used and developed in the Lab would not fundamentally compromise the free exchange of ideas that characterizes academic research; and (2) the net benefits of IURC would far outweigh the burdens imposed by the implementation of rules and procedures for protecting confidential information.

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[157] *See, e.g.*, Amy Dockser Marcus, *Class Struggle: MIT Students, Lured to New Tech Firms, Get Caught in a Bind – They Work for Professors Who May Also Oversee Their Academic Careers – Homework as 'Nondisclosure,'* WALL ST. J., June 24, 1999, at A1 (reporting problems associated with binding graduate students to nondisclosure agreements at MIT).

[158] *See generally* Ann S. Jennings & Suzanne E. Tomkies, *An Overlooked Site of Trade Secret and Other Intellectual Property Leaks: Academia*, 8 TEX. INTELL. PROP. L.J. 241, 251 (2000) (characterizing university classrooms and research laboratories as "mine fields for trade secret disclosure").

[159] We note that some private sector research facilities require *all* visitors to wear badges and sign nondisclosure agreements as a condition of admittance. *See, e.g.*, Sun Microsystems, *Visitor Confidential Non-Disclosure Agreement* (on file with the authors); *see also* Campbell Soup Co. v. Conagra, Inc., 801 F. Supp. 1298, 1301, 1305 (D. N.J. 1991) (noting that firm's measures to protect confidential information included locking research files and a research facility access regime consisting of sign-in procedures, visitor passes, and escorts).

C. The New Policies

After the arguments on both sides of the internal debate had been aired, the Smith School adopted a set of formal procedures that would regulate access to the Net Lab, and extend a duty of nondisclosure to those most closely involved with the work of the facility. The basic elements of the Net Lab confidential information policy are: (1) a four-part classification system regulating access to the Lab, and (2) a pre-publication review procedure for writings containing confidential information drawn from Net Lab research activities.

1. Lab Access / Four Classifications

The Net Lab confidential information policies establish rules and procedures for four types of Net Lab users requiring access to the facility: (a) "researchers & staff;" (b) "visitors; (c) "confidential visitors;" and (d) "students."[160]

a. *Researchers & Staff*:

The "researchers & staff" category consists of Net Lab staff and those faculty members and graduate students who are engaged in ongoing research using the Lab facility. They are permitted to enter the Lab at any time without supervision. However, each researcher and staff member is required to execute a nondisclosure agreement and wear a color-coded identification badge at all times when they are in the Lab.

b. *Visitors*:

The "visitor" category is comprised of those who visit the Lab, but have no ongoing relationship with the facility as a researcher or student. The typical "visitor" to the Lab is someone from outside the

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[160] *See* Memorandum from Sandor Boyson and Thomas Corsi, Co-Directors, Supply Chain Management Center, to the Smith School Community, Re: Use of the Netcentric Laboratory (Mar. 2, 2001) (announcing Net Lab access policy) (unpublished document on file with the authors).

Smith School community who tours the Net Lab facility as part of a visit to the University. This category includes, for example, candidates for university positions, prospective students, donors and alumni, as well as academics and administrators from other institutions, and businesspeople. Under the Net Lab confidential information policy, visitors are not required to execute NDAs. However, they are not permitted to enter the Lab unless they are escorted by a member of the Smith School faculty or administration. Visitors are also required to wear color-coded visitor badges while in the facility.

It is the responsibility of Net Lab staff and researchers to secure the Lab before the arrival of visitors by removing any confidential materials from plain view. This approach is consistent with principles of trade secret law obliging the owner of confidential information to take reasonable precautions to maintain its secrecy.[161] While the Lab might have adopted the added precaution of requiring every visitor to execute an NDA, this option was rejected as unduly burdensome.

c. *Confidential Visitors*:

The "confidential visitor" classification consists of visitors who have no ongoing research or coursework relationship with the Lab, but visit the Lab for specific projects or tasks that expose them to confidential information. To be admitted to the Lab, the confidential visitor must execute an NDA, wear a color-coded badge, and be accompanied by an escort.

d. *Students*:

The "student" category consists of students who enter the lab to attend classes held in the facility. Since they are exposed to proprietary software and other confidential materials, each student must execute an NDA before entering the Lab. Students must also wear identification badges and enter only under the supervision of an instructor.

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[161] *See supra* notes 140-45 and accompanying text.

2. Pre-Publication Review

The Net Lab confidential information policies also require researchers to submit for pre-publication review any writings based in some part on research conducted in the Net Lab facility. The review is conducted by a panel of three faculty members responsible for determining whether the writing discloses confidential information. Within fifteen days after the piece is submitted for pre-publication review, the committee reports to the author. If the writing discloses a confidential and patentable invention, the committee may delay the publication of the piece for up to sixty days to allow the owner of the confidential material to apply for patent protection. If the writing discloses confidential information that is not patentable, the committee will make an arrangement with the author and the owner of the proprietary information to revise the writing to avoid the disclosure of confidential information and allow for the expeditious publication of the revised work.[162]

D. A Preliminary Assessment of the New Policies

Because the Net Lab confidential information policies have been in operation for just a short time, any assessment of their efficacy is necessarily tentative and preliminary. However, it can be said that the Net Lab policies reflect a credible effort to address the concerns of industry partners without fundamentally compromising the university research culture.

While the execution of non-disclosure agreements and the regulation of access to the facility undoubtedly imposes a higher degree of formality in a generally informal university research culture, the level of actual conduct restriction is relatively modest and no greater than that consistent with the most basic obligation to preserve the secrecy of research materials provided by industry partners on a confidential basis. Once a researcher has signed a NDA with the Net Lab, he or she has completely unrestricted access to the facility. Nor is there any restriction on the exchange of information among researchers who have executed NDAs. The confidential information

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[162] Netcentricity Laboratory, Robert H. Smith School of Business, *Publication Review Policy* (undated document on file with the authors).

policies also keep the Net Lab open to students and visitors, subject only to the requirements that they enter under supervision and that they wear identification badges while in the facility.

With regard to the scope of the information subject to disclosure restrictions and publication delays, the new policies are less expansive than those found in some IURC arrangements, but potentially more expansive than others, depending on the future activities of the Lab. The non-disclosure obligations of Lab users apply not only to confidential research materials provided by outside firms, but to any materials designated as "confidential" by the Lab. This approach has the benefit of flexibility, allowing the University to protect, for example, the confidentiality of proprietary educational software being developed by university researchers in the Lab. The new policies also permit, but do not require, the protection of other types of information developed in IURC (as distinguished from industry-provided research materials), such as research results, should the administrators of the Lab determine that such protection is justified. While the potential scope of information subject to disclosure restrictions is a matter of legitimate concern, there is little reason to believe that such concerns cannot be addressed through the exercise of judgment and administrative oversight on a case-by-case basis. An alternative approach, such as a bright-line rule expressly limiting protectable confidential information to industry-provided research materials, would have the advantage of simplicity and might arguably result in a more open research environment. But this rule would leave the educational software mentioned above without protection. Moreover, as a general proposition, the bright-line rule approach excludes the possibility that circumstances could arise in which agreeing to some protection of some other types of information might be consistent with the mission of the University.[163]

Overall, the benefits of the Net Lab's confidential information policies are likely to outweigh the burdens. For its part, the Net Lab principally undertakes through these policies to prevent the disclosure

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[163] For example, a situation could arise in which a firm asked the Net Lab to refrain from disclosing a small subset of IURC research results because such results are unpatentable and require secrecy for trade secret protection. Under such circumstances, the Net Lab might nevertheless conclude that the balance of unrestricted research results and the other benefits of the collaboration to the university substantially outweigh the costs of the nondisclosure arrangement.

of confidential materials provided by industry partners and to delay publication of patentable research results until a patent application can be filed. And, as previously noted, the Lab also reserves the right to designate other materials as confidential and/or to extend publication delays, if circumstances warrant such steps. In return, University researchers and students gain a state-of-the-art research and teaching facility, and access to some of the most advanced research tools available for the analysis of supply chain management problems. In future industry-university research collaborations, some of which almost certainly would not occur without credible confidential information rules and procedures, university researchers and students are likely to gain additional benefits in the form of further access to industry resources, exposure to some of the most intellectually-challenging supply chain management problems confronting private firms, and significantly enhanced training and placement opportunities. Viewed in terms of the University's core mission — the generation and diffusion of knowledge — the Net Lab's confidential information policies promise to facilitate the generation and diffusion of more knowledge than would have been the case had the Smith School refused to keep some secrets in the campus lab.

IV. Conclusion

Several concluding observations emerge from the foregoing analysis of structures and rules for industry-university research collaboration. First, although the internal debate within the Smith School echoed some of the concerns articulated in the national debate over industry-university collaboration, one of the most prominent issues in the national discussion, the allocation of intellectual property rights and licensing income, barely registered in the Net Lab debate. Thus the divergence in the Net Lab case from the national focus on intellectual property rights and royalties may serve as a useful reminder that, as important as such considerations have become, other aspects of industry-university collaboration may be as important or more important in some cases. A second observation is that formal government and university policies are not the only factors that shape the legal and institutional structures of industry-university collaboration. In this case, for example, the Smith School faced a major problem, *i.e.,* preventing disclosure of confidential information by non-employees, that had not been addressed by

University policy or by the public law regulating the use of federal research funds. And in its effort to address the problem, the Net Lab used private law mechanisms and the practices of private firms as its primary models. A third observation, which can hardly be overemphasized, is that industry-university collaborations are accompanied and conditioned by an almost infinite variety of circumstances. Even in its infancy, the Net Lab has already established several different types of collaborative relationships with industry and is in the process of creating still others. While it is important to look for patterns and prospectively applicable insights, this is not an area in which the application of comprehensive rationality is likely to identify a single "best" approach to structuring such relationships. Analysis of IURC must proceed, therefore, on a case-by-case basis in order to judge in each instance whether the benefits of collaboration are likely to exceed the burdens of restricting access to confidential information in the context of university research.