POWER-KNOWLEDGE THEORY IN INTELLECTUAL PROPERTY LAW

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INTRODUCTION

Intellectual property law is fundamentally about the commodification of knowledge.[1] Contrast this with traditional property law, where the owner exercises control of property by excluding others from utilizing their private property without the owner's permission.[2] Under this regime, the owner of a particular piece of land's right to exclude is limited to the area he owns; he may restrict others from stepping foot on it, but that is largely the extent of the restriction.[3] Intellectual property law is different; The scope of an intellectual property owner's right to exclude extends significantly further. Under intellectual property law, an eligible patent holder not only has the power to exclude people from possessing his property, he can go so far as to exclude anyone from unlawfully benefitting from the claimed invention.[4] His right to exclude is without any physical boundary, rather the right concerns primarily the expression of ideas. These ideas are a form of knowledge, commodified such that the owner can harness their economic power.

Michel Foucault is one of the most influential French thinkers of the twentieth century.[5] Some scholars consider him a philosopher for his contribution to a creative philosophical methodology known as genealogy.6 Genealogy is commonly understood as a study of family history. Foucault uses it as a tool in his philosophical works to analyze a given system of

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1. Henry Etzkowitz, *Knowledge as Property: The Massachusetts Institute of Technology and the Debate over Academic Patent Policy*, 32 Minerva 4 (1994).

2. *See* JAMES Y. STERN, *WHAT IS THE RIGHT TO EXCLUDE AND WHY DOES IT MATTER?* (M.H. Otsuka & J.E. Penner eds., Cambridge University Press 2018).

3. *Id.*

4. *General Information Concerning Patents*, UNITED STATES PATENT AND TRADEMARK OFFICE https://www.uspto.gov/patents/basics/general-informationpatents#:~:text=The%20right%20conferred%20by%20the,invention%20into%20the%20United%20States [https://perma.cc/JF8W-GELR].

5. Michel Foucault, 1926-1984, was a French philosopher, writer, social activist, historian. His theories address the relationship between power and knowledge. Some of his famous work include the *History of Sexuality* and *Discipline and Punishment*. His thought influences academics in a variety of fields such as philosophy, sociology, history, feminism, and critical theory.

6. Foucault used genealogical study in both *Discipline and Punishment* and *the History of Sexuality*.

thought through the lens of historical contingences as opposed to the "outcome of rationally inevitable trends"[7] This historical foundation leads some to see him as a historian.[8] He uses the genealogical approach throughout his work to analyze the relationship between power and knowledge.[9]

Foucault analyzes power from a different perspective than that commonly used in traditional methodology. Under the traditional view, the property owner exercises his right of property through the authority of a 'magical legal token' in a negative manner; prohibiting, restricting, obstructing and so on.[10] Traditionally, these rights are protected by centralized sources of authority e.g., government, and law enforcement agencies. In this analysis, power always flows through and from those centralized sources. Foucault labels this analysis as incomplete, because all individuals are "simultaneously undergoing and exercising power."[11]

In his work, *A Philosophy of Intellectual Property*, Peter Drahos provides an overview of philosophical analysis pertaining to intellectual property.[12] Drahos discusses his understanding in terms of Michel Foucault's power mechanism.[13] Yet he moves away from Foucault's methodology and focuses on the "sovereignty mechanism" as he examines the power of abstract objects.[14] Foucault's power-knowledge theory is a necessary component to comprehensively analyze how power is wielded in intellectual property regimes. Though Drahos admits that he is aligned with Foucault, he implies that Foucault's methodology is not entirely compatible in terms of the power mechanism analysis concerning intellectual property.[15]

Foucault developed this power-knowledge theory to provide a new

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7. Gary Gutting & Johanna Oksala, *Michael Foucault*, in STAN. ENCYCLOPEDIA OF PHI., 3.3 (May 22, 2018), https://plato.stanford.edu/archives/sum2021/entries/foucault/ [https://perma.cc/RFH8-8K5P].

8. Many scholars view him as a historian due to his contributions to the historical development of ideas. E.g., this New York Times article refers to him as a "French historian." Peter Kerr, *Michael Foucalt, French Historian*, N.Y. TIMES (June 26, 1984), https://www.nytimes.com/1984/06/26/obituaries/michel-foucault-french-historian.html [https://perma.cc/C9NY-69TQ].

9. Larry Shiner, *Reading Foucault: Anti-Method and the Genealogy of Power-Knowledge*, 21 HISTORY AND THEORY 3, 382-98 (1982).

10. The right to exclude others is essential in the bundle of rights that are commonly characterized as property. Kaiser Aetna v. United States, 444 U.S. 164, 176 (1979).

11. *See* MICHEL FOUCAULT, POWER/KNOWLEDGE: SELECTED INTERVIEWS AND OTHER WRITINGS 1972-1977, at 98, (C. Gordon ed., Brighton Leo Marshall et. al. trans. The Harvester Press 1980).

12. PETER DRAHOS, A PHILOSOPHY OF INTELLECTUAL PROPERTY (ANU press. 1996).

13. *Id.* at 176-8.

14. *Id.* at 177. ("Rather the purpose is to show that property is one such mechanism, what we might call a sovereignty mechanism.")

15. *Id.* Drahos's power mechanism in intellectual property primarily concerns sovereign power while Foucault's power mechanism addresses some form of universal power distributed among all men.

perspective on analysis of history and sociology, which is in the realm social science. The power mechanism in the realm of patents primarily involves natural science.[16] It is dubious to presume that power theories of social science will be compatible with natural science. Contemporary philosopher, Joseph Rouse[17] bridged this gap, analyzing Foucault's power-knowledge mechanism and incorporating it into the realm of natural science.[18] Rouse's power theory is deeply connected to the technological incubation in the laboratory.

In this article, I will discuss the nature of power in the context of intellectual property; particularly with respect to patent rights, and how the notion of power operates through the lens of Michel Foucault's and Joseph Rouse's power-knowledge theories. The purpose of this paper is to provide a more comprehensive view of power-knowledge theory as applied to intellectual property and patent law. I will examine Drahos's theory on the knowledge power of intellectual property and show why his analysis of power-knowledge theory is incomplete and could be further developed.

First, I will discuss the development of Foucault's power-knowledge theory. Foucault's understanding of the genealogy of power derives from the ideas of Frederick Nietzsche.[19] Some philosophers believe Foucault's power theory has "Nietzschean roots."[20] I will briefly discuss Nietzsche's power theory and Foucault's development.

Second, I will examine Drahos's theory of sovereign power in terms of abstract objects and how Foucault's power mechanism completes his analysis. Drahos believes the best way to understand power in intellectual property is from a sovereign power perspective attributed to the distinctive nature of abstract objects.[21] In other words, for Drahos, it is best to understand intellectual property power by looking into the sovereignty

16. Except for design patents, most technologies involved in the utility patents are within the field of natural sciences such as biotechnology, chemistry, electrical engineering, computer science, mechanical engineering, and physics.
USPTO provides administrative oversight to nine Patent Technology Centers and coordinates the activities of the examination of applications for patents for all patent-examining functions in the Technology Centers. Eight of the nine Patent Technology Centers are about natural sciences. OFFICE OF THE DEPUTY COMMISSIONER FOR PATENT OPERATIONS, https://www.uspto.gov/about-us/organizational-offices/office-commissioner-patents/office-deputy-commissioner-patent [https://perma.cc/DYZ3-GCAH].

17. Joseph Rouse is a professor in the Department of Philosophy and the Science in Society Program at Wesleyan University. JOSEPH ROUSE, POWER AND KNOWLEDGE: TOWARD A POLITICAL PHILOSOPHY OF SCIENCE (Cornell Univ. Press 1987).

18. *Id.*

19. Shiner, *supra* note 9, ("It is Nietzsche's term and Foucault uses it in Nietzsche's ironic, agonistic way.")

20. Leslie Paul Thiele, *The Agony of Politics: The Nietzschean Roots of Foucault's Thought*, 84 THE AM. POL. SCI. REV. 3, 907-25, (Sept. 1990).

21. DRAHOS, *supra* note 12, at 190 ("This sovereignty mechanism in the case of intellectual property applies to abstract objects.").

mechanism[22] of entities with high-level scientific capacity and economic resources. I will demonstrate the inadequacy of this methodology and how Drahos's analysis can be enhanced by Foucault's power-knowledge theory.

Third, I will discuss the power mechanism in the patent market through the lens of Foucault's power-knowledge theory including the net-like nature of power and his metaphor of the Panopticon.[23]

Fourth, I will discuss how Joseph Rouse incorporates Foucault's Panopticon model into his laboratory model in the context of natural science. His power-knowledge theory focuses on the nature of science and how this form of knowledge power shapes our world.[24]

Finally, I will employ a broad perspective to analyze how the power mechanism of intellectual property operates globally in terms of cooperation and competition between different countries in our era of both globalization and trade protectionism. I will discuss how Foucault and Rouse offer valuable methodologies in the analysis of global patent strategy.

Development of Foucault's Power-Knowledge Theory

From Plato to David Hume,[25] western philosophy has consistently separated knowledge from power. Knowledge bore an inherent form of objectivity that was unrelated to any individual's subjective perception. It revealed certain qualities of things. Under this theory, knowledge was independent of power.[26]

Friedrich Nietzsche disagreed with this notion. He believed that knowledge does not exist independently as a whole. It only exists in part through one's *perspective*.[27] His notion of perspectivism differentiates knowledge from truth. Truth is merely a practice of holding something to be true.[28] To Nietzsche, knowledge serves as an instrument of the will to power, which is the main driving force in human beings.[29] According to Nietzsche, the pursuit of knowledge is not motivated by the longing for truth but by the desire to harness power to control.[30] He states that "how is truth proved? By the feeling of enhanced power."[31] Thus, the nature of

22. *Id.* at 187-90.
23. GORDANA FONTANA-GIUSTI, FOUCAULT FOR ARCHITECTS, 89–92 (Routledge 2013).
24. ROUSE, supra note 17.
25. David Hume is a Scottish Enlightenment philosopher in the 18th Century best known for his system of philosophical empiricism, skepticism, and naturalism.
26. *See* DAVID HUME, A TREATISE OF HUMAN NATURE (1937).
27. STEVEN HALES & REX WELSHON, NIETZSCHE'S PERSPECTIVISM (Univ. of Ill. Press 2000).
28. Robert Nola, *Nietzsche's Theory of Truth and Belief*, at 2-3, 47 PHIL. AND PHENOMENOLOGICAL RES. 4 (June 1987).
29. FRIEDRICH NIETZSCHE, THE WILL TO POWER (1901).
30. Soner Soysal, *Nietzsche's Perspectivist Epistemology: Epistemological Implications of Will to Power* (Feb. 2007) (unpublished Ph.D. thesis, Middle East Technical University), 104, https://etd.lib.metu.edu.tr/upload/12608159/index.pdf [https://perma.cc/GJ9N-W8HQ].
31. NOLA, *supra* note 28, at 4.

knowledge is power. It is worth noting that Nietzsche's notion of power is not the same as an external sovereign power involving violence and repression. Instead, it is a positive form of energy that surges forth from inside a human being.

Based on Nietzsche's theory on power and knowledge, Foucault developed his own methodology to analyze the relationship between power and knowledge.[32] According to Foucault, the form that power takes has changed fundamentally between the 18th and 19th century.[33] Foucault made a distinction between traditional sovereign power and his disciplinary power.[34] He believes power gradually transitioned from the sovereign power of feudalism to disciplinary power. Foucault described how the traditional sovereign power operated:

> The sovereign exercised his right of life only by exercising his right to kill, or by refraining from killing; he evidenced his power over life only through the death he was capable of requiring. The right which was formulated as the "power of life and death" was in reality the right to *take* life or *let* live. Its symbol, after all, was the sword.[35]

This form of sovereign power is repressively prohibiting certain behavior by threatening to take something away such as money, freedom, and ultimately life. Focault rejects the idea that the only form of power that matters is repressive.[36] Instead, he adopted a new form of power concerning knowledge: the disciplinary power.[37] It is a kind of power that we exercise by ourselves to accommodate certain social nnorms; essentially, we use ourknowledge to fit into society. It is also a power of normalization, since this power regulates the subjects to behave in a manner that appears to be in accordance with certain social norms in institutions, such as hospitals and schools.[38] The subjects did not behave accordingly in the first place but gradually "normalize" their behavior. For example, many students do not study school materials unless they are pushed to do so. Before attending school, students often do not form a habit of studying. However, at school, teachers discipline the students to study. This is a form of repressive power. Students have to study as instructed by their teachers, or they may be punished. After a period of pushing and forcing their study behavior, some

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32. THIELE, *supra* note 20.

33. Daniel Guizzo and Iara Vigo de Lima, *Foucault's Contributions for Understanding Power Relations in British Classical Political Economy*, 16 ECONOMIA, 194, 195 (2015).

34. LYNN FENDLER, MICHEL FOUCAULT, Bloomsbury Library of Educational Thought (2010).

35. MICHEL FOUCAULT, THE HISTORY OF SEXUALITY, VOL. I: AN INTRODUCTION 136 (Robert Hurley trans., vol. 1 Pantheon Books 1978), https://suplaney.files.wordpress.com/2010/09/foucault-the-history-of-sexuality-volume-1.pdf [https://perma.cc/7HS2-HGKT].

36. FENDLER, supra note 34.

37. *Id*. at 45.

38. *Id*. at 79.

students form a ritual of study even when such repressive power is absent. They may self-study without being supervised by teachers.[39] In this way, the environment normalizes their behavior. This form of self-discipline is a manifestation of disciplinary power.

Beginning in the 19th century, the punishment methodology changed from causing pain, to deterring criminals, to enforcing discipline among these criminals. In *Discipline and Punish*, Foucault explores the history of punishment, particularly how the mode of punishment evolved from torturing and killing to more civilized form.[40] This transition, according to Foucault, is more effective in serving what he proposes to be the purpose of punishment; "not to punish less, but to punish better."[41]

Foucault uses the model of the Panopticon to illustrate his opinion on discipline.[42] First conceived of by Jeremy Bentham in the 18th century; the Panopticon is an architectural form that is optimized for a single security guard to supervise multiple prisoners.[43] [44] Foucault proposes that because they know their behavior can be observed at any time, the prisoners will behave in a submissive manner.[45] In other words, they will discipline themselves without being forced to do so.Foucault thenextends the model of the Panopticon by using it as a metaphor for modern disciplinary society.[46] Since this form of architecture is very effective in allowing guards to better discipline prisoners, society extends the model of Panopticon to other institutions such as hospitals, schools, dormitories and asylums.[47] These institutions all have a fundamental characteristic that are strikingly similar to the Panopticon; The supervisor, or the "security guard," can observe and control other's behavior. In Foucault's theory, knowledge and power share the same goal; "in knowing we control and in controlling we know."[48] According to Foucault, in the process of acquiring knowledge, people refrain from killing and stealing, not because of the deterrence of being punished by the government who exercises the sovereign power, but because their understanding of social norms keep them from doing so. The Panopticon creates a system where people will regulate their behavior regardless of whether the security guard is watching.[49] This self-regulation

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39. *Id*. at 44. ("We try to be normal by disciplining ourselves even in the absence of threats of punishment").

40. MICHEL FOUCAULT, DISCIPLINE AND PUNISH: THE BIRTH OF THE PRISON, New York: Second Vintage Books (1991).

41. *Id*. at 82.

42. FENDLER, *supra* note 34, at 80.

43. JEREMY BENTHAM, PANOPTICON, OR THE INSPECTION HOUSE (1791).

44. FENDLER, *supra* note 34, at 80.

45. *Id*.

46. FENDLER, *supra* note 34, at 44.

47. FONTANA-GIUSTI, *supra* note 23.

48. Stanford Encyclopedia of Philosophy, 'Michel Foucault' (2008). M. Foucault, *Discipline and Punish* (trans. A. Sheridan, 1975), at 170–177.

49. FENDLER, *supra* note 34, at 44. ("We try to be normal by disciplining ourselves even in the

is an inner power that motivates people to act in certain ways regardless of law, and in this way, it is another manifestation of the disciplinary power.[50]

The social implication of this form of disciplinary punishment is also aligned with some other institutions in modern society. In disciplinary institutions other than prison, such as schools and hospitals, those being disciplined learn about the benefit of discipline.[51]Schools educate students on the importance of social norms and help shape their value.[52] Hospitals let doctors and nurses decide medical procedures for patients ensuring that patients' behavior is disciplined by medical experts. Knowing that it is beneficial for their health, patients tend to discipline themselves to follow the orders given by their doctors. These are all forms of knowledge-sensitive disciplinary enforcement.[53] The assumption for the successful operation of this system is that certain experts have superior knowledge in their field, qualifying them to discipline others for their own good.[54] It is knowledge that bestows the power of discipline on those experts; From this perspective, the path to power could be achieved through knowledge. This motivates people to acquire knowledge. As in Nietzsche's point of view, for Foucault, people acquire knowledge to harness power.[55] This "knowledge power" is able to not only influence or control others but can also help one re-assert control of oneself from others. Foucault names this form of power to control one's own life "biopower":

> Power would no longer be dealing simply with legal subjects over whom the ultimate dominion was death, but with living beings, and the mastery it would be able to exercise over them would have to be applied at the level of life itself: it was the taking charge of life, more than the threat of death, that gave power its access even to the body.[56]

Biopower, in essence, is a form of power based on knowledge.[57] It is not a replacement for repressive sovereign power; rather, it works together with sovereign power. Sovereign power is exercised from the top of the social hierarchy whereas knowledge power, harnessed by learning, is exercised from the bottom of the social hierarchy.[58]

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absence of threats of punishment.")

50. FENDLER, *supra* note 34.

51. *Id*.

52. *Id*.

53. Foucault argued that schools and hospitals resemble prisons from the perspective of disciplinary power. *Supra* note 41.

54. Fendler, *supra* note 34, at 71-80.

55. *Id.*

56. FOUCAULT, *supra* note 35, at 142-143.

57. *Id*. at 47.

58. Sovereign power is exercised by government agencies from top of society. Individuals generate power through acquiring knowledge and try to pursue a higher social status with this power of

In the process of acquiring knowledge, people formulate and their biopower and social norms. Both disciplinary power and biopower are associated with knowledge.[59] Different from repressive power, these forms of power are decentralized because individuals can harness this power through the process of acquiring knowledge.[60] Here, knowledge is not just a means for individuals to harness power. Knowledge itself is a form of power. Power, according to Foucault, is "exercised from innumerable points."[61] That is to say, power is "exercised through a net-like organization" and people "are always in the position of simultaneously undergoing and exercising this power."[62] Drahos agrees with this idea to a limited extent and illustrates it by showing that agent A can concentrate to some degree the flow of power so that A can affect B in a manner contrary to B's interests.[63] This flowing nature of knowledge power will also be addressed later in the article.

I. DRAHOS'S APPLICATION OF POWER MECHANISM IN INTELLECTUAL PROPERTY

Peter Drahos discusses Foucault's power-knowledge theory briefly in his work, *A Philosophy of Intellectual Property*.[64] Though he refrained from focusing his ideas on Foucault's analysis of power and knowledge, Drahos applies significant parts of Foucault's genealogical approach[65] in the context of intellectual property.[66] Though he believes that his analysis of the power mechanism of property "converges nicely with Foucault's,"[67] the scope of that convergence is limited:

> Here our analysis parts ways with Foucault's, for he is seeking to replace the juridical-political theory of sovereignty which has formed the traditional basis of analysis of power with an approach that is focused on the mechanisms, tactics and strategies of domination. The approach being advocated here adopts Foucault's emphasis on

knowledge.

59. FENDLER, *supra* note 34, at 44.

60. FENDLER, *supra* note 34.

61. FOUCAULT, *supra* note 35, at 94.

62. FOUCAULT, *supra* note 11, at 98.

63. Drahos quotes Lukes. *See* STEVEN LUKES, POWER: A RADICAL VIEW 27 (Palgrave Macmillan 2nd Ed. 2005 1974).

64. DRAHOS, *supra* note 12, at 174-76.

65. Foucault's analysis methodology is called "genealogy", first deployed in his Discipline and Punish. On this paper, I will not dig deep into this method of genealogy. In general, it is a method of analysis with respect to the historical development of power. Wendyl Luna published a paper that discusses Drahos' proprietarianism and Foucault's genealogical method. Focault, *supra* note 41, *See generally*, Wendyl Luna, *Emancipating Intellectual Property from Proprietarianism: Drahos, Foucault, and a Quasi-Genealogy of IP*, GENEOLOGY (2018).

66. *Id*.

67. DRAHOS, *supra* note 12, at 176.

mechanisms of power, but retains the link to sovereignty.[68]

When Drahos moves away from Foucault's power mechanism, he is not necessarily contradicting Foucault's power theory. According to Foucault, sovereign power is of a juridical form.[69] Drahos points out that "threat power based on the ownership of abstract objects is a form of power that is law-dependent."[70] In this sense, Drahos and Foucault agreed with each other regarding the nature of sovereign power.

Though Drahos does briefly discuss Foucault's opinion on decentralized power, he nevertheless indicates that this form of power appears to be irrelevant in the study of power in the field of intellectual property.[71] This does not renderFoucault's notion of decentralized power irrelevant; Foucault's power theory is not contradictory to traditional power theory. His notion of power-knowledge is used asa complement to sovereign power, rather than as a replacement. This allows Foucault's methodology to serve as a useful tool in the examination of intellectual property. In fact, Foucault's power-knowledge theory is particularly useful to provide a different perspective on Drahos's analysis of the power mechanism of intellectual property.[72]

In the Seventh Chapter of *A Philosophy of Intellectual Property*, Drahos discusses the power of abstract objects.[73] Since intellectual property entities such as patents are expressions of ideas, intellectual property law can be viewed as a mechanism of protection over abstract objects; "[property] is a sovereignty mechanism. This sovereignty mechanism in the case of intellectual property applies to abstract objects."[74] Drahos proposes that intellectual property law not only provide protection over abstract objects, rather it is also observable as conferring controlling power over "funds" of knowledge.[75] Paul M. Romer considers knowledge as the basic form of capital.[76] This is more evident in the world of intellectual property. Drahos states that capital must, "allow entrepreneurs control over production goods so that they can redirect those goods in new ways."[77] He quoted

68. *Id.*
69. FOUCAULT, *supra* note 11, at 139-140.
70. DRAHOS, *supra* note 12, at 195.
71. DRAHOS, *supra* note 12, at 176.
72. Peter Drahos applied Foucault's power theory when he discusses the mechanism of property power. He did not mention Foucault when he later discusses the power mechanism of intellectual property. DRAHOS, *supra* note 12.
73. Drahos, *supra* note 12, 178-86.
74. DRAHOS, *supra* note 12, at 188.
75. *Id*. at 186.
76. Paul M. Romer, *Increasing Returns and Long-Run Growth*, 94 U. CHI. J. OF POL. ECON. 1002-30 (1986) (discussing knowledge as the basic form of capital).
77. Drahos, *supra* note 12, at 186.

Schumpeter's words to define capital as a "fund of purchasing power."[78] Here, abstract objects can be considered unds of controlling power over productive means: "[i]ntellectual property law determines rights of ownership over parts of this fund and who has access to the fund. The controlling power over the fund is given by the property mechanism."[79]

One distinctive feature of abstract objects is that they are also able to serve as the means of production as opposed to just a commercial product. Many patents are prosecuted for a production process rather than for a machine or a tool.[80] Some of the patentable processes are considered vital to a particular type of product,[81]while others cannot circumvent such processes without generating unreasonably high costs. This fact leads to a critical conclusion: "[a]bstract objects function as *gateways* to valuable physical objects."[82] For example, if pharmaceutical company A holds the patent of a particular process for producing a certain medicine which is the only cure for a certain disease, no other pharmaceutical companies will be capable of making this sort of medicine without a license granted by A. A's patent is the gateway for products that cure this disease. In traditional property law, no property holder can prevent others from producing a similar physical object with their own resources.[83] The property holders may only forbid others from using their own property[84] ,however, in patent law holders are authorized to restrict others from using the knowledge embodied in their patent claims for any unauthorized practice.[85] Meaning that some owners of abstract objects, such as patented processes, have a form of extraordinarily strong power to exclude others from the business.

Moreover, even certain machines or tools have the same gateway effect. For example, ASML, a Dutch company, has a monopoly on modern lithography machines that produce the most advanced chips.[86] This machine is a must-have for anyone who wants to produce smartphones because it is the only type of machine that can make certain types of modern smartphone CPU.[87] Some may argue that such circumstances are rare in the general

78. J.A. SCHUMPETER, THE THEORY OF ECONOMIC DEVELOPMENT 116 (1949).

79. Drahos, *supra* note 12, at 186.

80. A "process" is a patentable subject matter. https://www.uspto.gov/web/offices/pac/mpep/s2106.html.

81. Such processes would be considered "gateway" objects. DRAHOS, *supra* note 12, at 188.

82. *Id.* 186.

83. STERN, *supra* note 2.

84. *Id*.

85. Ownership of a patent gives the patent owner the right to exclude others from making, using, offering for sale, selling, or importing into the United States the invention claimed in the patent. 35 U.S.C. 154(a)(1).

86. Veldhoven, *How ASML Became Chipmaking's Biggest Monopoly*, ECONOMIST (Feb. 29, 2020), https://www.economist.com/business/2020/02/29/how-asml-became-chipmakings-biggest-monopoly [https://perma.cc/A66Z-WUFB].

87. *Id*. ASML alone has harnessed "extreme ultraviolet" (EUV) light, with wavelengths of just 13.5 nanometers (billionths of a meter), which is essential for certain CPU production. *Id.*

market. Most of the productions can find substitutes. But even when substitutes are available, the patent owners of certain tools could nevertheless hold the gateway keys. There are hundreds of programming languages[88] and dozens of popular language programming tools[89] in today's market, but software companies will only use a limited number of languages in all their program development.[90] These companies are now dependent on the programming tools developed for their programming languages and pay a licensing fee to the patent owner.[91] Though it is technically possible to change to another language, the cost to do so is prohibitive.[92] This creates a regime wherein patents of non-monopolized tools can still have a gateway effect.

It is worth noting that not all intellectual property entities have this gateway effect. For instance, trademarks do not possess the same level of gateway power.[93] According to Drahos; trademark law is most functional in advertisement to differentiate one's products from others, while copyright is "unlikely to increase the power base of the author."[94] These forms of intellectual property are outside the scope of this note, I will therefore focus my discussion of abstract objects around patents.

Because of this gateway effect, a relationship of dependence emerges. Assume A is the holder of a patent X, which is necessary to produce Y. B is the individual who is running a business selling Y. B's X business is dependent on A's permission to use Y. Thus, the dependent relationship exists in both objects and people. This relationship of dependence endows A with some degree of coercive power against B. One may argue that this sort of coercive power exists in almost all property rights. But when it comes to intellectual property, the dependence is much stronger for the potentially "limitless" power to exclude.

Drahos states that there are two consequences of the distribution of

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88. Trent Fowler, *How Many Computer Programming Languages are There*?, CAREER KARMA (July 21, 2020), https://careerkarma.com/blog/how-many-coding-languages-are-there/ [https://perma.cc/L3G2-TQMP].

89. SOFTWARE TOOLS FOR PROGRAMMING LANGUAGES RESEARCH, http://www.cs.umd.edu/projects/PL/tools.html [https://perma.cc/39BT-VW5K].

90. *Google, Amazon, IBM and Other Top Software Firms Use These Programming Languages the Most*, TECHGIG (Sept. 6, 2020), https://content.techgig.com/google-amazon-ibm-and-other-top-software-firms-use-these-programming-languages-the-most/articleshow/77959781.cms [https://perma.cc/4PA5-FJCR].

91. Except for open-source language tools, most software tools require users to pay license fees.

92. Software language choice has been a serious topic for any software companies for its cost control. *See*, Chris Rommel, *Controlling Costs with Software Language Choice How ADA Can Help*, VDC RESEARCH https://www.adacore.com/uploads/techPapers/Controlling-Costs-with-Software-Language-Choice-AdaCore-VDC-WP.PDF [https://perma.cc/6NJE-LH7A] (the factors and variables of controlling costs in language choice for software companies).

93. DRAHOS, *supra* note 12, at 188.

94. *Id*. at 141889

power in abstract objects.[95] First, the scope of power can be extensive; According to Drahos, "[t]he range of power abstract objects is potentially global."[96] The Patent Cooperation Treaty ("PCT") evidences this opinion. Enacted in 1970, the PCT is the legal doctrine governing the international patent system,[97] as of 2020 over 150 countries have signed the PCT.[98] This allows the power over abstract objects can easily cross territorial boundaries. Second, the imbalance of power in abstract objects tends to increase.[99] The cost of research and development of technology is an insurmountable hurdle for most individuals. Large industry parties and businesses disproportionately applied for valuable patents, as these are the only entities that have resources and manpower to conduct the necessary research.[100] Large tech companies will inevitably harness exponentially greater power in terms of abstract objects. Drahos posits that these large companies have private sovereign power in intellectual property:

> That is to say that extensive, possibly global, power will probably be concentrated in the hands of those who, through their scientific/technological capabilities and superior capital resources, are able to capture, through the property mechanism for abstract objects, resources upon which there is a universal reliance.[101]

So far it seems that sovereign power dominates the power mechanism particularly in the realm of intellectual property. As far as I agree with Drahos's opinion on the concentration and centralization of power pertinent to patents,[102] I believe his power analysis of intellectual property fails in its comprehensiveness. His argument depends on his presumption of the gateway effect of abstract objects.[103] If one holds the key to the gateway, the rest must depend upon him. That is not always the case. In fact, the gateway effect in patents is more complicated than Drahos's description in two ways. On the one hand, in a particular industry, there are "upstream" patents and "downstream" patents. The holder of the former usually harnesses more power than the holder of the latter.[104] A patent is considered "upstream" when the patent controls the more fundamental process in the

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95. DRAHOS, *supra* note 12, at 191.
96. *Id*. 14
97. Patent Cooperation Treaty, art. 1, June 19, 1970, 28 U.S.T. 76452731, 1160 U.N.T.S. 231.
98. *The PTC Now Has 153 Contracting States*, WORLD INTELLECTUAL PROPERTY ORGANIZATION https://www.wipo.int/pct/en/pct_contracting_states.html [https://perma.cc/R3XA-LJU8].
99. Drahos, *supra* note 12, at 192.
100. Drahos, *supra* note 12, 192-93.
101. DRAHOS, *supra* note 12, at 193.
102. DRAHOS, *supra* note 12, 174-93.
103. DRAHOS, *supra* note 12, 191-93.
104. Richard Li-Dar Wang, *Biomedical Upstream Patenting and Scientific Research: the Case for Compulsory Licenses Bearing Research-through Royalties*, 10 YALE J. L. & TECH. 251 (2008).

stream of commercial production while the "downstream" patents controls gateways nearer to the end of the chain of production.[105]

For example, suppose A holds patents for a particular design of circuits and B holds patents for a necessary computer software for any company to draw their design of circuits. B's patents are considered upstream while A's are downstream; therefore, B harnesses more power compared to A.[106] On the other hand, different patent holders can depend on each other. As Drahos stated, it is true that the imbalance of power tends to increase because only those large companies have the resources to invest in scientific development[107]; they can maintain their market power. However, this trend can only continue to a degree. In modern, globalized society, high-tech products are a result of cooperation from different companies all over the world.[108] A small smartphone CPU can be the subject of thousands of patents owned by companies from dozens of countries and each company built their own patent portfolios for CPU design and manufacture throughout the past several decades.[109]

The manufacturing process of smartphones has hundreds of steps.[110] Each step involves hundreds of patents from companies all over the world.[111] Not a single company on the planet is able to complete the whole process manufacturing a marketable smartphone chip without foreign technologies.[112] In fact, no single country, including the United States, is

105. *Id.*

106. *Id*.

107. DRAHOS, *supra* note 12, at 192.

108. *Technological Co-operation Between Firms*, THE INNOVATION POLICY PLATFORM, http://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/content/technological-co-operation-between-firms/index.html [https://perma.cc/8NCD-L5YD].

109. Arabinda Das, *60 Years of the Semiconductor Industry and Its Changing Patent Strategy*, K, https://www.techinsights.com/blog/60-years-semiconductor-industry-and-its-changing-patent-strategy [https://perma.cc/KY6A-9KCJ].

110. A typical CPU chip manufacturing process is extremely complicated. The whole process can be divided into three steps: design, fabrication and test, and high-performing packaging. First, the design process of a silicon chip includes the chip size, number of transistors, and the schematics for different transistors to create a map for electricity to flow. This process will use computer software such as EDA and CAD. Then we start to "engrave" the designed pattern onto wafers. The fabrication of wafer includes thermal process, photolithography, etch, ion implant, dielectric deposition, CMP, and metallization. After fabrication, the wafer is cut into pieces and each piece is packaged between a substrate and a heat spreader to form a completed processor that may be integrated into a computer system or mobile device. Jamie McKane, *How a Computer Chip is Created- From Sand to CPU*, MYBROADBAND (Apr. 15, 2017), https://mybroadband.co.za/news/hardware/200748-how-a-computer-chip-is-created-from-sand-to-cpu.html.

111. The newest smartphone product of Apple, iPhone 12, is powered by 5nm chip technology, the most advanced chip technology in the world. This 5nm chip can only be manufactured in TSMC, a Taiwan chip foundry company. In order to produce the 5nm chip, TSMC has to use EUV111,, the most advanced photolithography equipment in the world. Only ASML, a Dutch company, can produce this equipment. To assemble this equipment, ASML must acquire patent license of optical technology from Ziess, a German company.

112. Don Clark, *The Tech Cold War's "Most Complicated Machine" That's Out of China's*

able to manage the whole process alone. Japan holds the most competitive technology in the purification process,[113] Germany is considered to have the best optical technology,[114] Taiwan leads in the fabrication business,[115] and the most complicated and significant device in the manufacturing of integrated circuits – the lithography machine – is almost monopolized by a Dutch company.[116]

Under this scenario, all those companies who hold one or more critical patents have the coercive power to threaten each other. If each of them can break the chain of production individually, their relationship is interdependent rather than dependent. In 2018, the revenue of ASML was about 13 billion dollars[117] while Apple's revenue is about 265 billion dollars.[118] Based on revenue, Apple is twenty times larger than ASML. However, Apple's market competitiveness depends to a large degree on ASML, whose successful operation also cannot bear the loss of the market that Apple provides. Such interdependence is pervasive in the modern production of technology. Therefore, Drahos's concern about the ever-expanding sovereign power of large companies over abstract objects is unwarranted. The interdependent nature of international companies limits the trend of power imbalance in intellectual property. In this way, the controlling power in a certain technology business is distributed and dispersed over many companies. The analysis of this form of distributed power is in line with Foucault's power-knowledge theory.[119]

Drahos's focus on sovereign power fails to address another important issue. While he states that the "ownership of some kinds of abstract objects requires both high-level scientific capability and large capital investment,"[120] he did not break down these requirements as a matter of

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Reach, N.Y. TIMES (July 4, 2020), https://www.nytimes.com/2021/07/04/technology/tech-cold-war-chips.html [https://perma.cc/HR63-YG9P]. ("A study this spring by Boston Consulting Group and the Semiconductor Industry Association estimated that creating a self-sufficient chip supply chain would take at least $1 trillion and sharply increase prices for chips and products made with them. That goal is "completely unrealistic" for anybody, said Willy Shih, a management professor at Harvard Business School who studies supply chains. ASML's technology "is a great example of why you have global trade.")

113. Only Japan can purify a silicon wafer up to 99.999999999%.

114. Carl Ziess AG, a German semiconductor company, has the leading optical technology in the world.

115. TSMC, a Taiwan company, has the most market share in fabrication business.

116. ASML, a Dutch company, takes over approximately 75% of the global lithography machine.

117. *ASML Holding Revenue 2006-2021*, MACROTRENDS, https://www.macrotrends.net/stocks/charts/ASML/asml-holding/revenue [https://perma.cc/NE4R-CPB6].

118. *Apple Revenue 2006-2021*, MACROTRENDS, https://www.macrotrends.net/stocks/charts/AAPL/apple/revenue [https://perma.cc/425F-4X68](last visited Aug 31, 2021).

119. Foucault's notion of knowledge power is decentralized among individuals. MICHEL FOUCAULT, POWER/KNOWLEDGE, 98 (Colin Gordon ed., Brighton, 1980).

120. DRAHOS, *supra* note 12, at 192.

power construction. High-level scientific capability is illustrated by both high-level scientific facilities and experts in that field. The facility is also designed by experts. Take the semiconductor industry as an example; according to Moore's law, the number of transistors on a CPU would double about every two years.[121] That is to say, there needs to be an upgrade on manufacturing equipment every two years. Outdated equipment is almost useless in the ever-evolving market of technology.[122] Thus, experts like engineers and scientists are the most valuable assets for any tech giants to stay competitive. Now the power is further distributed from the interdependent companies to the experts. These experts gain power through knowledge; more marketable knowledge increases their power. Here, the notion of power is no longer a form of sovereign power; It is a form of power associated with knowledge. Because engineers and scientists are mobile individuals compare to companies, the power they harness embodies a flowing and circulating form. This flow of power is exactly what Foucault's power mechanism describes.[123]

II. FOUCAULT'S POWER-KNOWLEDGE THEORY AND THE PATENT MARKET

According to Foucault, knowledge power in modern society is decentralized and flowing.[124] For example, in a personal injury lawsuit, both the plaintiff and defense attorneys will introduce their own expert witness to examine the injury and support their own argument. Here the power "flows" from the court to a group of people with certain expertise in the pertinent field. That particular expertise, or "knowledge," bestows power on them.

This phenomenon is prominent in intellectual property law. In intellectual property, technical expertise plays a significant role. That is one of reasons why intellectual property law firms prefer to hire attorneys with a background in technology. Imagine a semiconductor patent infringement case without experts in the legal system. The only parties capable of understanding the technology would be the plaintiff and defendant. They would need to translate esoteric terms and industry jargon into lay terms so their attorneys can formulate legal arguments. The attorneys would then need to argue in court with only a surface level understanding of the

121. MOORE'S LAW, http://www.mooreslaw.org/ [https://perma.cc/VL5C-CT97].

122. Joe Work, *5 Reasons Outdated Manufacturing Equipment Equals Higher Maintenance Costs*, MAGNET (Sept. 12, 2019), https://www.manufacturingsuccess.org/blog/5-reasons-outdated-manufacturing-equipment-equals-higher-maintenance-costs [https://perma.cc/MW27-9DDY].

123. *Foucalt and Feminism: Toward a Politics of Difference*, https://www.dartmouth.edu/~engl5vr/foucault.html **[**https://perma.cc/9U24-K6QC]**.**

124. *Id*.

technological expertise relevant to the case. Judges are also lay persons, who make decisions based on their legal experience and rule of law with advice from experts. Different expert witnesses may provide opposite conclusions. Given the complexity of patents, it is not enough for a lay person to assess advice from disinterested experts without understanding the core technological issue himself. How can someone who cannot tell the difference between series and parallel circuits rule on a patent infringement case involving extremely complicated electronical engineering that takes years to master? This is not a matter of law or a matter of fact, but a matter of knowledge.

The current judicial system must start acknowledging this problem. In recent years, the shortage of patent attorneys became more serious with the increasing number of patent suits.[125] Furthermore, in some IP boutique firms, attorneys are organized by knowledge base: patent attorneys who have biology or chemical engineering backgrounds will primarily practice in the patent market of pharmaceuticals, while those who have a computer science or electrical engineering background will focus on patents involving computers and electronics.

This trend extends to the judicial branch of the government in the U.S. and globally; In the U.S., the Patent Trial and Appeal Board (PTAB) appoints special patent judges to hear patent cases.[126]The European Union uses a Unified Patent Court.[127] Germany has the Federal Patent Court of Germany.[128] Japan has the Intellectual Property High Court.[129] Switzerland has the Federal Patent Court of Switzerland.[130] United Kingdom has both Patent County Court and individual Patent Court.[131] In 2014, the Chinese government founded three special intellectual property courts in Beijing, Shanghai, and Guangzhou.[132]

Currently, though administrative patent judges from USPTO handle

125. Katherine Snow Smith, *Demand for Patents Up, Number of Patent Lawyers Down. Why*?, THE LEGAL EXAMINER (Jan. 14, 2021), https://www.legalexaminer.com/legal/demand-for-patents-up-number-of-patent-lawyers-down-why/ [https://perma.cc/WHV3-K2ZM].

126. PATENT TRIAL AND APPEAL BOARD, https://www.uspto.gov/patents/ptab [https://perma.cc/ND6N-32U4].

127. UNIFIED PATENT COURT, https://www.unified-patent-court.org/ [https://perma.cc/K7RM-9ZER].

128. *The Federal Patent Court*, https://www.bundespatentgericht.de/SharedDocs/Downloads/EN/Infobrochures/InfobrochureE_download.pdf?__blob=publicationFile&v=2 [https://perma.cc/H57Z-KSGW].

129. INTELLECTUAL PROPERTY HIGH COURT, https://www.ip.courts.go.jp/eng/index.html [https://perma.cc/9X6F-9TSL].

130. FEDERAL PATENT COURT, https://www.bundespatentgericht.ch/en/ [https://perma.cc/UK9B-39GD].

131. PATENTS COURT, https://www.gov.uk/courts-tribunals/patents-court.

132. *Updates on China's Specialized IP Courts and Tribunals*, LEXOLOGY, https://www.lexology.com/library/detail.aspx?g=365fea3e-d682-4b63-822d-d7c9f0959b5d [https://perma.cc/TB7J-SKMV].

cases with sections adjudicating different technology areas[133], federal judges who hear patent cases still rule on all kinds of patent cases regardless of their fields of expertise. None of the sovereign states mentioned above enjoy the luxury of appointing different patent judges to accommodate needs for different areas of expertise. Some may argue that patent litigation work is not as technology oriented as patent prosecution. That the judicial system does not need to appoint judges with specific backgrounds for specific cases. But the trend is clear: with the segmentation of technological development, patent litigation will encompass cases that require a higher level of expertise. In the future, it is probable that those who have a technological background in a particular field will only preside over cases involving technology in that field. In this way, the power of knowledge is further distributed. If a patent infringement case involves interdisciplinary technology, the power of knowledge is not only distributed, but also intertwined into a net-like organization, as Foucault pointed out.[134]

Foucault's notion of the Panopticon is applicable to the power mechanism of abstract objects in some patents. Though Foucault's power-knowledge theory primarily focuses on knowledge in the field of social science such as psychology and sociology, many scholars believe that his theory of power-knowledge is also applicable to other fields. French philosopher Jean-François Lyotard, for example, focuses on information technology in his theory[135] of power and knowledge. Knowledge was traditionally correlated with a person's growth. Its main function was to help shape one's spirit and value. With industrialization and globalization, knowledge has been deeply commodified. It is generated for sale and consumption, and gradually became the primary productive force.[136] Thus, knowledge turns into the battleground of international competition for power. As Lyotard stated, "[k]nowledge in the form of an informational commodity indispensable to productive power is already, and will continue to be, a major—perhaps the major—stake in the worldwide competition for power."[137]

Foucault's Panopticon is also useful from a macroscopic perspective. In the Panopticon, the security guard can watch all prisoners' behavior from the center.[138] Under Foucault's metaphor, the security guard needs to be a

133. PATENT TRIAL AND APPEAL BOARD, https://www.uspto.gov/patents/ptab [https://perma.cc/QLK9-G5K4].

134. FOUCAULT, *supra* note 11, at 98.

135. JEAN-FRANÇOIS LYOTARD, POSTMODERN CONDITION, (1979).

136. *Id.*

137. *Id*. at 5. JEAN-FRANÇOIS LYOTARD, THE POSTMODERN CONDITION: A REPORT ON KNOWLEDGE 5 (Geoff Bennington & Brian Massumi, trans., Univ. of Minn. 1984).

138. FENDLER, *supra* note 34, at 80.

particular person or organization.[139] As long as the prisoners are aware that their behavior is being observed, they will discipline themselves.[140] In the patent context, patent holders in the same business watch each other. I have established that the power over abstract objects one harnesses corresponds to the quantity and quality of the patents that person owns. Thus, the more power one has, the more people that person will supervise. If A is holding an upstream patent, A will be watching over those who are downstream. If anyone downstream infringes A's patent, A can file a claim against that person. It is worth noting that A does not necessarily have to sue B (the downstream producer) in order to regulate B's behavior. As long as B understands that A *could* file an infringement claim against B, B will be "disciplined" from violating patent law. At the same time, A is being watched by other patent holders who are relatively upstream compared to A.

However, there will not be an ultimate security guard in this patent market. As in the case of semiconductor production, large companies are interdependent. Their patent inventory can be viewed as an arsenal that serves a defensive purpose to deter other large tech giants from starting a patent war. Therefore, the mechanism by which power is transmuted through knowledge, from the perspective of a macroscopic Panopticon model, is also a net-like organization. The knots are patent holders, and the strings are pathways that power may flow through. Under this power-knowledge mechanism, different patent holders "are always in the position of simultaneously undergoing and exercising this power [of knowledge]."[141]

Foucault's Panopticon model focuses on explaining power mechanisms in the context of social science.[142] Some may argue that power mechanisms in social science are not necessarily applicable in the context of natural science. Patents, however, are primarily concerned with the realm of natural science. Therefore, we should at least deliberate the natural science aspect to the power mechanism of intellectual property. Indeed, the analytical methodology that works well in social science may be incompatible, even useless, in the context of natural science. And Foucault never expressed intent that his knowledge-power theory should extend to natural science.[143][144] Patentable products and processes, however, are often created from

139. *Id.*
140. *Id.*
141. FOUCAULT, *supra* note 11, at 98.
142. FENDLER, *supra* note 34.
143. FENDLER, *supra* note 34.
144. Eight of the nine Patent Technology Centers are about natural sciences. OFFICE OF THE DEPUTY COMMISSIONER FOR PATENT OPERATIONS, https://www.uspto.gov/about-us/organizational-offices/office-commissioner-patents/office-deputy-commissioner-patent [https://perma.cc/5YG2-5CQP].

laboratories through experiments by scientists and engineers.[145] Their knowledge of natural science endows them with power through the process of patent incubation. Therefore, there is a gap that needs to be filled between Foucault's power-knowledge theory and the power mechanism of patents. This might be another reason Drahos ultimately abandons Foucault's power theory. [146]We need to find a way to bridge this gap between social science and natural science with respect to Foucault's power-knowledge theory. In other words, we need to find similarities between the power mechanism in the context of laboratories and the context of social institutions such as prisons and hospitals.[147]

III. JOSEPH T. ROUSE'S POWER-KNOWLEDGE THEORY

American philosopher Joseph T. Rouse investigates how power operates in the specific practice of natural science.[148] Both Lyotard's and Rouse's theories are deeply influenced by Foucault.[149] Rouse innovatively integrated the power-knowledge theory into his model of laboratories and reached conclusions similar to those reached by Foucault through the Panopticon model.[150] In Foucault's theory, the typical metaphorical institutions are hospitals and prisons.[151] Their underlying knowledge-power mechanism spreads to society at large and renders the whole society to be a sort of prison-like institution.[152] In Rouse's practical philosophy of science, the typical metaphorical institution is a laboratory.[153] Its knowledge-power mechanism spreads outward and makes the whole society's power mechanism function like a laboratory. I will analyze his idea of power-knowledge in the laboratory from three dimensions: the power strategy in the creation of phenomena, the power mechanism in the discipline of the subject, and the spread of local knowledge.

A. Power Strategy in the Creation of Microworlds

In *Knowledge and Power*, Rouse perceives science as a practical

145. Patents pertinent to biology, for instance, are incubated in laboratories. Summary of workshop, *National Research Council, Sharing Laboratory Resources*, https://www.nap.edu/read/9156/chapter/4#9 [https://perma.cc/DN7V-A64K].

146. DRAHOS, *supra* note 12, at 177.

147. Foucault argued that schools and hospitals resemble prisons from the perspective of disciplinary power. FOUCAULT, *supra* note 40.

148. ROUSE, *supra* note 24.

149. *Id*. at 214, 218.

150. *Id*. at 107.

151. FOUCAULT, *supra* note 40.

152. *Id*.

153. ROUSE, *supra* note 24, at 107.

activity.[154] Like Foucault, and unlike Drahos, his account of knowledge power in science is a form of decentralized power in contrast to sovereign power.[155] His notion of practical activities such as techniques of experimentation in research institutions derives from this form of decentralized power.[156] Rouse attempts to analyze power-knowledge theory at a micro-sociological level – the laboratory. In other words, he believes that laboratories are not only research institutions controlled by scientists and engineers, but they are in essence a "microworld" as well.[157] A microworld is a "local reconstruction of the world" set-up with the purpose of producing certain phenomena.[158] It is worth noting that the successful operation of this microworld depends not only on the objects and instruments in the process of the experiment, but also on the skills of the researchers. Their skills are honed through both their academic training and practical activity in experimentation with the objects and instruments at hand.[159] Rouse uses this concept of a microworld to replace the traditional subject matter of research to emphasize that this microworld is not a real natural system but a product of human construction.[160] It is operated and controlled by scientists and engineers. Therefore, Rouse focuses on the laboratory model to study how scientists and engineers perform in such a microworld under specific conditions.[161]

Scientists build such a microworld to control it. Microworlds in natural science involve three basic characteristics in operation: isolation, intervention, and tracking. Scientists and engineers isolate the microworld from external influences to gain better control over the experiment. Scientific research does not put unpredictable external influence into consideration. Through isolation, scientists and engineers can control variables and produce an expected outcome. They also intervene in the process to influence objects in the experiment. In this way, scientists and engineers create new research fields from their interaction with the objects. Tracing is about monitoring and correcting the process of the experiment to ensure the stability and predictability of the outcome. Therefore, the creation of this microworld in a laboratory is not a neutral and objective activity. It is a deliberate reconfiguration of the world that allows scientists and engineers to obtain a practical and conceptual grasp on reality.[162]

These characteristics of this microworld show a certain form of power

154. ROUSE, *supra* note 24.
155. *Id.* at 113.
156. *Id*. at 21.
157. *Id*.at 106.
158. *Id*. at 104-05.
159. *Id*. at 38-93, 100.
160. *Id*. at 24.
161. *Id*.
162. *Id*.

strategy. The practical activity in natural science differs from the activity in social science in terms of their distinctive power strategies. To better serve the purpose of the laboratory microworld, scientists and engineers isolate, intervene, and trace the whole process of experimentation.[163] To serve the purpose of Foucault's Panopticon model, wardens supervise, examine, and punish the prisoners to normalize their behavior. Both power strategies are similar in nature for their decentralization. Scientists and engineers regulate their behavior not because of some order from their supervisors. They create such microworlds in a certain manner to conduct experiments because they understand that they have to abide by scientific methodology. Like the power mechanism in Foucault's model, the researchers' exercise of power is also decentralized. Furthermore, Rouse believes the power strategy adopted in laboratorial microworld is particularly important for the development of scientific knowledge.[164]

B. Power Strategy in the Discipline of the Subject

In Foucault's Panopticon, power is exercised through discipline.[165] In laboratories, there also exists a similar disciplinary form of power. Rouse gives three reasons for the necessity of such a form of power mechanism.[166] First, if laboratories do not mandate discipline, their operation would be unimaginable. Scientific methodology itself requires scientists to conduct research through a rigid process to control variables and achieve expected results. If researchers failed to conduct research in a disciplined manner, valid results would not be achieved. Second, the construction of microworlds in a laboratory is an example of how people control and manipulate society. By applying laws of physics to control the outcome of the physical world, researchers naturally become subjects of this disciplinary practice. Third, the purpose of the disciplinary mechanism in laboratories is the same as Foucault's disciplinary mechanism in social institutions such as prisons, hospitals, and schools. That is, to improve productivity and efficiency of society through regulating subjects' behavior. Here, the subjects are researchers while Foucault's subjects are prisoners, patients, and students.

Thus, Rouse's microworld power-knowledge disciplinary mechanism is similar to Foucault's. Under Foucault's Panopticon, knowing that the warden could watch the prisoners anytime, the prisoners behave

163. *Id*. at 105.
164. ROUSE, *supra* note 24.
165. FENDLER, *supra* note 34.
166. ROUSE, *supra* note 24.

submissively.[167] Under Rouse's laboratory model, knowing that results could be reliably achieved only if research is conducted in a given method, scientists and engineers also act in a way submissive to the specific scientific methodology. Otherwise, the prisoners will be punished by the warden and researchers will be punished by failing to achieve the expected outcome. Both Rouse's laboratory model and Foucault's Panopticon model share similar disciplinary techniques. Such disciplinary techniques include spatial isolation, controlled interaction, nominal classification, description, explanation, surveillance, and documentation.[168] Another similarity between Foucault and Rouse is that they both believe such disciplinary mechanism almost always comes with resistance, and such resistance ensures the continuity of the ongoing mechanism. In Rouse's model, researchers resist the existing methodology by trying new means of research.

C. The Spread of Local Knowledge

The laboratory is an essential, organic, constituent of the social structure, so this model must spread its influence outward. Though the inner experimental process of a laboratory is to be constructed as a closed environment independent of external forces, the laboratory as an institution must integrate with the social structure and interact with other institutions. For example, the patentable product or process incubated in the laboratory will be manufactured and commercialized. In this way, the power of laboratories spreads outward to other institutions such as factories and universities.

> In scientific research, we obtain a practical mastery of locally situated phenomena. The problem is how to standardize and generalize that achievement so that it is replicable in different local contexts. We must try to understand how scientists get from one local knowledge to another rather than from universal knowledge to its local instantiation.[169]

On the surface, the most direct manifestation of the outward interaction between laboratories and other institutions is the transfer of new material, new methods, and new equipment. But the more significant transfers are the specific characters of the laboratory power mechanism, including calculability, manipulative techniques, experimental ideology, and social connections inside the research institution. Traditionally, this outward spread of power is a matter of the application of scientific production

167. FENDLER, *supra* note 34, at 80.
168. ROUSE, *supra* note 24, at 217.
169. *Id*. at 22.

(factories and corporations manufacture and commercialize the experimental results of laboratories to put them in application). Rouse rejects this view. He identifies two ways to spread the knowledge power in the microworld. On the one hand, he considers the spread of laboratory practice achieved through "standardization".170 This process requires scientists and engineers to standardize the objects and instruments in the microworld of the laboratory to put them in use beyond this enclosed environment.171 For example, scientists and engineers will work with factories and corporations to reconstruct the experimental process based on a cost-effective principle for massive repetition. Here their knowledge power based on natural science such as physics will cooperate with knowledge power of social science such as economy. In this manner, Rouse's and Foucault's power-knowledge theories interact and merge with each other.

On the other hand, Rouse believes that the spread of power in a microworld is a matter of adaptation rather than application.[172] It is achieved through, "the reconstruction of the surrounding world to resemble the laboratory in important respects."[173] That is to say, the interaction between laboratories and other social institutions is through the adaptation from one specific environment, such as the experimental conditions in laboratory, to another specific environment, such as the manufacturing conditions in a factory. Rouse even states: "science sometimes 'work' works' only if we change the world to suit it."[174] There are numerous examples of adaptation in the real world. Companies put a lot of effort into establishing proper standards of measurement for "the development of the chemical industry to manufacture the pure substances that chemical know-how presupposes."[175] The complicated power grid of electricity is another instance of time-consuming adaptive work to make the system function as well as the microworld in a laboratory. Almost all technological systems we see and use in daily life have undergone adaptation using both principles of science and economy.

If we perceive the knowledge in a laboratory as a form of local knowledge due to its enclosed environment, the spread of this knowledge power is not from a local microworld to a universal macroworld but rather from a local microworld to another local microworld. Thus, the spread of knowledge power from a laboratory to other institutions does not actually

170. *Id*. at 113.
171. *Id*.
172. JOSEPH ROUSE, ENGAGING SCIENCE: HOW TO UNDERSTAND ITS PRACTICES PHILOSOPHICALLY, 131 (1996).
173. *Id*.
174. ROUSE, *supra* note 24, at 118.
175. *Id*. at 119.

go through the process of decontextualization. Through standardization of the objects and instruments in the laboratory and adaptation of the new environment to resemble the environment in the laboratory, the power mechanism transfers from one place to another.

The laboratory model is critical to the analysis of the power mechanism with respect to patents. Since Rouse believes that this system of power contributes to the development of technology, it inevitably serves as a motivation to the formation of patentable products. The potential patentability of research outcomes, on the other hand, serves as an incentive for the scientists and engineers to create such a microworld to incubate their ideas. With respect to the transfer of local knowledge, both the standardization and adaptation processes are affected by patent law. In standardization, corporations and factories will commercialize their products in accordance with the patent claims filed with the USPTO that best serve their economic interest. Thus, the process of commercialization is greatly affected by patent law. In adaptation, the construction of the marketplace environment is governed by scientific principles in the microworld. since adaptation will inevitably interact with standardized products, it is indirectly influenced by the power of patents.

Like the Panopticon, the laboratory shares similar features such as supervision, examination, documentation, special organization such as separation and categorization, standardization, etc.[176] This similarity is significant since patentable knowledge is mostly generated through lab experiments. Because laboratories are a part of the dynamic technological world, their power is distributed outward. This distribution of knowledge power is interactive since other disciplinary institutions may also contribute to the operation of laboratories. For example, hospitals and schools are typical disciplinary institutions under Foucault's power mechanism. Pharmaceutical laboratories usually work together with both hospitals and medical schools for their experiments. In this way, the power of knowledge is again intertwined and forms a net-like organization.

IV. A BROADER PERSPECTIVE

If we start to examine the larger picture in terms of free-market and global competition, under the trend of globalization and free-market ideology, the unit of competition is no longer just technology companies. Sovereign states come to the stage of intellectual property. Drahos is well aware of this fact. *A Philosophy of Intellectual Property* was published a year after the ratification of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) in 1995. TRIPS is an agreement over

176. *Id*. at 235-39.

intellectual property rights including patents, trademark, copyright, and trade secrets signed by all World Trade Organization (WTO) members.[177] Drahos indicates that this agreement was pushed mainly by developed countries, particularly the United States, to coerce less developed countries to enforce and implement intellectual property laws.[178] According to Drahos, developed countries have an advantage in both the quantity and the quality of intellectual property. By enforcing IP laws on less developed countries, they will maintain their technological advantage. Just like large tech companies have the coercive power to threaten smaller ones, developed countries are using the same method to coerce less developed countries into abiding by the international IP laws enacted by the developed countries. Drahos states, "by helping its multinational clientele to achieve *dominium* over the abstract objects of intellectual property the US goes a long way towards maintaining its *imperium*."[179] In another work, he writes, "[T]he case of intellectual property shows the US state and international business mobolising the mechanism of coercion to get developing countries to sign TRIPS."[180] TRIPS is evidence for the exercise of sovereign power by sovereign states.

When different states become the competition unit, the imbalance of power is enforced not only through law, but also through the economic and military power of the stronger states. After all, international laws such as TRIPS are enforced through the beneficiary's economic and military power. Even in this scenario, Foucault's power mechanism still applies. In fact, the flow of power in intellectual property is more evident in the global competition among different sovereign states. When a developed country expands its market into the less developed countries to consume their surplus productive power, they invest both technological and economic resources into the land of the less developed countries. By trading market for technology, less developed countries will be able to develop their marketable pool of knowledge at a much faster and cost-effective way. This late-developing advantage, first deployed by American economist Alexander Gerchenkron,[181] will help the developing countries catch up with the developed countries to ease the imbalance of power. That is how China and Vietnam developed their economies for the past several decades.

177. TRIPS – *Trade-Related Aspects of Intellectual Property Rights*, WORLD TRADE ORGANIZATION, https://www.wto.org/english/tratop_e/trips_e/trips_e.htm [https://perma.cc/88TB-P8S7] (last visited Aug. 31, 2021).

178. Peter Drahos, *Global Property Rights in Information: The Story of TRIPS at the GATT*, 13 Prometheus 1, 6-19 (1995). *See also supra* note 66, at 6.

179. *Id.* at 16.

180. Peter Drahos & John Braithwaite, *The Globalisation of Regulation*, 9 J. OF POL. PHIL 103, 124 (2001).

181. Steven L. Barsby, *Economic Backwardness and the Characteristics of Development*, 29 J. OF ECON. HIST. 449, 449 (1969).

Because China is now the largest market economy in the world, the technology is developing at a speed much faster than any other developed countries. China is now the number one patent prosecutor entity in the world.[182] In 2019, China prosecuted 58,990 patents, approximately 1,000 more than the United States.[183] For the past twenty years, China experienced a twenty-fold increase in the number of patent prosecutions through PCT.[184] Therefore, the trend of imbalance is not irreversible. The power of knowledge flows dynamically even in terms of IP competition among sovereign states. This flow of power interacts with sovereign power in intellectual property.

Knowledge power, in nature, embodies these two power mechanisms. Foucault's notion of biopower can be seen as a resistance against Drahos's notion sovereign power in intellectual property. Where there is sovereign power, there is biopower of knowledge flowing in this net-like organization. This symbiotic relationship exists everywhere in the power mechanism that dominates abstract objects.

CONCLUSION

Peter Drahos analyzes the power mechanism in intellectual property markets from the top of the hierarchy.[185] His notion of sovereign power over abstract objects is in nature a form of juridical power.[186] However, the power mechanism in intellectual property is not limited to juridical power. Knowledge power, on the other hand, is a more fundamental form of power harnessed through knowledge according to Foucault. In intellectual property, particularly patents, knowledge power interacts with sovereign power. Unlike sovereign power, individual's knowledge power flows with the passage of knowledge and serves as a form of resistance against tech giants' sovereign power. This is evidenced through the relationship of interdependence between different companies and between companies and experts. As I have established earlier, the power in patent market is ubiquitously intertwined under a net-like organization. It is also flowing constantly in a free market system.

Joseph Rouse bridges the gap between the power mechanism in social science and natural science. He inherited Foucault's power-knowledge

182. *China Leads the World in PCT Applications in 2020*, CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION, https://english.cnipa.gov.cn/art/2021/3/6/art_2509_157298.html [https://perma.cc/DG2U-APJS].

183. *China Becomes Top Filer of International Patents in 2019 Amid Robust Growth for WIPO's IP Services, Treaties and Finances*, WORLD INTELLECTUAL PROPERTY ORGANIZATION, https://www.wipo.int/pressroom/en/articles/2020/article_0005.html [https://perma.cc/5RB3-NMGA].

184. *Id.* Patent Cooperation Treaty, June 19, 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231.

185. DRAHOS, *supra* note 12, at 176.

186. *Id.*

theory and put them in the context of a laboratory.[187] He uses an enclosed microworld model to explain how the power of knowledge affects the experiment processes in the context of natural science.[188] In this microworld of phenomena, the disciplinary methods resemble that of Foucault's Panopticon model. The power of knowledge in this context is also decentralized. Since the power strategy Rouse describes in the laboratory is like other institutions such as prisons, hospitals, and schools, Foucault's power-knowledge theory is also applicable in the context of natural science. Since the transfer of this form of decentralized natural science power is from one locality to another, the whole process of the outward spread of power is still a decentralized form of power. Such a power mechanism of local knowledge transfer creates numerous power centers through standardization and adaptation. From a macro perspective, different localities are just like the innumerous knots of a giant power net as described by Foucault. Moreover, the patent marketplace consists of both the processes of patent formation and the commercialization of patents. It is an organic and interactive combination of both natural science and social science. The sovereign power analysis of Peter Drahos, together with the power-knowledge theory of Michel Foucault and Joseph Rouse, provides us with a more comprehensive picture of power mechanisms in the realm of intellectual property.

187. ROUSE, *supra* note 24.
188. *Id.*