DREADFUL POLICING: ARE THE SEMICONDUCTOR INDUSTRY GIANTS CONTENT WITH YESTERDAY'S INTERNATIONAL PROTECTION FOR INTEGRATED CIRCUITS?

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INTRODUCTION

A. THE SEMICONDUCTOR INDUSTRY

[1] Over the past twenty years, the semiconductor industry has grown rapidly.[1] Technological advances have resulted in smaller, faster, and more cost-efficient semiconductor integrated circuits.[2] Today, integrated circuits ("chips") are found in the majority of electronic devices.[3] This

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[1] *See* 2 MELVIN F. JAGER, TRADE SECRETS LAW § 9:16 (2009); Joseph Desposito, *Forecasting Industry Growth for 2009 and Beyond*, ELECTRONIC DESIGN, Jan. 15, 2009, *available at* http://electronicdesign.com/Article/ArticleID/20425/20425.html.

[2] Dan Fost, *IBM Says Tiny Chips Are Big Breakthrough; Self-Assembling Material Creates Insulation for Wire*, S.F. CHRON., May 3, 2007, at C1. This trend is typically referred to as Moore's Law. *Id.*

[3] *See* H.R. REP. NO. 98-781, at 2 (1984), *reprinted in* 1984 U.S.C.C.A.N. 5750, 5751.

includes consumer electronics like computers, phones, televisions, and automobiles, and industrial electronics such as motor drives and programmable logic controllers.[4]

[2] With the semiconductor industry's overwhelming success, however, come questions of proper intellectual property protection. Although the chip manufacturing process is now relatively inexpensive, new circuit designs often take years and millions of dollars to perfect.[5] This expensive process accounts for a substantial portion of the cost of a new integrated circuit.[6] For this reason, chip manufacturers desire internationally recognized intellectual property protection for their efforts to develop commercially beneficial design topographies.[7]

[3] If international protection is not granted, chip manufacturers will be unable to prevent competing companies from copying the integrated circuit layout design, bypassing the costly development stage, and reproducing part or even the entire semiconductor chip for a fraction of the cost.[8] Even though the underlying function of the integrated circuit may be patent-protected, patent coverage is limited and does not provide adequate protection for chip manufacturers.[9] In an attempt to resolve this

[4] These are just a few examples of the many devices that rely on semiconductors to function. *Id.*

[5] *Id.*

[6] For example, even as early as 1984, design costs for a single chip could cost as much as $100,000,000. *Id.* Meanwhile, for less than $50,000, a competitor can reproduce the mask work, thus able to flood the market with cheap copies of the chip. *Id.*

[7] A design topography is another name for the semiconductor integrated circuit layout design. *See* J.A.L. STERLING, WORLD COPYRIGHT LAW § 2.60 (3d ed. 2007).

[8] *See* S. REP. NO. 98-425, at 4 (1984). ("The would-be copyist simply removes the plastic or ceramic casing; photographs the top, metal connection layer; dissolves the metal away with acid in order to photograph the semiconductor material in the next layer; and then photographs underlying layers by varying the depth of focus of the camera so that it picks up the desired layer of the translucent semiconductor material lying below.").

[9] *See infra* Part III.C.

problem, the World Intellectual Property Organization (WIPO) set forth the Washington Treaty on Intellectual Property in Respect of Integrated Circuits in 1989.[10]

B. WHAT IS A LAYOUT DESIGN/MASK WORK?

[4] Simply stated, a "mask work" is the pattern followed in the production of an integrated circuit chip, or a series of chips, on a semiconductor sheet.[11] A two-dimensional or three-dimensional layout is used to portray the arrangement of integrated circuit components, which includes transistors, resistors, inductors, and capacitors, as well as their connections and other electronic components.[12] Some chips have multiple layers of inter-connected transistors, copper leads, and other circuit devices, while others are contained on a single layer.[13] Since integrated circuit designers generally seek to fit as many transistors into the smallest

[10] Treaty on Intellectual Property in Respect of Integrated Circuits, May 26, 1989, 28 I.L.M. 1483 [hereinafter Washington Treaty].

[11] Lee Hsu, *Reverse Engineering Under the Semiconductor Chip Protection Act: Complications for Standard of Infringement*, 5 ALB. L.J. SCI. & TECH. 249, 253–54 (1996).

[12] *See* 17 U.S.C. § 901(a)(2) (2006).

[13] *See* Hsu, *supra* note11, at 254.

space possible,[14] design topographies have become increasingly complicated.[15]

[5] In producing integrated circuits, a sheet of silicon is covered with a "photomask" resistant to light and certain chemicals.[16] The silicon sheet can be etched with laser light or dipped into a chemical bath.[17] During this process chemicals "etch" pieces left uncovered, "doping" certain portions of the silicon with extra electrons or fewer electrons, adding tiny layers of glass, or providing metal "gates" through which current can flow.[18] After a series of such chemical etchings and using a different photomask for each layer, chip producers have created electrical transistors and interconnections on the silicon wafer that can be controlled to conduct or not to conduct electricity (thus termed a semiconductor).[19]

[14] More compact chips allow designers to cut down on the expected delay/transition times when passing signals through the circuit. This results in a quicker clock rate, which controls the speed at which the chip is ready to pass a information through its pipeline. For example, today's personal computers may have a Central Processing Unit ("CPU") capable of running at clock rates in excess of 3 gigahertz (3 billion cycles per second), while personal computers in 1997 were only capable of clock rates of 300 megahertz (300 million cycles per second). This was accomplished primarily through advances in lithographic manufacturing technologies, giving the ability to make memory cells with a "half pitch" (basically an average measure of the distance between chip features) of as small as 45 nm (nanometers) today, as opposed to 250 nm in 1997. Chronology of Microprocessors, http://processortimeline.info/proc1996.htm, & http://processortimeline.info/proc2006.htm (last visited Dec. 4, 2009).

[15] For example, in 1997, Pentium was able to squeeze 7.5 million transistors onto its Pentium II chip. *Id.* By contrast, today's Intel Dual Core Itanium chip holds 1.7 billion transistors. News Release, Intel, New Dual-Core Intel® Itanium® 2 Processor Doubles Performance, Reduces Power Consumption (July 18, 2006), *available at* http://www.intel.com/pressroom/archive/releases/2006/20060718comp.htm.

[16] H.R. REP. NO. 98-781, at 13 (1984); *see also* Hsu, *supra* note 11.

[17] H.R. REP. NO. 98-781, at 13.

[18] *Id.*

[19] *Id.*

The final layout of these transistors and other electrical components is called a layout design or design topography.[20]

C. TREATIES

[6] Proponents of the Washington Treaty set out to ensure worldwide intellectual property protection for the layout designs of integrated circuits.[21] Although the Washington Treaty has not yet entered into force,[22] many of its provisions were adopted in the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights at the end of 1994.[23]

[7] This WTO adoption was important for many reasons. First, the original Washington Treaty was only signed by eight nations in 1990.[24] This low turnout may have been due in part to the fact that it calls for a minimum protection term of eight years,[25] whereas technology superpowers Japan and the United States called for international

[20] *Id.* at 12.

[21] Washington Treaty, *supra* note 10, art. 6, 28 I.L.M. at 1486.

[22] World Intellectual Property Organization, Washington Treaty on Intellectual Property in Respect of Integrated Circuits, http://www.wipo.int/treaties/en/ip/washington (last visited Nov. 25, 2009).

[23] Agreement on Trade-Related Aspects of Intellectual Property art. 35, Apr. 15, 1994, 33 I.L.M. 1197, 1211 [hereinafter TRIPS Agreement] (incorporating by reference Articles 2 through 7 with the exception of paragraph 3 of Article 6, Article 12, and paragraph 3 of Article 16 of the Washington Treaty).

[24] World Intellectual Property Organization, Washington Treaty Signatory States, http://www.wipo.int/edocs/notdocs/en/washington/treaty_washington_1.html (last visited Nov. 25, 2009). These nations included Ghana, Liberia, Yugoslavia, Zambia, Guatemala, Egypt, China, and India. *Id.*

[25] Washington Treaty, *supra* note 10, art. 8, 28 I.L.M. at 1488.

protection of ten years.[26] Since its inception, only four other nations have ratified or acceded to the treaty.[27] By contrast, the TRIPS Agreement applies to a much broader collection of nations, specifically all members of the WTO.[28] Although the TRIPS Agreement provides for different transition periods (allowable delays in compliance) for nations of different developmental status, even the least developed nations are required to comply as members of the WTO.[29]

[8] The single most important benefit to the Washington Treaty's incorporation into the TRIPS Agreement is the application of the WTO's Dispute Settlement Understanding (DSU),[30] often called the crown jewel of the WTO.[31] In the original articles of the Washington Treaty, the dispute settlement process had less power because the Contracting Parties were constituted into a Union for the purposes of the treaty,[32] an Assembly

[26] 17 U.S.C. § 904(b) (2006); Kaisetsu Handotai sysuseki kairo-ho [The Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit], Law No. 43 of 1985, art. 10.

[27] World Intellectual Property Organization, Washington Treaty Notifications, http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&search_what=N&treaty_id=29 (last visited Nov. 25, 2009). Egypt has ratified the treaty, while Bosnia, Herzegovina, and Saint Lucia have acceded. *Id.*

[28] TRIPS Agreement, *supra* note 23, art. 1, 33 I.L.M. at 1198–99.

[29] *Id.* arts. 65–66, 33 I.L.M. at 1222.

[30] Understanding on Rules and Procedures Governing the Settlement of Disputes, Apr. 15, 1994, 33 I.L.M. 1125, 1226 [hereinafter DSU].

[31] *See, e.g.*, David Palmeter, The WTO Dispute Settlement System in the Next Ten Years (Apr. 7, 2006) (unpublished manuscript, on file with Columbia University School of International and Public Affairs), *available at* http://www.sipa.columbia.edu/wto/pdfs/PalmeterWorkingPaper.pdf; Deborah E. Siegel, *Legal Aspects of the IMF/WTO Relationship: The Fund's Articles of Agreement and the WTO Agreements*, 96 AM. J. INT'L L. 561, 583 (2002). For a thorough discussion of the Dispute Settlement Understanding, see generally Susana Hernandez Puente, *Section 301 and the New WTO Dispute Settlement Understanding*, 2 ILSA J INT'L & COMP. L. 213, 215–23 (1995).

[32] Washington Treaty, *supra* note 10, art. 1, 28 I.L.M. at 1485. In this way, the few signatories only had each other to depend upon for enforcement of dispute decisions.

was formed to oversee the treaty,[33] and the Assembly would choose three members to form a panel to make recommendations for a resolution.[34] By contrast, the WTO's DSU allows for third-party *amicus curiae*-like participation as well as an automatic appellate review process not seen in the purview of the Washington Treaty.[35] Remedies available under the DSU include withdrawal of the disputed measures, potential compensation, and, as a last resort, retaliatory trade measures.[36] More generally, the DSU provides a more efficient, complete, and workable dispute resolution mechanism than does the Washington Treaty.[37]

[9] As semiconductor technology has advanced, legislation protecting it has fallen behind. This article will explore where the shortfalls exist and the inability of current patent and copyright laws to protect integrated circuits internationally. Part I reviews the current protections for layout designs under the TRIPS Agreement. Part II acknowledges the general compliance with the TRIPS Agreement and highlights the failures of WTO members to protect semiconductor topographies. Part III reviews the current patent and copyright of the United States, indicating the insufficiency of these systems to adequately protect integrated circuits.

[33] *Id.* art. 9, 28 I.L.M. at 1488. Again, with the small number of contracting parties, worldwide effectiveness was of a minimal degree.

[34] *Id.* art. 14, 28 I.L.M. at 1489-90.

[35] DSU, *supra* note 30, arts. 10, 17, 33 I.L.M. at 1232–33, 1236–37.

[36] *Id.* art. 3, 33 I.L.M. at 1227.

[37] *Compare id.* (providing a detailed dispute resolution process with an automatic appeal right), *with* Washington Treaty, *supra* note 10, art. 14, 28 I.L.M. at 1489–90 (providing a "bare bones" dispute resolution process).

I. INTERNATIONAL PROTECTION FOR LAYOUT DESIGNS UNDER THE TRIPS AGREEMENT

A. SUBJECT MATTER

[10] "Each Contracting Party shall have the obligation to secure, throughout its territory, intellectual property protection in respect of layout-designs (topographies) in accordance with this Treaty."[38] The integrated circuit need not be integrated into a product (such as a computer) for this provision to apply.[39] Moreover, adopted provisions of the Washington Treaty provide their own definition of a layout design: "the three-dimensional disposition, however expressed, of the elements, at least one of which is an active element, and of some or all of the interconnections of an integrated circuit, or such a three-dimensional disposition prepared for an integrated circuit intended for manufacture."[40] In this way, WTO members are required to protect final layout designs, which may include the final chip layout used for production or a three-dimensional model of the chip. Notably excluded from this required coverage are two-dimensional mask works,[41] since they are not "three-dimensional dispositions," and computer models of the layout design, since they include no "active element." But both of these works may be protectable under an alternative system.[42]

[11] Another requirement included in the Washington Treaty, and subsequently adopted into the TRIPS Agreement, is originality.[43] Layout designs are considered original if they "are the result of their creators' own

[38] Washington Treaty, *supra* note 10, art. 3(1)(a), 28 I.L.M. at 1485.

[39] *Id.* art. 3(1)(b), 28 I.L.M. at 1485.

[40] *Id.* art. 2(ii), 28 I.L.M. at 1485.

[41] *See supra* Introduction Part B (explaining that two-dimensional mask works are used in the production of an integrated circuit).

[42] *See infra* Part IV.D.

[43] Washington Treaty, *supra* note 10, art. 3(c)(2), 28 I.L.M. at 1486.

intellectual effort and are not commonplace among creators of layout-designs (topographies) and manufacturers of integrated circuits at the time of their creation" or are an original combination of commonplace interconnections and elements.[44] This originality requirement may be seen as less restrictive than the novelty and non-obviousness requirements in the United States patent system,[45] but more restrictive than the "minimally creative" requirement in the United States copyright system.[46]

B. FORMS OF PROTECTION AND NATIONAL TREATMENT

[12] WTO members have the right to choose the form of intellectual property protection they institute in order to comply with the TRIPS provisions.[47] While this is an important privilege, members with the most to gain seem to take it for granted.[48] Rather than seeking to protect design topographies through existing national patent or copyright systems, it seems that the most proficient semiconductor-manufacturing nations have passed additional legislation to afford protection limited in scope as defined in the Washington Treaty, potentially missing out on valuable additional intellectual property protection.[49]

[13] Aligning itself with other WTO agreements, the Washington Treaty also affords members national treatment.[50] This is bolstered by

[44] *Id.*

[45] 35 U.S.C. §§ 102–103 (2006).

[46] Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345 (1991) ("Original, as the term is used in copyright, means only that the work was independently created by the author (as opposed to copied from other works), and that it possesses at least some minimal degree of creativity."). In fact, the court in *Feist* goes on to note that two poets may compose identical poems, both satisfying the originality requirement (and thus copyrightable) even though not novel. *Id.* at 345–46.

[47] Washington Treaty, *supra* note 10, art. 4, 28 I.L.M. at 1486.

[48] *See infra* Part II.

[49] *See infra* Part III.

[50] Washington Treaty, *supra* note 10, art. 5, 28 I.L.M. at 1486.

Article 4 of the TRIPS Agreement which further provides for most-favored-nation treatment.[51] Not to be confused with each other, most-favored-nation treatment stipulates: "With regard to the protection of intellectual property, any advantage, favour, privilege or immunity granted by a Member to the nationals of any other country shall be accorded immediately and unconditionally to the nationals of all other Members."[52] National treatment under the Washington Treaty, however, grants any person or legal entity of another contracting party the same protection with respect to intellectual protection of layout designs as its own nationals.[53] When used in conjunction, as national treatment and most-favored-nation status aim to prevent exclusionary or protectionist practices, each member benefits from open discussion and fair dealing.[54]

C. UNLAWFUL ACTS

[14] Members to the Washington Treaty are required to implement provisions making it unlawful to reproduce a layout design protected, in whole or in part, so long as the part meets the originality requirements.[55] Additionally, it is unlawful to import, sell, or commercially distribute a protected topography without the design holder's authorization.[56] In both cases, reproducing or distributing an integrated circuit, manufactured using the protected layout design, is unlawful.[57] Nevertheless, abstract

[51] TRIPS Agreement, *supra* note 23, art. 4, 33 I.L.M. at 1200.

[52] *Id.* For a more detailed discussion of most-favored-nation treatment, see Di Jiang-Schuerger, Comment, *The Most Favored Nation Trade Status and China: The Debate Should Stop Here*, 31 J. MARSHALL L. REV. 1321, 1324–35 (1998).

[53] Washington Treaty, *supra* note 10, art. 5, 28 I.L.M. at 1486.

[54] However, most-favored-nation treatment is not without its exceptions. *See* TRIPS Agreement, *supra* note 23, art. 4(a)-(d), 33 I.L.M. at 1200.

[55] Washington Treaty, *supra* note 10, art. 6(1)(a)(i), 28 I.L.M. at 1486.

[56] *Id.* art. 6(1)(a)(ii), 28 I.L.M. at 1486.

[57] *See id.* art. 6(1)(a), 28 I.L.M. at 1486.

computer models of the circuit layout and two-dimensional mask works are not protected from appropriation.[58]

[15] The portions of the Washington Treaty adopted under the TRIPS Agreement are flexible, explicitly allowing members to specify other acts unlawful as they see fit.[59] The scope of this power, however, is limited.[60] Unauthorized reproduction of protected topographies must be permitted when "performed by a third party for private purposes or for the sole purpose of evaluation, analysis, research or teaching."[61] This, in effect, grants the right to reverse-engineer a layout design, so long as the resulting design based on the analysis or evaluation of the protected design is itself original.[62] This reverse-engineering allowance was likely included to encourage innovative practices as a matter of policy.[63] With the ability to learn from, examine, and use protected designs as a model for new integrated circuits, WIPO and the WTO have taken a progressive approach to further innovation.

D. TERM OF PROTECTION

[16] The required term of protection for layout deigns under the TRIPS Agreement is ten years.[64] The starting date of that term, however, may vary by country. If registration is required for protection, then the term begins on the date of filing the application or the "first commercial

[58] *See supra* Part I.A.

[59] *See* Washington Treaty, *supra* note 10, art. 6(1)(b), 28 I.L.M. at 1486.

[60] *See id.* art. 6(2), 28 I.L.M. at 1486–87.

[61] *Id.* art. 6(2)(a), 28 I.L.M. at 1486.

[62] *See id.* art. 6(2)(b), 28 I.L.M. at 1487.

[63] *See* Hsu, *supra* note 11, at 274 ("[T]he main legislative purpose of reverse engineering [is] allowing second-source competitors to produce compatible chips . . . [and] encouraging improvements upon and alternatives to the existing mask work designs.").

[64] *See* TRIPS Agreement, *supra* note 23, art. 38, 33 I.L.M. at 1212.

exploitation" of the layout design if not yet registered.[65] In nations where registration is not required, the term simply begins with the first commercial exploitation of the layout design.[66] Moreover, TRIPS members may include an optional provision calling for the term of protection to lapse fifteen years after the layout design's creation.[67]

II. INTERNATIONAL COMPLIANCE

[17] The largest countries in global semiconductor manufacturing include traditional technology giants Japan and the United States, which have been recently joined by newcomer China.[68] Generally, smaller, developing nations would prefer an international intellectual property system offering less protection since pirating is more likely to occur in these nations than in producing nations.[69] By contrast, one would expect the leading semiconductor nations to seek stronger protection to protect others from freely misappropriating design topographies.

[18] Interestingly, China, Japan, and the United States have all implemented legislation only calling for the minimum ten-year protection required by the TRIPS Agreement,[70] even though they have the option of

[65] *Id.* art. 38(1), 33 I.L.M. at 1212.

[66] *See id.* art. 38(2), 33 I.L.M. at 1212.

[67] *See id.* art. 38(3), 33 I.L.M. at 1212. This may act to prevent a designer from "sitting on" a potentially beneficial layout design in hopes of utilizing it at a future date when it may be more profitable.

[68] *See generally* World Semiconductor Trade Statistics, 22 Years WSTS Blue Book Data: 1986 to Date, http://www.wsts.org/public/files/bbhist-22.xls (last visited Nov. 25, 2009).

[69] Peter K. Yu, *The Copyright Divide*, 25 CARDOZO L. REV. 331, 353 (2003).

[70] 17 U.S.C. § 904(b) (2006); Kaisetsu Handotai sysuseki kairo-ho [The Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit], Law No. 43 of 1985, art. 10; Order of the State Council on the Issuance of the Regulations on the Prot. of Layout-Designs of Integrated Circuits (promulgated by the St. Council, Apr. 2, 2001, effective Oct. 1, 2001), art. 12, *translated in* 2001 China Law LEXIS 1963.

extending this term indefinitely.[71] Note, however, that an extension of this term would effectively allow circuit designers and manufacturers all over the world to benefit due to treaty provisions calling for national treatment.[72] Nevertheless, it may be beneficial for the largest semiconductor-producing nations to seek to protect designs for more than the minimum ten-year term, as this extended term would give producers greater rights.[73]

[19] Unsurprisingly, communist China has implemented a provision calling for special treatment in the event of a national security issue: "Where a layout-design for which registration is applied relates to the security or other vital interests of [China] and is required to be kept secret, the application shall be handled in accordance with the relevant provisions of [Chinese law]."[74] Meanwhile, Japan and the United States have not included such a provision, probably in large part due to the idea that a semiconductor layout design would be unlikely to bring about issues of national security.[75]

[20] Additionally, China, Japan, and the United States have failed to adopt legislation protecting abstract computer models of semiconductor

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[71] TRIPS Agreement, *supra* note 23, art. 38, 33 I.L.M at 1212.

[72] *See supra* Part I.B.

[73] Legislative inaction on this front may be traced to the relatively short market-life for most layout designs. In effect, if a chip is only profitable for five or six years, there is no need to protect its layout design beyond that period. Given the rapid rate at which technology becomes obsolete, then, there may be little incentive to extend the term of protection. *See* Rajkumar Dubey, *Semiconductor Integrated Circuits Layout Design in Indian IP Regime*, MONDAQ BUS. BRIEFING, Sept. 24, 2004, *available* at http://www.thefreelibrary.com/Semiconductor+Integrated+Circuits+Layout+In+Indian+IP+Regime.-a0122477463.

[74] Order of the State Council on the Issuance of the Regulations on the Prot. of Layout-Designs of Integrated Circuits (promulgated by the St. Council, Apr. 2, 2001, effective Oct. 1, 2001), art. 15, *translated in* 2001 China Law LEXIS 1963.

[75] *Cf.* 37 C.F.R. § 5.1(e) (2009) (disallowing publication of a United States patent application where the disclosure would be "detrimental to national security").

layout designs.[76] Although semiconductor layout designs were once quite simple, technological advances have led to the increasing complexity of semiconductor circuits, which will likely continue for some time.[77] As the technology has matured, however, legislation protecting this technology has fallen behind. Even though WTO members are complying with the TRIPS Agreement, they have failed to take the next step in furthering international protection for semiconductor topographies.

[21] Overall, international compliance with the TRIPS Agreement regarding the adopted provisions of the Washington Treaty has been largely formulaic.[78] Even though the TRIPS Agreement allows for a good deal of flexibility, members seem reluctant to cater legislation to their specific needs. This may exemplify a spirit of cooperation among nations or simply be an indication that members view other international issues with more importance.[79] Most recently, during the seemingly perpetual Doha Developmental Round, members focused their attention mainly on issues relating to agriculture, as well as non-trade barriers such as agricultural subsidies and more traditional industrial tariffs.[80] In this way, it seems that most members are generally complacent regarding

[76] In fact, the author has been unable to find ANY WTO member that has passed legislation to protect such design models.

[77] *See* Gordon E. Moore, *Cramming More Components onto Integrated Circuits*, ELECTRONICS, Apr. 19, 1965, *available at* http://download.intel.com/research/silicon/moorespaper.pdf.

[78] *Compare* 17 U.S.C. § 904(b) (2006), *with* Kaisetsu Handotai sysuseki kairo-ho [The Act Concerning the Circuit Layout of a Semiconductor Integrated Circuit], Law No. 43 of 1985, *and* Order of the State Council on the Issuance of the Regulations on the Prot. of Layout-Designs of Integrated Circuits (promulgated by the St. Council, Apr. 2, 2001, effective Oct. 1, 2001), art. 12, *translated in* 2001 China Law LEXIS 1963.

[79] Note that Japan and the United States have not even modified their semiconductor chip protection since the TRIPS Agreement came into effect, ten and eleven years after their initial semiconductor legislation.

[80] *See generally* World Trade Organization, Ministerial Declaration of 14 November 2001, WT/MIN(01)/DEC/1 [hereinafter Doha Declaration], *available at* http://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.pdf.

international treatment of intellectual property issues. Perhaps they feel they have larger issues that need to be resolved.[81]

III. OTHER FORMS OF PROTECTION

A. IP POLICY/INCENTIVES

[22] The United States Constitution provides the groundwork for U.S. copyright and patent protection, granting Congress the power "[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[82] By implementing legislation providing authors and inventors limited monopoly power over their works, Congress has created incentives for innovation in the United States.[83] International intellectual property protection, then, promotes a globalized plan for innovation. This can benefit the worldwide community with cultural innovation in the form of new literature and music, as well as technological innovation including life-saving medicines and helpful electronic devices. Of course, one could reasonably argue that granting limited monopolies only increases consumer costs.[84] But without the potential for monetary gain, inventors and authors would have little incentive to innovate and create, thus hurting society as a whole.[85]

[81] The Doha declaration seeks to clarify the scope of the TRIPS Agreement, noting that it should be read "in a manner supportive of public health, by promoting both access to existing medicines and research and development into new medicines." *See id.* at ¶ 17.

[82] U.S. CONST. art. I, § 8, cl. 8.

[83] *See* 17 U.S.C. §§ 101–1332 (2006) (copyrights); 35 U.S.C. §§ 1–376 (2006) (patents).

[84] *See generally* Mark F. Grady and Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 Va. L. Rev. 305, 310–13 (1992) (discussing the reward theory of patents).

[85] *Id.*

B. COPYRIGHT PROTECTION

[23] Originally, United States copyright law protected only a limited number of works of authorship, including maps, charts, and books.[86] Protection was also only granted to United States authors, leaving foreign authors' works free to be copied and distributed.[87] As the United States forged its own cultural identity, however, it began to push for and implement greater international intellectual property protection. In fact, after the rampant pirating of British novels in the early nineteenth century, the United States "transformed from the most notorious pirate to the most dreadful police."[88]

[24] Today, protection under United States copyright law has broadened significantly in scope, including the protection of paintings, drawings, music, and even architecture and computer codes.[89] But one notable limitation on copyrightable works is that only the aesthetic portions of a pictorial, graphical, or sculptural work are copyrightable.[90] This so-called separability doctrine states that:

> [T]he design of a useful article . . . shall be considered a pictorial, graphic, or sculptural work only if, and only to the extent that, such design incorporates pictorial, graphic, or sculptural features that can be

[86] *See* Copyright Act of 1790, 1 Stat. 124.

[87] *See id.*

[88] *See* Yu, *supra* note 69, at 353. Note also that similar to layout designs, pirated books were much less expensive: "[c]ompared to a legitimate English edition, an American pirated edition cost approximately one-tenth of the total cost." *See id*. at 341–42.

[89] *See* 17 U.S.C. § 102(a). Note that computer code is includable as a literary work under § 102(a)(1).

[90] *See* 17 U.S.C. § 101.

> identified separately from, and are capable of existing independently of, the utilitarian aspects of the article.[91]

Although courts in the United States have struggled when attempting to apply this doctrine, an integrated circuit layout design that serves only a functional purpose, with no aesthetic design intended or separable, would fail this useful article test.[92]

[25] Additionally, a work must be minimally creative to be eligible for copyright protection in the United States.[93] In *Feist Publications, Inc. v. Rural Telephone Service Co.*, the United States Supreme Court held that a telephone book was not copyrightable because it merely contained factual information that was compiled alphabetically, an arrangement which is not considered to be original.[94] Semiconductor topographies would easily meet this burden because designers cannot rely on formulaic approaches and mere facts to piece together an original circuit layout design.

[26] Given this brief introduction to copyright law, one can surmise that layout designs would likely be able to meet the copyright requirements but for the prohibition against providing copyright protection to useful articles. If a circuit designer did want some form of copyright protection for his semiconductor topography, he would have to include some aesthetic feature separable from its utilitarian function.[95] For example,

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[91] *Id.*

[92] *See* Universal Furniture Int'l, Inc. v. Collezione Europa USA, Inc., 196 F. App'x 166, 171 (4th Cir. 2006) (finding that furniture design is not copyrightable when the design aspects serve a mainly functional purpose); *see also* Brandir Int'l, Inc. v. Cascade Pac. Lumber Co., 834 F.2d 1142, 1143, 1148 (2d Cir. 1987) (holding that a squiggle-designed "ribbon" bicycle rack was a useful article and thus not copyrightable); ConWest Res., Inc. v. Playtime Novelties, Inc., 84 U.S.P.Q.2d 1019, 1023–24 (N.D. Cal. 2006) (determining that design aspects of body part sculptures were not separable from their utilitarian functions).

[93] Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 346–51 (1991).

[94] *Id.* at 354–63 (rejecting "sweat of the brow" as a minimum standard for copyrightability).

[95] 17 U.S.C. § 101.

some manufacturers may embed their logo into a chip design, sacrificing some functionality for aesthetic value.[96] But unless the entire mask work implemented this design throughout the layout design, only those portions with the embedded logo would be protectable under United States copyright law.[97] Furthermore, copyrighted works in the United States benefit from long terms of protection, most recently extended for most works to the author's lifetime, plus seventy years.[98] For these reasons, it seems somewhat impractical for manufacturers to expect international protection of their layout designs through copyright.

C. PATENT PROTECTION

[27] Since their inception in 1790, the United States patent laws have distinguished themselves from those of every other country.[99] With its first-to-invent patent system, the United States cuts against the norm of a first-to-file patent system seen in every other nation, with the recent exception of the Philippines.[100] Over the years, patent laws in the United States have become increasingly complex.[101] In order to understand the intended scope of international protection for layout designs of integrated circuits, it is important to understand the basics of the most common of United States patents: the utility patent.

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[96] *See Brandir*, 834 F.2d at 1146–48 (holding that the RIBBON Rack is not copyrightable because "any aesthetic elements cannot be said to be conceptually separable from the utilitarian elements").

[97] 17 U.S.C. § 101.

[98] 17 U.S.C. § 302(a).

[99] Patent Act of 1790, 1 Stat. 124.

[100] Sean T. Carnathan, *Patent Priority Disputes – A Proposed Re-Definition of "First-to-Invent,"* 49 ALA. L. REV. 755, 791–97 (1998) (discussing extensively the benefits of a first-to-invent versus a first-to-file patent system).

[101] Most of the intricacies of U.S. patent law are beyond the scope of this paper.

[28] An invention in a utility patent application must meet numerous statutory requirements to be eligible for a patent: in addition to providing an enabling disclosure of the invention, the application must cover patentable subject matter that is useful, novel, and non-obvious.[102] The subject matter requirement is relatively straightforward and incorporates the requirement of usefulness.[103] United States courts have broadly interpreted this requirement to include the patenting of business methods[104] and man-made bacterium,[105] while precluding protection for mathematical algorithms[106] and mental processes.[107] A circuit design topography would likely satisfy the statutory requirement as a new and useful article of manufacture.

[29] The novelty and non-obviousness requirements would be significantly more difficult to satisfy. The novelty requirement is significantly higher than the originality requirement in copyright law.[108]

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[102] 35 U.S.C. §§ 101–103, 112 (2006).

[103] *Id.* § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor.").

[104] State St. Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998).

[105] Diamond v. Chakrabarty, 447 U.S. 303 (1980).

[106] Gottschalk v Benson, 409 U.S. 63 (1972). This includes scientific formulas or principles, since, as a policy matter, it makes little sense to allow a patent for something that is infringed by living.

[107] *In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008) (en banc), *cert. granted sub nom.*, Bilski v. Doll, 129 S. Ct. 2735 (2009). Note also that perpetual motion machines are considered unpatentable because they do not meet the utility requirement. U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 706.03(a) (8th ed. 2008) ("A rejection on the ground of lack of utility includes the more specific grounds of inoperativeness, involving perpetual motion.").

[108] 35 U.S.C. § 102(a) (invention does not meet the novelty requirement if it "was known or used by others in this country . . . or described in a printed publication in this or a foreign country").

But even assuming a given circuit layout design is novel, it will be difficult to prove that it is non-obvious to a person having ordinary skill in the art.[109] This is especially true given the recent Supreme Court decision in *KSR v. Teleflex*,[110] where the Court determined that an invention may be obvious without a prior art teaching, suggestion, or motivation.[111] Currently, "obvious to try" may be sufficient to make an invention obvious over the prior art.[112] Nevertheless, semiconductor manufacturers may be able to distinguish *KSR* by noting that when designing a circuit layout, there are an infinite number of possible solutions.

[30] In order to be eligible for a patent, then, a circuit designer would be forced to add many claim limitations, narrowing the scope of his patent application so much that it would be useless in any international patent system.[113] For example, in the United States, a patent is only infringed if each element of a claim in the patented invention is found in the accused infringing product.[114] Thus, if just one of the claim limitations is absent from the accused device, a patent holder will be unable to prove infringement. Additionally, "writing a patent application supporting a claim with thousands of elements would be extremely complex, cumbersome, and expensive."[115]

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[109] 35 U.S.C. § 103.

[110] KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398 (2007).

[111] *Id.* at 419.

[112] *Id.* at 421 ("When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp[;] . . . the fact that a combination was obvious to try might show that it was obvious under § 103.").

[113] Dubey, *supra* note 73.

[114] This is due to the fact that the United States implements a peripheral claiming system. RIDSDALE ELLIS, PATENT CLAIMS §§ 4–9 (1949).

[115] Dubey, *supra* note 73.

[31] Useful designs are also eligible for a United States patent.[116] While the design patent system in the United States may seem like a likely candidate for incorporation of layout design protection, it fails for a similar reason as copyright: a design patent only covers the design which is "primarily ornamental" and nonfunctional.[117]

[32] For all these reasons, the United States patent system currently in place is not flexible enough to sufficiently cover design topographies.

D. WHERE MIGHT LAYOUT DESIGN PROTECTION FIT?

[33] The United States Congress asked this question over twenty-four years ago, when trying to determine how to best protect semiconductor topographies.[118] As demonstrated above, neither patent nor copyright law is suitable for protecting semiconductor layout design. In fact, the United States Copyright Office has refused to register design layout patterns where no separate aesthetic aspects were demonstrated.[119] Moreover, Congress wanted a more expeditious process for registering layout designs than the cumbersome patent application process.[120] Hence, it would seem that the congressional decision to implement a *sui generis* system of protection for mask works would be perfectly acceptable.[121] Nevertheless, the semiconductor industry has changed dramatically over the past twenty-four years.

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[116] 35 U.S.C. § 171 (2006) (covering any "new, original and ornamental design for an article of manufacture")

[117] U.S. PATENT & TRADEMARK OFFICE, *supra* note 105, § 1504.01.

[118] *See* H.R. REP. NO. 98-781, at 3–4 (1984).

[119] *Copyright Protection for Semiconductor Chips: Hearing on H.R. 1028 Before the Subcomm. on Courts, Civil Liberties, and the Administration of Justice of the H. Comm. on the Judiciary*, 98th Cong. 77 (1983) (statement of Dorothy Schrader, Associate Register of Copyrights for Legal Affairs).

[120] S. REP. NO. 98-425, at 8 (1984).

[121] *See* 17 U.S.C. § 904(b) (2006).

[34] In addition to the implementation of the Washington Treaty into the TRIPS Agreement in 1994, integrated circuits have become exponentially smaller, faster, and more complex.[122] Over the same period, the United States has only made minor amendments to the Semiconductor Chip Protection Act, the last being in 1991, nearly four years before the TRIPS Agreement became effective.[123] And other semiconductor giants such as China and Japan have been equally slow in making modifications to their legislative actions, failing to take advantage of all of the potential advantages afforded in the Washington Treaty and the TRIPS Agreement.[124]

[35] In effect, although international implementation of layout design protection was initially ahead-of-the-curve, legislative inaction has rendered the current system outdated. The United States is a prime example: Congress was wise in forming a *sui generis* approach to semiconductor protection; however, present semiconductor topography protection does not protect abstract computer models of layout designs used to reproduce semiconductor chips today. This leads to the simple conclusion that the pitfalls of copyright-like and patent-like protection for layout designs should be reexamined in addition to the pieces left out of the current system of protection. By doing so, we may discover a more flexible form of protection that can be tweaked with advances in innovative technological semiconductor practices. Perhaps, by modeling layout design protection on the patent system rather than the copyright system, Congress will be able to formulate stronger patent-like protection without the cumbersome procedural costs as seen in the traditional patent system used today.[125]

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[122] *See supra* Parts I.A, I.C.

[123] Semiconductor International Protection Extension Act of 1991, Pub. L. No. 102-64, 105 Stat. 320.

[124] *See supra* Part III.

[125] This is merely a suggestion, as the scope of this paper is limited to the goal of bringing about the idea that such a system may be practicable.

CONCLUSION

[36] Semiconductor manufacturers and integrated circuit designers have much to gain in seeking more strict international protection for layout designs. The Washington Treaty/TRIPS Agreement leaves open possibilities of intellectual property protection for computer models of integrated circuits, as well as longer terms of protection. Although copyright and patent-like protection may be available as an alternative in WTO member nations, these systems are far too rigid to adapt to the needs of the semiconductor industry. This leaves WTO members with the task of modifying outdated legislation to incorporate more effective systems of international protection. Current protection under the TRIPS Agreement, along with the powerful WTO DSU, has put into force the right first steps in fully protecting layout designs of integrated circuits. By taking a second look at its own copyright and patent systems, as well as the deficiencies in the Semiconductor Chip Protection Act of 1984, the United States has the opportunity of once again leading the way into a more extensive system of international intellectual property protection for design topographies.