

3-21-2014

Copyright and 3D Printing

James Barker

Follow this and additional works at: <https://digitalcommons.law.uw.edu/techclinic>

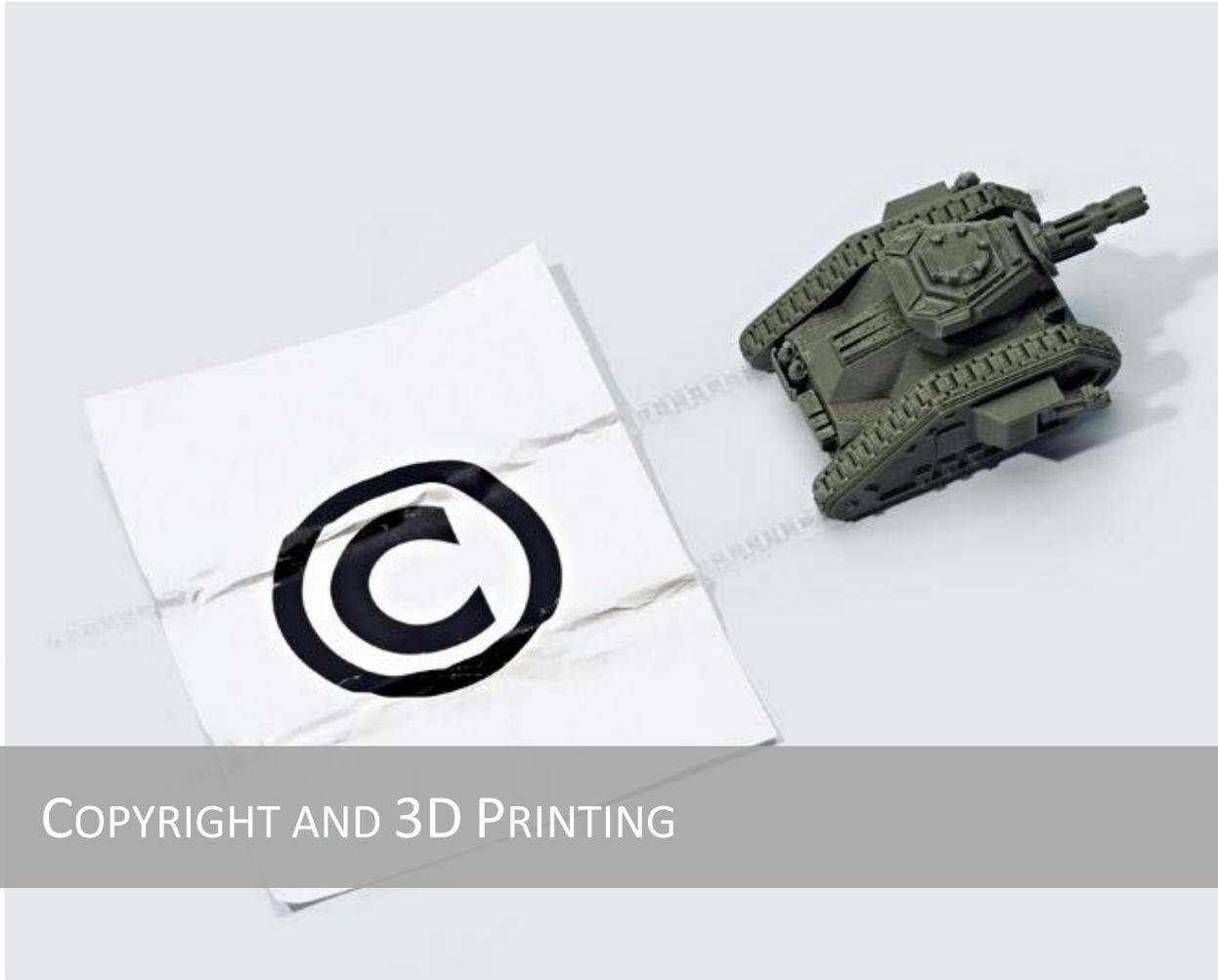
 Part of the [Intellectual Property Law Commons](#), and the [Science and Technology Law Commons](#)

Recommended Citation

James Barker, *Copyright and 3D Printing*, (2014).

Available at: <https://digitalcommons.law.uw.edu/techclinic/14>

This Book is brought to you for free and open access by the Centers and Programs at UW Law Digital Commons. It has been accepted for inclusion in Technology Law and Public Policy Clinic by an authorized administrator of UW Law Digital Commons. For more information, please contact cnyberg@uw.edu.



1

¹ Image credits: Jon Ippolito, Print your own Legos, game figures--if the lawyers don't stop you first, NMDnet.org, <http://www.nmdnet.org/2012/06/04/print-your-own-legos-game-figures-if-the-lawyers-dont-stop-you-first/> (2012), Photo by Andrew B. Myers

Abstract

The implications of 3D printing are manifold, with some commentators anticipating permanent market disruption in the massive (and ill-defined) field of *small physical things*. I begin this paper by asserting that the opportunities afforded by 3D printing are so attractive that it is a mere matter of time before an explosion of use; but that the diffusion of manufacturing to the consumer level is poised to put individual end-users in uncomfortably close contact with intellectual property law.

By analogy to the physical CD-distribution model, and the ways in which it broke down in the Napster era, (and with sensitivity to the technological and physical limitations of 3D printing,) I will argue that the copyright landscape as it currently exists is not up to the challenge of managing consumer-grade 3D printing, but that legal clarification as to the copyright eligibility of CAD designs and products can substantially improve this situation.

Moreover, I will argue that business should apply copyright delicately to 3D printing. Rather than enforcing copyrights on a similarity basis, industry should instead adopt permissive models of licensing to manage 3D-printable parts, thereby letting go of a part of the market in order to preserve consumer goodwill and develop new markets.

Introduction

With the development of the modern press, an era of inexpensive and mass-produced literary work was born, creating the publishing industry. Copyright infringement developed alongside, to protect the authors and publishers from unauthorized duplication, and it was relatively simple in a time when, to capitalize on infringement, an infringer must engage in a practically *commercial* venture. Likewise in music, the development of cheap and mass-

producible phonorecords heralded an era of big music, and created the rock stars and the pop stars, and the massively lucrative “record label” business model.

In modern times, technology has made infringement cost-effective for the individual consumer, and content providers are placed in the unenviable position where infringers and customers may be indistinguishable. Literary and artistic works are readily available on the internet. By the 90’s, it was easy to find and print such works on a \$50 Inkjet Printer in any home office. Music, ripped from commercial phonorecords, appears quickly on the internet and can be recopied to additional storage media or to CD mixtapes at the same time. The legal implications of this ease of copying continue to propagate.

Ink printers reproduce image and text. CD burners reproduce digital phonorecords. Now, **3D printers** reproduce *physical objects*. Originating in 1984 as a form of rapid prototyping, 3D printing has recently come in sight of consumer-grade pricing. Machines once cost on the order of \$20,000, but in 2013 it was possible to obtain comparable equipment on the order of \$500. (Some commentators report consumer-grade 3D printers as low as \$350.)² Given this history and environment, it is no surprise that we might expect legal difficulties to arise around intellectual property and 3D printing. I will first address the legal regime as it stands currently, and then address its implications and interactions with broad societal goals, with the patent laws, and issues arising with piracy in the digital space.

² Stephanie Noble, *Researching Emerging Technology*, 42-AUG Colo. Law. 103 (2013)

Copyright Regime in 3D Printing Technology

The technology of 3D printing, even in the consumer space, is probably legal as of *Sony Corp. v. Universal City Studios, Inc.*, (Sony)³ and *Metro-Goldwyn-Meyer Studios Inc. v. Gorkster, Ltd.* (Grokster).⁴ However, the promotion of infringing works, even physical objects, may create liability under Grokster. Unlike Grokster, which dealt with the distribution of audio/visual works (which are the main focus of copyright law), future case law in 3D printing will include physical works which may have significant functional characteristics.

3D printable works may also interact with the eligibility requirements of originality, fixation, and functionality in rather unconventional ways.⁵ Dasari argues that digital models and the physical models which they represent are both distinct expressions of ideas, and copyrightable independently.⁶ However, she cautions that the functionality doctrine would substantially restrict copyright's reach to nonfunctional items or decorative (partial) portions of functional items, resulting in a two-tiered regime where the physical objects may be only partially covered, but the digital models would be offered greater protections as works of authorship.⁷ This conclusion is not immediately clear to me. I would posit that the 3D print schematic, being at its essence an instruction sheet to construct a product, may be functional as to

³ *Sony Corp. v. Universal City Studios, Inc.*, 464 U.S. 417 (1984) held that companies which manufacture home recording machines are not liable for contributory infringement because the machines have significant noninfringing uses and are sold for legitimate purposes.

⁴ *Metro-Goldwyn-Meyer Studios Inc. v. Gorkster, Ltd.*, 545 U.S. 913 (2005) held that producing a technology that aids infringement, and promoting that use for infringement, can be grounds for suit for inducing copyright infringement.

⁵ See Haritha Dasari, *Assessing Copyright Protection and Infringement Issues Involved with 3D Printing and Scanning*, 41 *AIPLA Q.J.* 279 (2013) at 288-289

⁶ *Id.* at 289-290

⁷ *Id.* at 291

the purpose of manufacturing that object; so I would predict that courts will have mixed outcomes on this question. An intermediate position is supported by Weinberg, who posits that designs based on physical objects are only copyrightable insofar as they contain additional copyrightable elements, based on the copyright statute.⁸ He further divides the universe of digital 3D models into scans (which he views as not protected by copyright) and objects designed from scratch by computer-aided design (CAD).⁹ Digital files produced by scanning techniques, which presently aim to create a perfect replica of a physical object, he views as purely functional despite requiring complex, labor-intensive and skilled use to obtain, and even when the scanned object is purely creative.¹⁰ In contrast, original creation by CAD might create copyrightable subject matter in the resulting design; but if the design file is merely the only way to represent an object in virtual space, and particularly if the object is itself useful, then Weinberg posits that copyright protection cannot attach to the digital file, because to do so would overstep the bounds of copyright by preventing the representation of that object in virtual space.

11

Regarding infringement – because 3D printed models that are independently produced, or produced from a 3D scan of an original work, are unlikely to be identical to the original, we fall

⁸ See Michael Weinberg, Public Knowledge, What's the Deal with Copyright and 3D Printing?, <http://www.publicknowledge.org/news-blog/blogs/whats-the-deal-with-copyright-and-3d-printing> (2013) at 13, citing the copyright statute, 17 U.S.C. § 101: “The design of a useful article ... shall be considered [a work eligible for copyright protection] **only if, and only to the extent that, such design incorporates pictorial, graphic, or sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article.**” (Emphasis by Weinberg)

⁹ Id. at 15

¹⁰ Id. 3D Scanning is contrasted here by Weinberg with photography, which was originally viewed as mere recordation and therefore not copyrightable, but has since been granted extensive copyright protections. See, e.g., *Burrow-Giles Lithographic Co. v. Saroni*, 111 U.S. 53 (1884) at 15, 18

¹¹ Id. at 17

under the substantial similarity regime in copyright. This puts courts in the position of applying the gestalt “total concept and feel” test which, according to Dasari, is likely to result in findings of infringement when a defendant produces unauthorized copies of a *copyrighted digital model*.

¹² Following Weinberg’s argument, creating a copy of a scanned work will require the permission of the owner of the copyright in the original – not the creator of the scan – if it is a creative work, and no permissions at all if it is a scan of a purely useful work. ¹³ Regarding files that were independently created, it is likely that the file is independently protected as a work of authorship, and that objects created from it may be protected also as derivative works. ¹⁴

Weinberg argues that 3D printing already fits within the landscape of the copyright laws, but is imperfect. ¹⁵ He posits that the distribution problem – digital sharing of potentially infringing works – is covered by the DMCA which “has been able to handle copyright-protected 3D printing-related content about as well as it handles everything else.” ¹⁶ At this juncture, it appears that controversies over infringing content have remained in the world of DMCA notice, takedown, and counter-notice procedure, without rising to litigation. A problem that has already arisen, noted by Weinberg, is that the DMCA procedure affords content creators with leverage in the form of takedown requests without judicial oversight, at least at the initial stage, resulting in abuse of the DMCA system where a content creator may not hold a valid copyright. ¹⁷ Weinberg

¹² See Dasari, *supra*, at 306-307

¹³ See Weinberg, *supra*, at 19

¹⁴ *Id.* at 19, See also Dasari at 289-290

¹⁵ *Id.* at 5

¹⁶ *Id.*

¹⁷ *Id.* at 6-7

refers to the “Penrose triangle” incident, regarded as the first DMCA takedown notice by a 3D model creator to another 3D model creator, in which designer Ulrich Schwanitz created and uploaded (to Thingiverse.com) a model that creates the famous optical illusion, to have his design mimicked successfully shortly thereafter by another user.¹⁸ Schwanitz courted controversy by filing a DMCA takedown notice against the other user, despite a likelihood that his own design fell outside the bounds of copyrightable subject matter. The ability for companies and individuals to use judicial or pseudo-judicial systems without oversight is potentially chilling to the field, which would be potentially subject to burdensome over-enforcement. As noted by commentator Rideout, it was even unclear exactly which rights Dr. Schwanitz referred to: be they rights in the design files he had produced or the physical object to which it referred – which illustrates the chilling power of the DMCA.¹⁹

Weinberg’s other major complaint with the coverage of 3D printing in conventional copyright law is that 3D printed objects will exacerbate the already blurred lines in what constitutes copyrightable subject matter among physical objects.²⁰ He points out that printable objects fall along a continuum: some are purely artistic, such as figures or characters from popular media, for which copyright protection is relatively clean and conventional; some are purely functional, like replacement parts or small household goods and hardware (such as a door hinge); and some fall in-between, with both structural and artistic elements, which demand that a

¹⁸ Id. at 7

¹⁹ See Brian Rideout, *Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing*, 5 J. Bus. Entrepreneurship & L. 161 (2011) at 166

²⁰ Id. at 8

court exercise the judicial doctrine of severability.²¹ Notably, the severability doctrines are inconsistent as between circuits, and arguable, meaning that the advent of 3D printing may well produce test cases that stretch the boundaries of this doctrine.

Broad Implications of 3D Printing on Manufacturing

Rejeski discusses a phenomenon he terms the “Thingiverse world,” based on the real and growing web repository of 3D printing source code and schematics (<http://www.thingiverse.com>).²² The “Thingiverse world” represents the future where manufacture of small durable goods – and much more – is decentralized, crowd sourced, readily accessible and *cheap*. He joins the chorus in positing that “intellectual property protections remain ambiguous,” and also stresses the importance of the coming change with a warning that profound societal changes have historically followed major upsets in patterns of production.²³

²¹ Id. at 8-13, listing the various tests for severability, including the “[whether] artistic elements play a primary or secondary role in the object” rule from *Kieselstein-Cord v. Accessories by Pearl, Inc.*, 632 F.2d 989 (2nd Cir. 1980) which dealt with decorative belt-buckles and allowed severable protection for the artistic design; the “[whether] potentially severable elements were driven by utilitarian needs” rule from *Carol Burnhart Inc. v. Econ. Cover Corp.*, 773 F.2d 411 (2nd Cir. 1985) which dealt with sculpted mannequins and found that they were not copyrightable, despite arbitrary variations, because the variations all served the underlying purpose of displaying clothes; the “[whether] there are creative elements that were designed without regard for functional requirements” rule from *Brandir Int’l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142 (2nd Cir. 1987) in which highly minimalistic bike racks, which were alleged also to be sculpture, were not protected because the minimalist artistic elements were inseparable from the industrial design; and finally the “[whether] independent, artistic judgment drove the creation of the non-functional elements” test from *Pivot Point Int’l v. Charlene Prods.*, 372 F.3d 913 (7th Cir. 2004), in which the court protected severable aspects of a mannequin head for hair styling.

²² See David Rejeski, *The Next Industrial Revolution: How We Will Make Things in the 21st Century and Why it Matters*, 43 *Envtl. L. Rep. News & Analysis* 10232 (2013)

²³ Id. at 10233

Piracy

Finocchiaro raises the point that 3D printing changes the landscape of intellectual property infringement by allowing imitators to bring goods to the market “as quickly as innovators.”²⁴ In a similar vein, he summarizes the nature of peer-to-peer transfer of digital models for 3D printers, or “Napster Fabbing,” as coined by the Rapid Prototyping Journal, as a distribution scheme ready-built to provoke as much industry disruption to consumer-product manufacturers as Napster and its ilk did to the music industry.²⁵ Referring back to the image on the cover page, Jon Ippolito cites to accounts of hobbyist parents using 3D printers in very attractive ways that clearly violate the rights of innovators.²⁶ In the first half, he describes the travails of one Thomas Valenty, who painstakingly crafted custom 3D-printable models to be used for the tabletop game Warhammer™. (The image is of a Warhammer™ tank.) When he uploaded the files for free public use, he was slapped with a DMCA notice.²⁷ In the latter half, he describes a parent using 3D printing to sidestep the age-old problem, and one with which I am personally familiar, of intercompatibility between Lego™, K’Nex™, and other building toys. Using a 3D printer, Golan Levins (the parent) and his student Shawn Sims created, and

²⁴ Charles W. Finocchiaro, Personal Factory or Catalyst for Piracy? The Hype, Hysteria, and Hard Realities of Consumer 3D Printing, 31 *Cardozo Arts & Ent. L. J.* 473 at 474 (2013) citing *The Printed World*, *Economist*, <http://www.economist.com/node/18114221/print/> (2011)

²⁵ *Id.* at 475

²⁶ See Jon Ippolito, Print your own Legos, game figures--if the lawyers don't stop you first, NMDnet.org, <http://www.nmdnet.org/2012/06/04/print-your-own-legos-game-figures-if-the-lawyers-dont-stop-you-first/> (2012)

²⁷ *Id.* citing Clive Thomson, 3D Printing’s Legal Morass, *Wired*, <http://www.wired.com/design/2012/05/3-d-printing-patent-law/> (2012)

distributed for free, a large set of interconnection pieces called the “Free Universal Connector Kit”.²⁸

Levins’ kit has been hailed as a triumph of ingenuity, and also an unabashed shot at intellectual property rights, not least for its unapologetic acronym. Levins and Sims are outspoken about their belief in a free space for 3D printing invention and are openly critical of the ways in which large companies have used patent and copyright to attack other 3D-printing DIY’ers. Although it appears that Levins and Sims are safe for now, having printed only “functional” toys without the trademark logo and on which the patents have expired, Greenberg cites other cases where rights holders have been successful at enforcing cease-and-desist or DMCA notices against distributors of 3D-printing code.²⁹ Finocchiaro lists many more such acts of infringement which have not yet faced enforcement, including: the Inception (movie) top, the Darth Vader helmet, the “Companion Cube” from the computer game “Portal” by Valve.³⁰ Notably, no act of infringement in 3D printing has yet gone to trial, therefore the legal landscape is murky.³¹

Most commentators agree that a tipping point is cost dependent (and possibly also quality dependent) and that, for now, 3D printing is not yet mainstream, being expensive and lacking access to materials that give the “finished” look to products conventionally manufactured.

²⁸ See Andy Greenberg, How a Geek Dad and His 3D Printer Aim to Liberate Legos, Forbes Magazine, <http://www.forbes.com/sites/andygreenberg/2012/04/05/how-a-geek-dad-and-his-3d-printer-aim-to-liberate-legos/> (2012)

²⁹ Id.

³⁰ See Finocchiaro, *supra*, at 478

³¹ Id. at 480

Although, 3D printing services such as Shapeways (<http://www.shapeways.com/>) may effectively ease us through this tipping point by using limited centralization to offer commercial-grade 3D-printing services.³² Likewise, the economic costs to manufacturing businesses are small compared to the litigation costs while the 3D printing community remains small.³³ However, with costs for desktop units poised to fall below \$500 (the XYZprinting Da Vinci 1.0 3D Printer by XYZprinting now available for preorder on Amazon.com for \$499; and the MakerBot Replicator 2 Desktop 3D Printer for \$2199.00, both prime-eligible with free shipping) 3D printing may be on the verge of mass adoption.

Importantly, the form of piracy in the 3D printing realm will differ significantly from the form of piracy that dominated the Napster era in that physical products are very difficult to copy *exactly*, except by painstaking measurement or scanning, and that products copied by 3D printing are often no less expensive than the legitimate product.³⁴ The most likely form of piracy, then, would be in duplication or infringement of copyrighted designs or characters, thus invoking a similarity analysis.

Useful Arts and Patents: Medical Devices

Much of the discussion of 3D printing arises in the patent context: this author's search for patent-related case law turns up suits between 3D printer manufacturers over 3D printing technology, so far, but suits for infringement based on 3D-printed objects and devices cannot be

³² Id. at 499

³³ Id. at 479

³⁴ Id. at 501-502

far behind. Trout et. al. posit much the same: that a substantially new and unregulated channel of distribution and production is both a marvel and a likely source of “a host of patent and copyright disputes.”³⁵ Many of the problems with patent enforcement raised by Trout et. al. I see as valid in the context of copyright as well. It is worth noting that current consumer-grade 3D printing is cost-limited to additive processes with thermoplastics, but it is permissible speculation that commercial-grade processes (which can produce ceramics or metals) will come down in price until the items that can be produced at home are not at all limited to small plastic objects. Trout et. al. list, as examples of 3D-printable items, “metal hardware, electronic resistors and orthopedic implants ... [and even] more complex machines such as a crescent wrench, with no post-fabrication assembly necessary.”³⁶ In light of this complexity, there is no reason why 3D printers cannot produce copyrighted sculptural or decorative works. Difficulties to enforcement in the patent context, particularly in medical devices, include the decoupling of manufacturer from designer – geographically and legally. Furthermore, it creates numerous manufacturers who overlap directly with the sought-after end-users. In the medical device setting, filing suit against infringers would create the dangerous precedent of suing hospitals, doctors, EMT’s, against whom litigation is “undesirable” both in terms of scale and public perception.³⁷

Translating back to the copyright context with an example, consider fan-created models based on popular television shows, such as the U.S.S. Enterprise D (design is copyright # VAu000344526, registered in 1990). The success of merchandizing and licensing depends on the

³⁵ See Kyle J. Trout, Esq. and Justing N. Mullen, Kramer Amado, Preserving the Value of Medical Device Patents during the Rise of Three-Dimensional Printing, 20 No. 14 Westlaw Journal Intellectual Property 1 (2013)

³⁶ Id.

³⁷ Id. at 3

longstanding appetite of the fan base. This support might be quickly destroyed by suits against individual fans, and substantial recovery against individual infringers is likely – for that matter, it’s unclear how copyright holders would determine who had manufactured any given protected sculpture. Trout et. al. conclude that an approach which attacks the end-users of 3D printers is futile, and therefore that patent practitioners (in medical devices) should instead include claims that “will be directly infringed by a party who provides digital device designs for use with 3D printers.”³⁸ This conclusion brings to mind that copyright law might adapt by considering the code of a 3D design (ones and zeroes) a derivative work of the underlying sculpture, making dissemination of the code itself an act of infringement – a theory assumed already by rights holders, but not yet tested in court.

Public Policy around Breadth of Use of 3D Printers

Johnson also characterizes 3D printing as an impending “technological and manufacturing revolution,” but focuses on its implications for personal safety, security, and fourth-amendment rights in the context of printed firearms.³⁹ He cites the potential for this technology to manufacture: “jewelry, gears, brackets, and toys ... prosthetic hands, human organs, airplanes, and potentially even [components of] a lunar base.”⁴⁰ In light of the broad and beneficial applications of 3D printing, it seems important for the advancement of the public interests to remove roadblocks to improvements in the technology; and an open marketplace of ideas and crowd-sourced contribution may help to drive this industry forward.

³⁸ Id. at 6

³⁹ See Julian J. Johnson, Print, Lock, and Load: 3-D Printers, Creation of Guns, and the Potential Threat to Fourth Amendment Rights, U. Ill. J.L. Tech. & Pol’y 337 (2013)

⁴⁰ Id. at 338

However, mass-infringement using 3D printing is unlikely, as pointed out by Dasari; instead, 3D printing almost promises that many individuals – the target market and not conventional manufacturers – will each produce a small number of infringing articles.⁴¹ Although Dasari posits that the quality of 3D printed articles is insufficient to pose any replacement value (which is disputed already, but would probably soon be obviated by improvements in the technology if it were true,) she affirms that a complete artistic substitution is not necessary for infringement.⁴² This mitigated tone is shared by Finocchiaro, who posits that 3D printing is dissimilar from prior disruptive technologies, (such as the online sharing of music, which reduced the distribution cost of pirated content effectively to zero with no sacrifice to quality,) because the cost and convenience of obtaining articles by piracy with 3D printing is not now, nor likely to be, significantly better than that of conventional manufacture and distribution, and because highly sophisticated products will likely never be feasible to produce using 3D printing methods.⁴³

Solutions to Piracy and Legal Uncertainty: Commons Licensing

Consumer-grade printing and distributed design, together, may support a creative environment ripe for innovation. However, as Dasari argues, when such 3D printed products create demand and also infringe, the enforcement of copyrights will inevitably create a market

⁴¹ See Haritha Dasari, *supra*, at 308

⁴² *Id.* at 309

⁴³ See Finocchiaro, *supra*, at 507

gap.⁴⁴ She goes on to suggest that an effective model of combating piracy would revolve around licensing 3D model creators so as to legalize such creative endeavors and distribute the revenue stream in such a way as to promote innovation with this technology.⁴⁵ Weinberg agrees that permissive licensing is an attractive option, particularly under a solution like a Creative Commons license, but resurrects the issue of copyright-eligibility in physical works and digital representations of them, stating simply that “you cannot license what you do not have.”⁴⁶ He goes on, however, to a strong position on licensing even non-copyrightable files and objects on the grounds that it still offers legal certainty to users, which is in itself valuable even if the underlying rights are not; that it hedges against future changes in the copyright law which may occur to respond to this industry; and that it offers a social signaling function whereby a work’s creator tells the world to use his work in the expanding “ecosystem of creation, design, and innovation.”⁴⁷

Concluding Remarks

I agree with Weinberg’s assessment: permissive licensing schemes, such as Creative Commons, are a viable solution; but I would caution that much depends on the affirmative buy-in of creative companies and their willingness to adapt and compete in a novel business environment. Clarifying litigation in the future appears, to me, to be a virtual certainty to resolve the issues of ownership of copyrights in CAD models, whether scanned or programmed, and

⁴⁴ Id. at 284

⁴⁵ Id.

⁴⁶ See Weinberg, *supra*, at 20

⁴⁷ Id.

whether of useful or artistic objects; and I would anticipate preferential hair-splitting between these categories. Specifically: I would predict that only the programmed CAD designs of novel structures will be consistently protected by copyright in their own right. I see no compelling reason why these factors wouldn't shake out on their own, given time, and I anticipate a vibrant and distributed 3D printing industry and culture, with or without legislative interference.

Cited References:

Cases

- Sony Corp. v. Universal City Studios, Inc., 464 U.S. 417 (1984) held that companies which manufacture home recording machines are not liable for contributory infringement because the machines have significant noninfringing uses and are sold for legitimate purposes.
- Metro-Goldwyn-Meyer Studios Inc. v. Grokster, Ltd., 545 U.S. 913 (2005) held that producing a technology that aids infringement, and promoting that use for infringement, can be grounds for suit for inducing copyright infringement.
- Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53 (1884)
- Kieselstein-Cord v. Accessories by Pearl, Inc., 632 F.2d 989 (2nd Cir. 1980)
- Carol Burnhart Inc. v. Econ. Cover Corp., 773 F.2d 411 (2nd Cir. 1985)
- Brandir Int'l, Inc. v. Cascade Pac. Lumber Co., 834 F.2d 1142 (2nd Cir. 1987)
- Pivot Point Int'l v. Charlene Prods., 372 F.3d 913 (7th Cir. 2004)

Law Review Articles

- Haritha Dasari, Assessing Copyright Protection and Infringement Issues Involved with 3D Printing and Scanning, 41 AIPLA Q.J. 279 (2013) at 288-289
- Stephanie Noble, Researching Emerging Technology, 42-AUG Colo. Law. 103 (2013)
- David Rejeski, The Next Industrial Revolution: How We Will Make Things in the 21st Century and Why it Matters, 43 Env'tl. L. Rep. News & Analysis 10232 (2013)
- Julian J. Johnson, Print, Lock, and Load: 3-D Printers, Creation of Guns, and the Potential Threat to Fourth Amendment Rights, U. Ill. J.L. Tech. & Pol'y 337 (2013)
- Brian Rideout, Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing, 5 J. Bus. Entrepreneurship & L. 161 (2011)
- Charles W. Finocchiaro, Personal Factory or Catalyst for Piracy? The Hype, Hysteria, and Hard Realities of Consumer 3D Printing, 31 Cardozo Arts & Ent. L. J. 473 at 474 (2013) citing The Printed World, Economist, <http://www.economist.com/node/18114221/print/> (2011)
- Julian J. Johnson, Print, Lock, and Load: 3-D Printers, Creation of Guns, and the Potential Threat to Fourth Amendment Rights, U. Ill. J.L. Tech. & Pol'y 337 (2013)

Periodicals and White Papers

- Michael Weinberg, Public Knowledge, What's the Deal with Copyright and 3D Printing?, <http://www.publicknowledge.org/news-blog/blogs/whats-the-deal-with-copyright-and-3d-printing> (2013)
- Jon Ippolito, Print your own Legos, game figures--if the lawyers don't stop you first, NMDnet.org, <http://www.nmdnet.org/2012/06/04/print-your-own-legos-game-figures-if-the-lawyers-dont-stop-you-first/> (2012)
- Clive Thomson, 3D Printing's Legal Morass, Wired, <http://www.wired.com/design/2012/05/3-d-printing-patent-law/> (2012)

- Andy Greenberg, How a Geek Dad and His 3D Printer Aim to Liberate Legos, Forbes Magazine, <http://www.forbes.com/sites/andygreenberg/2012/04/05/how-a-geek-dad-and-his-3d-printer-aim-to-liberate-legos/> (2012)
- Kyle J. Trout, Esq. and Justin N. Mullen, Kramer Amado, Preserving the Value of Medical Device Patents during the Rise of Three-Dimensional Printing, 20 No. 14 Westlaw Journal Intellectual Property 1 (2013)

Background References and Further Reading

Books

- Hod Lipson and Melba Kurman, Fabricated: The New World of 3D Printing, John Wiley & Sons (2013)

Law Review Articles

- David Doherty, Downloading Infringement: Patent Law as a Roadblock to the 3D Printing Revolution, 26 Harv. J.L. & Tech. 353 (2012)
- John M. Newman, Copyright Freeconomics, 66 Vand. L. Rev. 1409
- Nora Freeman Engstrom, 3D Printing and Product Liability: Identifying the Obstacles, 162 U. PA. L. Rev. Online 35 (2013)

Periodicals

- R.B. Ruhl, Preparing Students for the Big Reinvention in Law, 60-AUG Fed. Law. 36 (2013)
- Richard Acello, Call it the Apple Effect | Firm Puts its Mark on Design Patents, 99-AUG A.B.A. J. 32 (2013)
- Michael Weinberg, Public Knowledge, 3D Printing, Matisse, and the Arbitrariness of Copyright Terms, <http://www.publicknowledge.org/news-blog/blogs/3d-printing-matisse-and-arbitrariness-copyrig> (2013)
- Michael Weinberg, Public Knowledge, Thanks to 3D Printing and Open Source Hardware, Patent May be on the Cusp of a Copyright Moment <http://www.publicknowledge.org/news-blog/blogs/thanks-to-3d-printing-and-open-source-hardware-patent-may-be-on-the-cusp-of-1> (2013)
- Vogel, B. J., Bloomberg Law, Casting 3D Printing's Coming IP Litigation: Usual Suspects and Dark Horses. <http://about.bloomberglaw.com/practitioner-contributions/casting-3d-printings-coming-ip-litigation-usual-suspects-and-dark-horses/> (2014)