

Printing a Revolution: The Challenges of 3D Printing on Copyright

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The ever-evolving nature of technology has brought us to the brink of yet another revolution—this time by literally adding a new dimension to printing. Three-dimensional (“3D”) printing carries immense potential for self-creation and mass-production of copyrighted objects. With several websites and designers propelling the growth of 3D printers and the availability of Computer-Aided Design files to feed such printers, copyright-protected articles face the threat of rampant infringement. If unchecked, the losses that copyright holders across the globe might incur are enormous. Hence it has become pertinent to gauge whether or not the extant copyright laws are flexible to accommodate this revolutionary technological leap. This Essay, briefly treading upon the operational aspects of 3D printing, predicts the copyright quandaries inherent to its preposterous printing capabilities. Recognizing that issues of copyright infringement and liability of intermediary websites that share infringing designs are likely to arise with such evolved technology, this Essay argues that it is time the laws be molded to better accommodate the capabilities and benefits of 3D printing. The authors also draw support from historical parallels where technological innovations have shaken our legal systems. While introducing amendments, however, due caution must be exercised to not hinder innovation at the expense of public or proprietary interests. This Essay concludes by recommending feasible benefit-sharing mechanisms that are in the interest of all the stakeholders and also further the innovative capabilities of 3D printing.

I. INTRODUCTION

3D printing is . . . a revolution that will transform our society . . .

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[and] give rise to thousands of new businesses; . . . new processes of intellectual property management, and create an entrepreneurial and financial tidal wave that could one day dwarf the Internet in its scale and disruptive power. . . . There probably isn't a better example of creative destruction than what is happening in the world of 3D.¹

Technology is constantly evolving. A decade ago, it would have seemed surreal to imagine a printer delivering more than just a copy of literary works. Today, three-dimensional ("3D") printing ("3Dp") has made its way from theory to a practical reality. First invented by Chuck Hull in 1986, this technology has now pervaded the industry and become ubiquitous.² Through 3Dp, the possibilities of self-production are endless—buildings, toys, food, weapons, medicines, and human organs—everything can be printed. There is little doubt that, with time, 3D printers will become as commonplace as two-dimensional ("2D") printers.

Due to its disruptive potential, however, several questions arise about the adverse impact of 3Dp on intellectual property rights. The technology enables copyright-protected objects to be scanned and reproduced, allowing for easy infringement.³ This is likely to lead to an increase in counterfeit and pirated products, similar to that which occurred with movies and music following the advent of file-sharing. If this parallel holds true, the issue of intermediary liability for websites that enable or contribute to infringement will also have to be addressed.

Copyright laws have not yet evolved adequately to address such changes in technology. It is therefore important to decide how copyright law must be amended to resolve issues that are likely to arise from 3Dp. The law must not sacrifice technological advancement under the guise of protecting rights. Instead, it should aim to strike a balance between the rights of copyright holders and users.

This Essay examines how this ever-elusive balance can be struck, discussing issues such as legal lacunae, piracy, and intermediary liability. It will also provide recommendations for the development of a framework

¹ Nick Graham, *3D Printing Will Change the Way We Undress*, BUS. INSIDER (Jan. 25, 2014, 9:00 AM), <http://www.businessinsider.com/3d-printing-will-change-how-we-undress-2014-1>.

² Charles W. Hull Co-Founder and Chief Technology Officer, 3DSYSTEMS, <http://www.3dsystems.com/files/downloads/3D-Systems-Charles-W-Hull-Executive-Bio.pdf> (last visited June 5, 2016).

³ See, e.g., *Geomagic Design X: The Fastest Path from 3D Scans to Your CAD Software*, 3DSYSTEMS, <http://www.rapidform.com/products/xor/overview/> (last visited June 5, 2016).

that will benefit all relevant stakeholders. The recommendations will be aimed at promoting the growth of 3Dp by suggesting changes to the current fair-use provisions and encouraging mutually-beneficial coordination between copyright holders and creators of 3D printed works.

II. HOW DOES 3DP WORK?

3Dp relies on additive manufacturing processes to transform virtual commands into physical objects.⁴ As opposed to the traditional manufacturing methods of carving/cutting (subtractive manufacturing), 3D printers build the article, with finer precision,⁵ layer by layer (additive manufacturing) until the article is completed.⁶

The digital files that feed a 3D printer may be prepared using a Computer-Aided Design (“CAD”) or animation modeling software that creates a fresh blueprint of the object.⁷ Alternatively, a 3D scanner may be utilized to scan an object or designs may be purchased from online repositories such as Thingiverse, Shapeways, YouMagine or Pinshape.⁸

CAD “slices” or divides the blueprint or the scanned image into several hundreds or thousands of layers to enable a 3D printer to read and print the object.⁹ The material for the printing is then chosen from a broad spectrum of options, including plastic, metallic powders or binding solutions, food, glass, biomaterial, or even lunar dust.¹⁰

The specifics of assembly vary with the material chosen, but many printers heat the material until it melts, allowing it to be expelled through the printing nozzle in a process called “extrusion.”¹¹ Once the liquefied

⁴ *3D Printing Technologies*, STRATASYS, <http://www.stratasys.com/3d-printers/technologies> (last visited June 5, 2016); *What is 3D Printing?*, 3DPRINTING.COM, <http://3dprinting.com/what-is-3d-printing/> (last visited June 5, 2016).

⁵ Jason Dorrier, *One Machine to Rule Them All: 3D Printing with German Precision*, SINGULARITYHUB (Feb. 25, 2015), <http://singularityhub.com/2015/02/25/one-machine-to-rule-them-all-3d-printing-with-german-precision/>.

⁶ Stephanie Crawford, *How 3-D Printing Works*, HOWSTUFFWORKS, <http://computer.howstuffworks.com/3-d-printing.htm> (last visited June 5, 2016); Matt Petronzio, *How 3D Printing Actually Works*, MASHABLE (Mar. 28, 2013), <http://mashable.com/2013/03/28/3d-printing-explained/#g5c hgtYEiqV>.

⁷ See *What is 3D Printing?*, *supra* note 4.

⁸ *3D Printers and 3D Printing: Technologies, Processes and Techniques*, SCULPTEO, <http://www.sculpteo.com/en/3d-printing-technologies/> (last visited June 5, 2016); see Claire Chabaud, *Looking for the Best 3D Printing Marketplace?*, SCULPTEO (July 22, 2015), <http://www.sculpteo.com/blog/2015/07/22/3d-printing-marketplace/>; SHAPEWAYS, <http://www.shapeways.com/>.

⁹ *What is 3D Printing?*, *supra* note 4.

¹⁰ *3D Printers and 3D Printing*, *supra* note 8.

¹¹ *Id.*

printing material is fed into the printer, the object is read slice by slice and printed by layering the object until it is whole.¹² Each slice solidifies rapidly and sticks together with the previous slices to engender the precise blueprint object.¹³

III. COPYRIGHT ISSUES ARISING FROM 3DP

There are two ways in which 3Dp impacts classical modes of production. First, it spans a wide range of objects—with guns, limbs, and even food currently being printed.¹⁴ Second, it will facilitate the household production of goods, leading to increased access to products by the public.¹⁵

Together, these two abilities create a quagmire for IP law. 3Dp allows people to create sculptures, toys, and other copyright-protected objects which will lead to piracy and losses for copyright holders. Without a framework that is adequately equipped to deal with such scenarios, there will be little to protect the interests of right holders from exploitation. This potential has led to 3Dp being labelled as the “counterfeiter’s best friend.”¹⁶

There has been extensive debate on the extent to which copyright will be affected by 3Dp’s growing popularity. Some argue that 3Dp will mark the end of copyright,¹⁷ whereas others compare it to a “Napster-moment” that will snowball into a relentless legal tussle for the copyright industry.¹⁸ Because the technology is still nascent, it is too early to gauge the exact degree to which copyright laws will be impacted by 3Dp. However, it is possible to foresee the different issues that are likely to arise. The

¹² Andrew Walker, *3D Printing for Dummies: How Do 3D Printers Work?*, INDEPENDENT (June 21, 2013), <http://www.independent.co.uk/life-style/gadgets-and-tech/features/3d-printing-for-dummies-how-do-3d-printers-work-8668937.html>.

¹³ *See id.*

¹⁴ Stuart Dredge, *30 Things Being 3D Printed Right Now (And None of Them Are Guns)*, GUARDIAN (Jan. 29, 2014, 7:40 AM), <http://www.theguardian.com/technology/2014/jan/29/3d-printing-limbs-cars-selfies>.

¹⁵ *See* Richard A. D’Aveni, *3-D Printing Will Change the World*, HARV. BUS. REV. (Mar. 2013), <https://hbr.org/2013/03/3-d-printing-will-change-the-world>.

¹⁶ Thomas A. Campbell & William J. Cass, *3-D Printing Will Be a Counterfeiter’s Best Friend*, SCI. AM. (Dec. 5, 2013), <http://www.scientificamerican.com/article/3-d-printing-will-be-a-counterfeiters-best-friend/>.

¹⁷ *See, e.g.*, Dominic Basulto, *Digital Pirates, 3D Printing and the End of Copyright*, BIG THINK, <http://bigthink.com/endless-innovation/digital-pirates-3d-printing-and-the-end-of-copyright> (last visited June 5, 2016).

¹⁸ *See* Mark Owen, *Is 3D Printing Facing Its Napster Moment?*, GUARDIAN (Apr. 10, 2014, 7:04 AM), <http://www.theguardian.com/media-network/media-network-blog/2014/apr/10/3d-printing-napster-retail-legal> (comparing 3Dp to the Napster online service that first popularized widespread file-sharing).

following Section discusses issues of piracy, liability of intermediary websites that host 3D designs, and legal ramifications that would arise from 3Dp.

A. *Piracy Arising from 3Dp*

We believe that the next step in copying will be made from digital form into physical form. It will be physical objects. . . . We believe that things like three dimensional printers, scanners[,] and such are just the first step. We believe that in the nearby future you will print your spare parts for your vehicles.¹⁹

At the outset, it's important to note that the fear over 3Dp is mostly preemptive. Much like online piracy in the early 2000s, interested parties recognize the counterfeiting threat that 3D printers are likely to pose in the future.

A gradual shift can be observed in the popularity of 3D printers. Until 2013, professional-grade 3D printers were as expensive as “about \$10,000 to several hundred thousand dollars.”²⁰ Further, their utility was also limited because the technology was “too slow and costly” to allow “mass production.”²¹ Sales numbers reflect the early lack of popularity of these printers—in 2012, only 35,508 such printers were sold worldwide.²² As of 2013, products from 3Dp accounted for less than 0.01% of global manufacturing.²³

In the coming decade, however, retailers' biggest competition may come from consumers printing products for themselves.²⁴ The growth in demand has been steady-between 2010 and 2012, the number of printers sold rose from 5978 to 35,508.²⁵ This significant increase in buyers within a span of merely two years demonstrates the rapidly rising popularity of 3D printers. Online traction has also improved significantly, with over an eight-fold increase in Google searches made for “3D printing” between

¹⁹ *Evolution: New Category*, PIRATE BAY (Jan. 23, 2012), <https://thepiratebay.se/blog/203>.

²⁰ James R. Hagerty, *5 Reasons Not to Go Gaga over 3D Printing*, WALL ST. J.: CORP. INTELLIGENCE (Nov. 1, 2013, 11:35 AM), <http://blogs.wsj.com/corporateintelligence/2013/11/01/five-reasons-not-to-go-completely-gaga-over-3d-printing/>.

²¹ *Id.*

²² See Pedro Malaquias, *The 3D Printing Revolution: An Intellectual Property Analysis* 6 (Aug. 8, 2014), <http://ssrn.com/abstract=2495416>.

²³ Hagerty, *supra* note 20.

²⁴ George Dearing, *The Future of 3D Printing*, FORBES (Apr. 23, 2014, 2:21 PM), <http://www.forbes.com/sites/capitalonespark/2014/04/23/the-future-of-3d-printing/>.

²⁵ See Malaquias, *supra* note 22, at 6.

2007 and 2015.²⁶ Competition amongst manufacturers of 3D printers has led to prices falling to less than \$2000.²⁷ 3Dp companies such as Makerbot are working towards ensuring that in the future, these printers can even be sold at stores such as Walmart as cheaply as \$99, allowing almost everyone to own one.²⁸

If creating objects becomes as easy as the pundits expect, the copyright industry will be exposed to an acute counterfeiting and piracy concern. Home-manufacturing of objects will mean that products no longer have to be bought from a seller licensed by the copyright owners. In this environment, the illegal distribution of 3Dp designs will prosper for the same reasons that online piracy does today—it is cheap, convenient, and fast.

The International Chamber of Commerce estimated that, in 2015, counterfeit and pirated products may have been worth \$1.77 trillion.²⁹ These are figures calculated in the absence of widespread 3Dp. Gartner, Inc. has predicted that by 2018, 3Dp is likely to cause an additional loss of at least \$100 billion per year to intellectual property holders globally.³⁰

There are two ways in which 3Dp is aiding copyright infringement. First, as long as users have the CAD files for an object, they can simply print the product for themselves. These files may be uploaded by users to websites such as Thingiverse.com and Shapeways.com. Indeed, the CAD files for several copyright-protected objects—such as the Iron Throne³¹ and the Iron Man helmet³²—were found on these websites at the time of this writing. Second, in the absence of CAD files, users can simply scan an

²⁶ See WEB SEARCH INTEREST: “3D PRINTING,” GOOGLE TRENDS (Feb. 1, 2016), <https://www.google.co.in/trends/explore#q=%223d%20printing%22> (displaying interest over time for search term “3d printing”).

²⁷ See Steve Henn, *As 3-D Printing Becomes More Accessible, Copyright Questions Arise*, NPR (Feb. 9, 2013, 3:01 AM), <http://www.npr.org/sections/alltechconsidered/2013/02/19/171912826/as-3-d-printing-become-more-accessible-copyright-questions-arise>.

²⁸ See Chris Anderson, *The New Makerbot Replicator Might Just Change Your World*, WIRED (Sept. 19, 2012, 3:15 PM), <http://www.wired.com/2012/09/how-makerbots-replicator2-will-launch-era-of-desktop-manufacturing/>.

²⁹ See FRONTIER ECONS., ESTIMATING THE GLOBAL ECONOMIC AND SOCIAL IMPACTS OF COUNTERFEITING AND PIRACY 9 (Feb. 2011), <https://drive.google.com/drive/u/0/search?q=Estimating%20the%20Global%20Economic%20and%20Social%20Impacts%20of%20Counterfeiting%20and%20Piracy>.

³⁰ Press Release, *Gartner Says Uses of 3D Printing Will Ignite Major Debate on Ethics and Regulation*, GARTNER (Jan. 29, 2014), <http://www.gartner.com/newsroom/id/2658315>.

³¹ *Iron Throne*, THINGIVERSE, <http://www.thingiverse.com/thing:158240> (last visited June 5, 2016).

³² *IronMan Helmet*, THINGIVERSE, <https://www.thingiverse.com/thing:1191393> (last visited June 5, 2016).

object using a 3D scanner and re-print it.³³

The technology is already creating legal ripples. Although no known court cases have been filed in the United States so far, this is likely because website owners have mostly complied with takedown notices sent pursuant to the Digital Millennium Copyright Act (“DMCA”).³⁴ One of the first ever notices was sent to Thomas Valenty, who used his 3D printer to create copies of a battle tank miniature for the table-top game *Warhammer 40,000* and posted the CAD files for free download on Thingiverse.³⁵ The copyright over these tanks belonged to a U.K.-based firm that sent Thingiverse takedown notices with which it immediately complied.³⁶

Similarly, Fernando Sosa, who 3D printed an Iron Throne iPhone dock and sold it on his website, received a cease-and-desist letter from HBO.³⁷ Game of Thrones is a popular fantasy television series and the Iron Throne is an iconic throne made of swords upon which the king sits. HBO, who owns the rights to the Game of Thrones series and thus to the Iron Throne, wrote: “[w]hile we appreciate the enthusiasm for the Series that appears to have inspired your creation of this device, we are also concerned that your iron throne dock will infringe on HBO’s copyright in the Iron Throne.”³⁸ When Sosa inquired about licensing, HBO refused on the pretext that the license to the iPhone dock had already been given to someone else.³⁹

These are not isolated instances—such letters have also been received by fans who have created figurines from the popular game series Final Fantasy⁴⁰ and replicas of items from movies such as Super 8.⁴¹

The aggressiveness with which the industry is attacking 3D printers shows its inclination towards “su[ing] the genie back into the bottle.”⁴² The approach has led some commentators to predict that the industry will

³³ See *Geomagic Design X*, *supra* note 3 (detailing scanning capabilities of software).

³⁴ 17 U.S.C. § 512(c) (2012); see Clive Thompson, *3D Printing’s Forthcoming Legal Morass*, WIRED (May 31, 2012), <http://www.wired.co.uk/news/archive/2012-05/31/3d-printing-copyright>.

³⁵ Thompson, *supra* note 34.

³⁶ *Id.*

³⁷ See Nathan Hurst, *HBO Blocks 3-D Printed Games of Thrones iPhone Dock*, WIRED (Feb. 13, 2013, 1:57 PM), <http://www.wired.com/2013/02/got-hbo-cease-and-desist>.

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ Nick Statt, *Print Chop: How Copyright Killed a 3D Printed Final Fantasy Fad*, CNET (Aug. 16, 2013, 11:29 AM), <http://www.cnet.com/news/print-chop-how-copyright-killed-a-3d-printed-final-fantasy-fad/>.

⁴¹ Nate Anderson, *Paramount: No 3D Printing of Our Alien Super 8 Cubes!*, ARSTECHNICA (June 29, 2011, 5:21 PM), <http://arstechnica.com/tech-policy/2011/06/paramount-no-3d-printing-of-our-alien-super-8-cubes/>.

⁴² Henn, *supra* note 27.

push for laws similar to the infamous Stop Online Piracy Act⁴³ when individuals start home-producing copyright-protected items on a larger scale, which would prevent 3D printers from printing anything that is not “authorized by megacorporations.”⁴⁴

The mistakes that were made in the battle against online piracy, however, should not be repeated. To stop the proliferation of copyrighted material, copyright holders pushed for stringent laws against online piracy. Companies such as 20th Century Fox launched extensive actions against torrent website The Pirate Bay, eventually leading to a conviction for criminal copyright infringement that was upheld by the European Court of Human Rights.⁴⁵ The Pirate Bay is an infamous file-sharing website created in Sweden that allows users to download copyrighted movies, music, software, and other products. In the past, the industry has also successfully litigated against platforms such as Napster⁴⁶ and Grokster⁴⁷ that enabled users to download copyright-protected material. Not only were these efforts in vain, they also wasted the opportunity to reach a mutually agreeable solution to the problem.

Despite losing a lawsuit in 2012, The Pirate Bay website remains consistently functional in 2016.⁴⁸ Some studies note that blocking these websites has not deterred users from using the BitTorrent software to illegally download content.⁴⁹ In certain cases, the amount of piracy was noted to have increased.⁵⁰ This shows that current copyright systems are not entirely conducive to contemporary developments and, in certain cases, might even prove counterproductive.

Even if, for the fear of piracy, restrictions are pushed against 3Dp, regulating the same way would be impossible. Once 3D printers become ubiquitous, users will be able to print things within the confines of their

⁴³ H.R. 3261, 112th Cong. (2011).

⁴⁴ Thompson, *supra* note 34.

⁴⁵ See *Neij v. Sweden*, 12 Eur. Ct. H.R. (2013), <http://hudoc.echr.coe.int/fre?i=001-117513>; see also Jemima Kiss, *The Pirate Bay Trial: Guilty Verdict*, *GUARDIAN* (Apr. 17, 2009, 5:25 AM), <http://www.theguardian.com/technology/2009/apr/17/the-pirate-bay-trial-guilty-verdict>.

⁴⁶ *A&M Records, Inc. v. Napster, Inc.*, 239 F.3d 1004 (9th Cir. 2001).

⁴⁷ *MGM Studios, Inc. v. Grokster, Ltd.*, 545 U.S. 913 (2005).

⁴⁸ See *THE PIRATE BAY*, <https://thepiratebay.se/> (last visited June 5, 2016).

⁴⁹ See, e.g., Ernesto Van der Sar, *Censoring The Pirate Bay Is Futile, Research Shows*, *TORRENT FREAK* (Aug. 22, 2013), <https://torrentfreak.com/censoring-the-pirate-bay-is-futile-research-shows-130822/>.

⁵⁰ Samuel Gibbs, *Pirate Bay Ban Lifted in Netherlands as Blocking Torrent Sites Ruled 'Ineffective'*, *GUARDIAN* (Jan. 29, 2014, 8:20 AM), <http://www.theguardian.com/technology/2014/jan/29/pirate-bay-ban-lifted-in-netherlands-as-blocking-torrent-sites-ruled-ineffective>.

homes. In response, it is likely that the manufacturing industry, which is the single largest lobby in the United States, will push for stringent laws to curb the misuse of 3Dp.⁵¹ Monitoring the activity of every household printer, however, is not feasible.

Companies will be unable to pursue actions against every small-scale infringer. Hence, attacking counterfeiters head-first is certainly not the best solution to the problem. Even if injunctions or blocks are obtained from courts, the experience with piracy has shown that enforcing them is a different task altogether.⁵² The problem will be temporarily pushed underground but will likely resurface in a different form.⁵³ For instance, pirate websites change domains or change their host country.⁵⁴ Those who are printing infringing products can also develop ways to effectively conceal them.⁵⁵ The Organization for Economic Co-operation and Development (“OECD”) notes that counterfeiters and pirates have the upper hand due to the ease of concealing counterfeit goods.⁵⁶ Even tactics such as passing restrictive legislation have failed in the past, as was evidenced in the widespread protests against the controversial Stop Online Piracy Act and Protect Intellectual Property Act.⁵⁷ Though these bills were aimed at blocking access to pirated content on the Internet, they were broad enough to restrict access to legal websites that discussed piracy or hosted user-generated content.⁵⁸ Wikipedia, Google, Reddit, and others protested these laws⁵⁹ because they feared that they would have a chilling effect by

⁵¹ See Thompson, *supra* note 34.

⁵² See Gibbs, *supra* note 50.

⁵³ See *id.*

⁵⁴ See Ernesto Van der Sar, *KickassTorrents Moves to Isle of Man Domain Name*, TORRENT FREAK (Apr. 23, 2015), <https://torrentfreak.com/kickasstorrents-moves-to-isle-of-man-domain-name-150423/>.

⁵⁵ See Eamon McNiff et al., *Counterfeiter Tricks of the Trade: How Fake Goods Might Get Past Inspectors*, ABC NEWS (May 13, 2015, 2:53 PM), <http://abcnews.go.com/US/counterfeiter-tricks-trade-fake-goods-past-inspectors/story?id=30961441>.

⁵⁶ ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, THE ECONOMIC IMPACT OF COUNTERFEITING AND PIRACY: EXECUTIVE SUMMARY 11 (2007), <https://www.oecd.org/sti/38707619.pdf>.

⁵⁷ S. 968, 112th Cong. (2011); David A. Fahrenthold, *SOPA Protests Shut Down Web Sites*, WASH. POST (Jan. 18, 2012), https://www.washingtonpost.com/politics/2012/01/17/gIQA4WY16P_story.html.

⁵⁸ *SOPA/PIPA: Internet Blacklist Legislation*, ELEC. FRONTIER FOUND., <https://www.eff.org/issues/coica-internet-censorship-and-copyright-bill> (last visited June 5, 2016).

⁵⁹ Dominic Rushe & Ryan Devereaux, *SOPA Support Drops Off as Blackout Protest Rattles the Internet*, GUARDIAN (Jan. 18, 2012, 1:44 PM), <http://www.theguardian.com/technology/2012/jan/18/sopa-wikipedia-blackout-google-reddit>.

forcing websites to constantly monitor and remove content⁶⁰ or risk getting “blacklisted.”⁶¹

If the copyright industry were to adopt a stance that is completely antithetical to that of the printers, it would kill the space for reaching a mutually agreeable solution. Such over-protectionism would certainly go against the interests of the right holders and exacerbate the conflict between the two stakeholders.

B. Intermediary Liability

Because it is difficult to enforce claims against individual offenders, enforcement mechanisms often focus on the websites that allow infringing designs to be shared.⁶² As has been noted above, there are two ways for objects to be 3D printed: by using CADs that are posted online or by scanning the object personally.⁶³ Host websites therefore play an important role in making the technology accessible to the public. For this reason, they have been made the targets of cease-and-desist letters, with which they have mostly complied.⁶⁴

The first takedown notice over 3Dp was sent by Netherlands-based designer Ulrich Schwanitz to a 3D modeler who succeeded in printing a version of a Penrose Triangle⁶⁵ and posted the CAD on Thingiverse.⁶⁶ Schwanitz’s letter asserted that the design files violated his copyright to his creation and, hence, had to be taken down.⁶⁷ Thingiverse quickly removed the designs, even though Schwanitz subsequently rescinded his complaint and released the design into the public domain.⁶⁸

Thingiverse has been at the receiving end of several other takedown notices. Moulinsart, the company that owns the copyright to the cartoon

⁶⁰ See Stephanie Condon, *SOPA, PIPA: What You Need to Know*, CBS NEWS (Jan. 18, 2012, 3:07 PM), <http://www.cbsnews.com/news/sopa-pipa-what-you-need-to-know/>.

⁶¹ *SOPA/PIPA: Internet Blacklist Legislation*, *supra* note 58.

⁶² See, e.g., 17 U.S.C. § 512(c) (2012) (defining liability for third parties hosting infringing content).

⁶³ See *supra* notes 31–33 and accompanying text.

⁶⁴ See *supra* notes 35–39 and accompanying text.

⁶⁵ Also known as the Impossible Triangle, the Penrose Triangle is an illusion which represents a two-dimensional triangle as three-dimensional. See Peter Hanna, *The Next Napster? Copyright Questions as 3D Printing Comes of Age*, ARSTECHNICA (Apr. 6, 2011, 12:35 AM), <http://arstechnica.com/tech-policy/2011/04/the-next-napster-copyright-questions-as-3d-printing-comes-of-age/1/>.

⁶⁶ Hanna, *supra* note 65.

⁶⁷ *Id.*

⁶⁸ Cory Doctorow, *3D Printing’s First Copyright Complaint Goes Away, but Things Are Just Getting Started*, BOING BOING (Feb. 21, 2011, 12:11 AM), <http://boingboing.net/2011/02/21/3d-printings-first-c.html>.

Tintin, served the website with a DMCA takedown notice to remove designs of Tintin's cartoon moon rocket.⁶⁹ Shapeways, too, received a cease-and-desist letter from Katy Perry's lawyers against selling a design of the Left Shark used by Katy Perry in one of her shows.⁷⁰

These websites, who play the role of Internet intermediaries, have incorporated DMCA requirements into their terms of use.⁷¹ These requirements, inter alia, state that the creator of a 3D design must hold the copyrights to the content and any item that infringes upon another party's copyright can be removed by filing a takedown notice.⁷²

With regards to the liability of such websites for hosting copyright infringing designs, one could presume that the standard policy of intermediary liability for copyright infringement would apply. Though the position varies slightly across jurisdictions, intermediaries can generally be held liable for content that is uploaded on their websites, once the intermediary is notified that copyright infringing material has been hosted, displayed, uploaded, or shared on the website and the intermediary fails to act in response to such notification.⁷³ Analogous provisions are present in articles 12 to 15 of the Directive on Electronic Commerce of the European Union⁷⁴ and section 79 of the Information Technology Act of 2000,⁷⁵ in India.

According to these provisions, if Thingiverse is notified about a certain infringing item being posted on its website, it must act within a stipulated period of time to either remove the material or inform the complainant about why the material does not violate its user policy.⁷⁶ Thingiverse cannot be held liable without such a notification because it does not exercise editorial control over the content that is posted.⁷⁷

Despite its growing use in dealing with 3Dp copyright issues, there are several well-established problems with intermediary liability regimes. The

⁶⁹ Henn, *supra* note 27.

⁷⁰ Signe Brewster, *Katy Perry's Lawyers Demand Taken Down of 3D Printable Left Shark*, GIGAOM (Feb. 5, 2015, 1:47 PM), <https://gigaom.com/2015/02/05/katy-perrys-lawyers-demand-takedown-of-3d-printable-left-shark/>.

⁷¹ See *Makerbot Terms of Use*, THINGIVERSE, <https://www.thingiverse.com/legal> (last updated Apr. 21, 2016); *Shapeways Terms and Conditions*, SHAPEWAYS, http://www.shapeways.com/terms_and_conditions (last updated Apr. 26, 2016).

⁷² See *Makerbot Terms of Use*, *supra* note 71; *Shapeways Terms and Conditions*, *supra* note 71.

⁷³ See, e.g., 17 U.S.C. § 512(c) (2012).

⁷⁴ See Council Directive 2000/31/EC, art. 12–15, 178 O.J. 13 (2000) (EC).

⁷⁵ Information Technology Act, No. 21 of 2000, § 79 INDIA CODE (2000), vol. 27.

⁷⁶ See, e.g., 17 U.S.C. § 512(c) (2012).

⁷⁷ See *id.*

foremost of these is the fear of a chilling effect, which would result in legitimate items being removed from websites and have a negative impact on innovation.⁷⁸ The chilling effect occurs because intermediaries are made to judge whether a notified item actually infringes on a copyright or not.⁷⁹ As a consequence, intermediaries choose to err on the side of caution and remove content without regard to its legitimacy out of fear of being prosecuted and facing civil or criminal liability.⁸⁰

Hence, even if a product does not infringe the complainant's copyright, the intermediary, out of uncertainty, may still clamp down on the item to protect its own interests. Considering how nascent the industry is, this chilling effect would set back the rate of progress by years because restrictions would dissuade designers from making and uploading CAD files. When Clive Thompson, creator of the Warhammer 40,000 CAD file, received the DMCA notice, he stated, "[t]he DMCA knocked the wind out of me. I haven't uploaded many of my printable models since it happened."⁸¹ Attacking intermediaries clearly affects both hosting websites and designers, leaving industrial progress as the victim.

Pirate websites have already jumped to fill the void left by chilled intermediaries. The creator of the 3D printed gun, Cody Wilson, launched his own search engine for 3D printed models called Defcad, which has been touted as The Pirate Bay of 3Dp.⁸² The Pirate Bay itself has also launched its own section for 3D designs (called Physibles) which allows users to download design files and print items that have been removed from legitimate host websites for violating copyright.⁸³ This new section of The Pirate Bay will enable users to print everything that is otherwise copyright protected, from Nike shoes to Lightsabers.⁸⁴ Any attempt to block these sources, would, as explained above, prove to be futile.⁸⁵ Companies need to adopt a different approach than the tried-and-tested method of sending takedown notices and filing infringement suits.

⁷⁸ See ARTICLE 19, INTERNET INTERMEDIARIES: DILEMMA OF LIABILITY 14 (2013).

⁷⁹ See *id.* at 11.

⁸⁰ See *id.*

⁸¹ Thompson, *supra* note 34.

⁸² Ernesto Van der Sar, *Defcad Launches 'The Pirate Bay' of 3D Printing*, TORRENT FREAK (Sept. 20, 2013), <https://torrentfreak.com/defcad-launches-pirate-bay-of-3d-printing-130920/>.

⁸³ See Jeff Bertolucci, *Pirate Bay Launches 3D-Printed 'Physibles' Downloads*, PC WORLD (Jan. 24, 2012, 2:20 PM), http://www.pcworld.com/article/248682/pirate_bay_launches_3d_printed_physibles_downloads.html.

⁸⁴ See *id.*

⁸⁵ See *supra* notes 48–50, 52–55 and accompanying text.

Shapeways has found a mutually beneficial solution to this problem.⁸⁶ The website has entered into a licensing agreement with Hasbro that allows it to share revenue with the company for its 3D designs sold online.⁸⁷ According to this arrangement, if the 3D design of a product to which Hasbro owns the copyright is sold for \$30 on Shapeways, it would fetch \$20 for Shapeways, \$6.50 for the artist, and \$3.50 for Hasbro.⁸⁸ Such a profit-sharing agreement benefits all the stakeholders. By allowing dissemination of copyright-protected materials, it benefits the market and the consumers. It also creates another source of revenue for Hasbro and allows Shapeways to host content without the threat of the dreaded DMCA notices.

Such a profit-sharing system is but one example of a route that companies could take to benefit from the 3Dp industry. Instead of seeing it as a game of one-upmanship, companies should work towards securing their interests through these websites. In the media industry, cooperation between stakeholders led to the creation of legal sources of dissemination such as Netflix and iTunes. There is no reason to believe that the same would not work with 3Dp.

C. *Legal Quandary*

There has been negligible judicial discussion on the legal aspects of 3Dp. Such discourse is important to address the ease with which legitimate uses of 3Dp are being curtailed. The role of copyright has been stretched farther than it was originally conceived. As Professor Ian Hargreaves argues, “[d]igital technologies are based on copying, so copyright becomes their regulator: a role it was never designed to perform.”⁸⁹

As a result, several questionable claims have been successful in stopping legitimate practices. For instance, Ulrich Schwanzitz’s takedown notice against the Penrose Triangle design had no legal basis because he was not the owner of the Triangle.⁹⁰ He did not have a right in the image

⁸⁶ See Mike Senese, *Hasbro and Shapeways Expand Partnership, Allow Fans to Sell Transformers Fan Art and More*, MAKEZINE (Aug. 25, 2014, 4:00 PM), <http://makezine.com/2014/08/25/hasbro-and-shapeways-expand-partnership-allow-fans-to-sell-transformers-fan-art-and-more/>.

⁸⁷ See *id.*

⁸⁸ See *id.*

⁸⁹ IAN HARGREAVES, DIGITAL OPPORTUNITY: A REVIEW OF INTELLECTUAL PROPERTY AND GROWTH 14 (2011), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32563/ipreview-finalreport.pdf [<https://perma.cc/2A9W-946R>].

⁹⁰ See Ulrich Schwanzitz—*Penrose Triangle—3D Design Takedown*, ELEC. FRONTIER FOUND., <https://www.eff.org/takedowns/ulrich-schwanzitz-penrose-triangle-3d-design-takedown> (last visited June 7, 2016).

nor in the process of converting it from an image to 3D because processes are not protected by copyright.⁹¹ Although the penalty of perjury is meant to deter false notices,⁹² Thingiverse did not file a countersuit. Similarly, in Katy Perry's Left Shark dispute, it is not clear that the Shark costume was even copyrightable because its aesthetic appeal and functional utility were intrinsically linked.⁹³

The basis on which disputes arise is that copyright vests in the objects being 3D printed. This presumption can be questioned, however. The definition of "works" under most copyright statutes has an imperfect application to 3D designs. In the U.K., the Copyright, Designs and Patents Act 1988 ("CDPA"),⁹⁴ offers ambiguous definitions of "sculptures" and "works of artistic craftsmanship" ("WAC").⁹⁵ Copyright disputes would mostly arise against these two categories of works owing to their artistic nature.

In *Lucasfilm, Ltd. v. Ainsworth*,⁹⁶ Justice Mann held that in order for an object to qualify as a sculpture it must have "the intrinsic quality of being intended to be enjoyed as a visual thing."⁹⁷ This judgment went against precedents established in *Wham-O Manufacturing Co. v. Lincoln Industries Ltd.*⁹⁸ and *Breville Europe PLC v. Thorn EMI Domestic Appliances Ltd.*,⁹⁹ wherein Frisbees and plastic sandwich toasters were held to be sculptures, respectively, even though visual appeal was not a primary function of either.¹⁰⁰

The question before the court in *Lucasfilm* was whether Stormtrooper helmets would qualify as sculptures or WAC under the CDPA.¹⁰¹ The court held that the helmets could not be classified as sculptures because their "primary function [was] utilitarian," and they lacked the necessary

⁹¹ See *id.*

⁹² See *Perfect 10, Inc. v. CCBill LLC*, 488 F.3d 1102, 1112 (9th Cir. 2007).

⁹³ See *Left Shark Dispute*, HARV. J. SPORTS & ENT. L. (Feb. 16, 2015), <http://harvardjsel.com/2015/02/left-shark-dispute/>.

⁹⁴ Copyright, Designs and Patents Act 1988, c.48 (Eng.).

⁹⁵ Simon Bradshaw et al., *The Intellectual Property Implications of Low-Cost 3D Printing*, 7 SCRIPTED 5, 21 (2010), <http://www2.law.ed.ac.uk/ahrc/script-ed/vol7-1/bradshaw.asp>.

⁹⁶ *Lucasfilm, Ltd. v. Ainsworth* [2008] EWHC (Ch) 1878, [2008] E.C.D.R. 17 (Eng.).

⁹⁷ *Id.* at [118(vii)].

⁹⁸ *Wham-O Mfg. Co. v. Lincoln Indus. Ltd.* [1981] 11 NZLR 281 (HC).

⁹⁹ *Breville Europe Plc. v. Thorn EMI Domestic Appliances Ltd.* [1995] 22 FSR 77 (Pat. Ct.) (Eng.).

¹⁰⁰ See *Wham-O* 11 NZLR at [282]; *Breville* 22 FSR at [94].

¹⁰¹ See *Lucasfilm*, EWHC (Ch) 1878 at [90].

quality of possessing “artistic purpose.”¹⁰² What mattered was the intention of the creator, which, in this case, was not for the helmets to be used for artistic purposes but rather as a toy, thus imputing on them a utilitarian nature.¹⁰³

The court rejected the contention that the helmets were WAC by relying on the New Zealand case of *Bonz Group (Pty) Ltd. v. Cooke*.¹⁰⁴ Justice Mann held that works could be considered WAC only if they are made by an artist and a craftsman.¹⁰⁵ The judgment defined an artist as someone with “creative ability who produces something which has aesthetic appeal” and a craftsman as “a person who makes something in a skillful way and takes justified pride in their [sic] workmanship.”¹⁰⁶ Because the helmets had not been produced for their aesthetic appeal, they were not considered WAC.¹⁰⁷

This ambiguity about what is considered a sculpture and WAC is likely to cause confusion in the 3Dp industry. Items such as superhero accessories (masks, gloves, costumes), sculptures with utility (vases, bottles, or Fernando Sosa’s Iron Throne iPhone holder that was removed from Thingiverse), and others would all lie in the legal grey area. Because the rate of infringement on physical items was significantly lower in the past, confusion was not widely felt prior to 3Dp. These cases are expected to increase,¹⁰⁸ however, which necessitates clarity about what constitutes sculptures and WAC. Without such clarity, it will remain unclear whether such articles are protected by copyright and whether they can be 3D printed by consumers without incurring any liability.

The other question is whether there would be an infringement in reverse engineering a copyrighted object and creating a design file out of it to print for private purposes. Section 51 of the CDPA provides that the copyright in a design document is not infringed by making an article out of it or by copying an article made out of such a design.¹⁰⁹ The Act defines a design document as “any record of a design, whether in the form of a drawing, a written description, a photograph, [or] data stored in a computer

¹⁰² *Id.* at [121].

¹⁰³ *See id.* at [123].

¹⁰⁴ *Bonz Group (Pty) Ltd. v Cooke* [1994] 3 NZLR 216 (HC); *see Lucasfilm, EWHC (Ch) 1878* at [131].

¹⁰⁵ *Lucasfilm, EWHC (Ch) 1878* at [131].

¹⁰⁶ *Id.* (quoting *Bonz Group*, 3 NZLR at [216]).

¹⁰⁷ *See id.* at [134].

¹⁰⁸ *See supra* Section III.A.

¹⁰⁹ Copyright, Designs and Patents Act 1988, c.48, § 51(2) (Eng.).

or otherwise.”¹¹⁰

On this basis, the copies of the Stormtrooper helmets in *Lucasfilm* did not infringe copyright because the helmets themselves did not enjoy copyright.¹¹¹ The copyright in the original drawings (design documents) was not infringed by copies being made of the helmets because section 51 clearly stipulates that a copyright in original drawings is not infringed by copies made of an article based on the design.¹¹²

Thus, there are two important questions that need to be answered: (1) are design files themselves protected, and (2) would creating design files from existing items amount to infringement. The first question has a relatively easy answer. If the design files are works of original authorship, then they can be protected as software programs.¹¹³ The second question, however, poses a more complex issue.

Two judgments clarify the law on this point. In *BBC Worldwide Ltd. v. Pally Screen Printing Ltd.*,¹¹⁴ the question was whether the production of garments bearing images of Teletubbies amounts to infringement.¹¹⁵ The court held that the Teletubbies were per se not protected by copyright because the original artwork constituted design documents.¹¹⁶ Because the garments were created directly from the Teletubbies as they were seen on the television, and not from the original artwork, there was no infringement.¹¹⁷ The court upheld this position in *Mackie Designs Inc. v. Behringer Specialised Studio Equipment (UK) Ltd.*,¹¹⁸ wherein the court held that reverse engineering a circuit diagram from a device did not infringe the original circuit diagram, provided the reverse engineering took place from the device and not the original circuit diagram.¹¹⁹

To put this in the context of 3Dp, if a CAD file is created from a Batmobile scene in a movie then there would be no copyright infringement because only the original drawings of the Batmobile would enjoy protection as design documents. Section 51 makes it clear that only the original drawings of the Batmobile would be protected by copyright and

¹¹⁰ *Id.* § 51(3).

¹¹¹ *See Lucasfilm*, EWHC (Ch) 1878 at [136]–[142]; Bradshaw, *supra* note 95, at 24.

¹¹² *See* § 51(2).

¹¹³ *See Lucasfilm*, EWHC (Ch) 1878 at [136]–[142]; Bradshaw, *supra* note 95, at 24.

¹¹⁴ *BBC Worldwide Ltd. v. Pally Screen Printing Ltd.* [1998] FSR 665 (EWHC (Ch)) (UK).

¹¹⁵ *See id.* at 668.

¹¹⁶ *Id.* at 672.

¹¹⁷ *Id.*

¹¹⁸ *Mackie Designs Inc. v. Behringer Specialised Studio Equipment (UK) Ltd.* [1999] 20 RPC 717 (EWHC (Ch)) (UK).

¹¹⁹ *See id.* at 723–24.

not the cinematic Batmobile because the latter is an article based on the original drawings, which are the design documents in this case. By the application of section 51, this copyright would not be infringed by CAD files being made out of the Batmobile. The Batmobile itself would not be protected by copyright and could be 3D printed and sold in the market without incurring any liability. Thus, making and distributing CAD files of design-protected objects would not constitute a copyright infringement.

This position would be greatly unfavorable to copyright holders. CAD files for objects protected by design laws could be copied and distributed online without any legal ramifications. This would have disastrous consequences for copyright holders once 3Dp becomes ubiquitous. The law on this issue must be clarified, and sufficient safeguards must be introduced to protect the interests of right holders.

The current legal framework is clearly inadequate to deal with 3Dp. This is not the first time that a technological innovation has compelled a reevaluation of the law. There are several instances in history wherein the law has had to evolve to accommodate revolutionary technological changes. The following section will look at some of these historical parallels and analyze the lessons that can be learnt.

IV. HISTORICAL PARALLELS

Throughout history, laws have had to undergo reforms so as to accommodate threats posed by new technologies. The advent of technologies such as the printing press, Napster, and Betamax, has, in the past, challenged our perception of copyright laws. This section examines how copyright laws have evolved to address such developments.

A. 2D Printing

Of all traditional innovations, one of the most significant redefining impacts on human socio-cultural life has stemmed from the printing press.¹²⁰ Until the dusk of the fourteenth century, rights of authors were not of much concern as extensive bootlegging of works was impracticable in the absence of adequate tools.¹²¹ With Gutenberg's invention of the printing press in the fifteenth century,¹²² the democratization of knowledge

¹²⁰ See Terence A. Tanner, *Newspapers and Printing Presses in Early Illinois*, 3 AM. PERIODICALS 100, 102 (1993) ("No one would deny that the technology of printing and the products of the printing press have played a significant role in the development of Western culture over the last 500 years.").

¹²¹ See EDWARD SAMUELS, *THE ILLUSTRATED STORY OF COPYRIGHT* 11 (2000).

¹²² See *id.*

and dissemination of Western-thought became widespread.¹²³ While academicians were tremendously incentivized to utilize the cheaply-reproducible method to spread their scholarly ideas, politicians were enticed by the potential of printed pamphlets to acquire public support.¹²⁴ The invention also held potential for improving literacy levels amongst the uneducated masses.¹²⁵

With the infringing capabilities of this new development, however, it became necessary to conceptualize a legal framework for the “ownership of copy” (later called copyright)¹²⁶ to prevent the mass, unauthorized dissemination of original ideas and data and to create a system of author-monopolies.¹²⁷ Intellectual property law’s journey stretches from the Stationers’ copyright charter in the 1550s, the Licensing of the Press Act 1662,¹²⁸ to the first official copyright law passed in 1710 (The Statute of Anne)¹²⁹ and the U.S. Copyright Act of 1790,¹³⁰ which were passed in order to combat issues of piracy, infringement, and unauthorized reprinting.¹³¹

B. *Napster*

The infamous upheaval that Napster caused in the online-music industry remains etched in the cultural consciousness even fifteen years after its downfall.¹³² Founded by Shawn Fanning and Sean Parker in May 1999, Napster paved the way for the democratization of online music¹³³ by allowing the peer-to-peer exchange of music files through the Internet.¹³⁴

¹²³ See *The Invention of the Printing Press*, PSPRINT, <https://www.psprint.com/resources/printing-press/> (last visited June 11, 2016).

¹²⁴ See *id.*

¹²⁵ See *id.*

¹²⁶ LYMAN RAY PATTERSON, COPYRIGHT IN HISTORICAL PERSPECTIVE 21 (1968).

¹²⁷ See *Copyright Timeline: A History of Copyright in the United States*, ASS’N RES. LIBR., <http://www.arl.org/focus-areas/copyright-ip/2486-copyright-timeline> (last visited June 11, 2016).

¹²⁸ See JAISHREE K. ODIN, TECHNOLOGIES OF WRITING (1997), <https://www.hawaii.edu/aln/printing.htm>.

¹²⁹ Act for the Encouragement of Learning (Statute of Anne), 8 Ann. c. 19 (1710) (Gr. Brit.).

¹³⁰ Copyright Act of 1790, 1 Stat. 124.

¹³¹ See SAMUELS, *supra* note 121, at 11–16.

¹³² See, e.g., Alex Moore, *Ten Years After Napster’s ‘Time’ Cover: The Revolution of Free*, DEATH & TAXES (Oct. 5, 2010), <http://www.deathandtaxesmag.com/30711/ten-years-after-napsters-time-cover-the-revolution-of-free/>.

¹³³ See Tom Lamont, *Napster: The Day the Music Was Set Free*, GUARDIAN (Feb. 23, 2013, 7:05 PM), <http://www.theguardian.com/music/2013/feb/24/napster-music-free-file-sharing>.

¹³⁴ See Scott A. Sher, *In re Napster Inc. Copyright Litigation: Defining the Contours of*

“Instead of storing the songs on a central computer, the songs live on users’s [sic] machines.”¹³⁵

Unlike prior online-music platforms (such as mp3.com) that allowed downloading of only songs in the public domain,¹³⁶ Napster made copyrighted songs accessible by allowing file downloads directly from other users’ machines without itself acting as a repository.¹³⁷

Popular amongst college students¹³⁸ because it was free of royalties to music companies or artists,¹³⁹ Napster circulated about 4 million songs in October 1999 and about 20 million in March 2000.¹⁴⁰ This caused massive unrest in the music industry, enraging several music labels¹⁴¹ and causing them to sue the service for facilitating wholesale pirating of popular, copyrighted music on the Internet.¹⁴²

Affirming accusations that the service abetted theft and defrauded the music industry of several billion dollars,¹⁴³ the Ninth Circuit Court of Appeals ruled in February 2001 that Napster must take steps to discontinue the sharing of copyrighted works on its service.¹⁴⁴ This litigation recognized that the weak copyright-enforcement regime nourished initiatives like Napster in the digital era,¹⁴⁵ and thus opened a floodgate of discussion over the control and management of intellectual property over the Internet.¹⁴⁶ Many argued for the re-conceptualization of copyright in

the Copyright Misuse Doctrine, 18 SANTA CLARA HIGH TECH. L.J. 325, 327 (2001).

¹³⁵ *How Does Napster Work and Why Is There Such a Huge Fight Around It Right Now?*, HOWSTUFFWORKS, <http://computer.howstuffworks.com/question392.htm> [https://perma.cc/WB8Z-8F4T] (last visited June 11, 2016).

¹³⁶ *See id.*

¹³⁷ *See id.*

¹³⁸ *Id.*

¹³⁹ Justin W. Webb et al., *You Say Illegal, I Say Legitimate: Entrepreneurship in the Informal Economy*, 34 ACAD. MGMT. REV. 492, 498 (2009).

¹⁴⁰ Lamont, *supra* note 133.

¹⁴¹ *See* J. O’Dell, *From Napster to Spotify, Sean Parker Is Planning for “The Next Music Industry”*, VENTUREBEAT (Oct. 18, 2011, 7:00 AM), <http://venturebeat.com/2011/10/18/sean-parker-web-2-0/>.

¹⁴² *See* Clare Kilbane, *Napster as a Model for 21st-Century Learning*, UNIV. MASS. AMHERST C. EDUC. CONNECTION, Spring 2002, at 1, 1. \

¹⁴³ *Id.*

¹⁴⁴ *See* A&M Records, Inc. v. Napster, Inc., 239 F.3d 1004, 1026–27 (9th Cir. 2001); *see also* Matt Richtel, *The Napster Decision: The Overview; Appellate Judges Back Limitations on Copying Music*, N.Y. TIMES (Feb. 13, 2001), <http://www.nytimes.com/2001/02/13/business/napster-decision-overview-appellate-judges-back-limitations-copying-music.html?pagewanted=all>.

¹⁴⁵ *See* Webb, *supra* note 139, at 501.

¹⁴⁶ *See generally* Richtel, *supra* note 144.

society.¹⁴⁷

Recognizing the potential threat to conventional copyright laws posed by digitization, the U.S. Congress sought to regulate digital infringement by proposing a variety of laws in the early twenty-first century (the Peer-to-Peer Piracy Prevention Act¹⁴⁸; the Digital Media Consumers' Rights Act of 2003¹⁴⁹; the Music Online Competition Act¹⁵⁰; the Author, Consumer, and Computer Owner Protection and Security Act of 2003 ("ACCOPS")¹⁵¹; the Stop Online Piracy Act;¹⁵² and the Protect IP Act¹⁵³ were some of the proposals made).¹⁵⁴ The judiciary, too, developed substantial jurisprudence on balancing protection and enforcement of copyright with the public interest while discussing extensively the application of fair use on the Internet.¹⁵⁵

C. *Conjectures from the Preceding Parallels*

These instances exhibit the degree to which technological advancements require intellectual property management to address the risks that are likely to arise. At each of these junctures, legislators or courts have flexibly molded copyright laws to suit the growing needs of authors and consumers.

With the massive potential that the evolution of 3Dp technology promises, it would not be wrong to surmise that the world is at the brink of its next big industrial revolution.¹⁵⁶ "3D printing is not the first idea to shake the IP world, nor will it be the last innovation to alter the legal

¹⁴⁷ See, e.g., Matthew Green, *Napster Opens Pandora's Box: Examining How File-Sharing Services Threaten the Enforcement of Copyright on the Internet*, 63 OHIO ST. L.J. 799, 830–31 (2002).

¹⁴⁸ Peer-to-Peer Piracy Prevention Act, H.R. 5211, 107th Cong. (2002).

¹⁴⁹ Digital Media Consumers' Rights Act of 2003, H.R. 107, 108th Cong. (2003).

¹⁵⁰ Music Online Competition Act, H.R. 2724, 107th Cong. (2001).

¹⁵¹ Author, Consumer, and Computer Owner Protection and Security (ACCOPS) Act of 2003, H.R. 2752, 108th Cong. (2003).

¹⁵² Stop Online Piracy Act, H.R. 3261, 112th Cong. (2011).

¹⁵³ Protect IP Act, S. 968, 112th Cong. (2011).

¹⁵⁴ GARTNERG2 & BERKMAN CTR. FOR INTERNET & SOC'Y, COPYRIGHT AND DIGITAL MEDIA IN A POST-NAPSTER WORLD 33–35 (2003), <https://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/2003-05.pdf>.

¹⁵⁵ See, e.g., *A&M Records Inc. v. Napster, Inc.*, 239 F.3d 1004, 1014–17 (9th Cir. 2001); *Universal City Studios, Inc. v. Reimerdes*, 111 F. Supp. 2d 294, 321–24 (S.D.N.Y. 2000); *UMG Recordings, Inc. v. MP3.com, Inc.*, 92 F. Supp. 2d 349 (S.D.N.Y. 2000).

¹⁵⁶ See Sam Rega, *How 3D Printing Will Revolutionize Our World*, BUS. INSIDER (Aug. 22, 2014, 11:56 PM), <http://www.businessinsider.in/How-3D-Printing-Will-Revolutionize-Our-World/articleshow/40717480.cms>.

landscape.”¹⁵⁷ Although still in its infancy, 3Dp has demonstrated its capability of printing an extensive array of things—from stationary replicas of objects and designs,¹⁵⁸ guns,¹⁵⁹ designer clothing, and jewelry,¹⁶⁰ to fully functioning cars, batteries, LEDs,¹⁶¹ therapeutically-effective drugs, and human tissues and organs.¹⁶²

Copyright infringements arise with the use of 3D scanners and lifting of CAD files from the Internet.¹⁶³ The options available to counterfeit protected works are infinite—one study predicts intellectual property losses due to 3Dp counterfeiting could total \$100 billion by 2018.¹⁶⁴ Given 3Dp’s features (easy to produce, affordable, and a range of varieties)¹⁶⁵ coupled with intermediaries such as The Pirate Bay promising free physibles (blueprints) on their sites,¹⁶⁶ large-scale piracy and protected-works fabrication could, in a few years’ time, become a household affair.¹⁶⁷

¹⁵⁷ *3D Printing Will Pose a Multifaceted Challenge to Our Current Intellectual Property Laws*, GOWLING WLG (July 1, 2014), <https://gowlingwlg.com/en/canada/insights-resources/3d-printing-will-pose-a-multifaceted-challenge-to-our-current-intellectual-property-laws>.

¹⁵⁸ Ariel Bogle, *Good News: Replicas of 16th-Century Sculptures Are Not Off-Limits for 3-D Printers*, SLATE FUTURE TENSE (Jan. 26, 2015, 12:51 PM), http://www.slate.com/blogs/future_tense/2015/01/26/_3_d_printing_and_copyright_replicas_of_16th_century_sculptures_are_not.html.

¹⁵⁹ *The World’s First 3D-Printed Gun*, FORBES, <http://www.forbes.com/pictures/mhl45ediih/the-liberator/> (last visited June 12, 2016).

¹⁶⁰ Susanne Weckbach, *3D Printing—Implications on Intellectual Property Rights (“IP Rights”)*, WHITE & CASE TECH. NEWSFLASH (Apr. 25, 2014), <http://www.whitecase.com/publications/article/3d-printing-implications-intellectual-property-rights-ip-rights>.

¹⁶¹ Daniel Cohen, Matthew Sargeant, & Ken Somers, *3-D Printing Takes Shape*, MCKINSEY Q. (Jan. 2014), http://www.mckinsey.com/insights/manufacturing/3-d_printing_takes_shape.

¹⁶² Heidi Ledford, *The Printed Organs Coming to a Body Near You*, NATURE (Apr. 15, 2015), <http://www.nature.com/news/the-printed-organs-coming-to-a-body-near-you-1.17320>.

¹⁶³ See Weckbach, *supra* note 160.

¹⁶⁴ Press Release, *Gartner Says Uses of 3Dp Will Ignite Major Debate on Ethics and Regulation*, *supra* note 30.

¹⁶⁵ *Stuff.co.nz: Affordable 3D Printing Is Finally Here*, XYZPRINTING (June 30, 2015), <http://xyzprinting.co.nz/stuff-co-nz-affordable-3d-printing-is-finally-here/> [<https://web.archive.org/web/20160122181722/http://xyzprinting.co.nz/stuff-co-nz-affordable-3d-printing-is-finally-here/>].

¹⁶⁶ Darren Quick, *The Pirate Bay Launches “Physibles” Category for 3D Printable Objects*, GIZMAG (Jan. 24, 2012), <http://www.gizmag.com/the-pirate-bay-physibles-3d-printing/21208/>; Ernesto Van der Sar, *Pirate Bay Takes Over Distribution of Censored 3D Printable Gun*, TORRENT FREAK (May 10, 2013), <https://torrentfreak.com/pirate-bay-takes-over-distribution-of-censored-3d-printable-gun-130510/>.

¹⁶⁷ See Meghan Neal, *A Spotify for Physical Objects Wants to Drown Out 3D-Printing*

As we are on the cusp of something new and amazing, 3Dp warrants an “open source discussion on how it will affect our lives.”¹⁶⁸ Taking into view the havoc that might be wreaked in the copyright world, the fine-tuning made to the intellectual property laws subsequent to previous revolutionary advancements needs to be followed alike in this era of 3Dp. New intellectual property-management schemes will prove as crucial as the emergence of copyright was consequent to the invention of the 2D printing press. “Only time will tell if and when the law will evolve to match this change.”¹⁶⁹

V. THE FAIR USE/DEALING SOLUTION

Fair use and fair dealing are defenses against claims of copyright infringement. Fair use allows copying from a copyright-protected work for a limited and transformative purpose, such as to comment upon, criticize, or parody the original.¹⁷⁰ Fair dealing, similarly, allows third parties to use a copyright-protected work for criticism, private study, and other purposes.¹⁷¹

The difference between fair use and fair dealing is that under the fair use doctrine, the list of purposes for which the copyright-protected work can be used is “merely illustrative.”¹⁷² As long as an infringing work satisfies the fairness factors,¹⁷³ even if it is not expressly covered by the

Piracy, MOTHERBOARD (Aug. 28, 2013, 4:20 PM), <http://motherboard.vice.com/blog/a-spotify-for-physical-objects-wants-to-drown-out-printing-piracy>.

¹⁶⁸ Nick Graham, *The Future of Everything*, THE ROBIN REPORT, (Nov. 11, 2013), <http://www.the-robin-report.com/the-future-of-everything/>.

¹⁶⁹ *3D Printing Will Pose a Multifaceted Challenge to Our Current Intellectual Property Laws*, *supra* note 157.

¹⁷⁰ Rich Stim, *What is Fair Use?*, COPYRIGHT AND FAIR USE: STAN. UNIV. LIBR., <http://fairuse.stanford.edu/overview/fair-use/what-is-fair-use/> (last visited June 12, 2016).

¹⁷¹ *Fair Dealing Definition*, DUHAIME’S LAW DICTIONARY, <http://www.duhaime.org/LegalDictionary/F/FairDealing.aspx>.

¹⁷² *The New Fair Dealing Exception: Differences Between New Fair Dealing and Fair Use*, AUSTRAL. GOV’T: AUSTRAL. L. REFORM COMM’N, <https://www.alrc.gov.au/publications/6-new-fair-dealing-exception/differences-between-new-fair-dealing-and-fair-use> (last visited June 12, 2016).

¹⁷³ See 17 U.S.C. § 107 (2012). 17 U.S.C. § 107 provides as follows:

Limitations on exclusive rights: Fair use. . . . In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted

exempted purposes, the use would be “fair” and would not amount to an infringement. The defense of fair dealing, in contrast, only applies if the infringing work is covered by one of the exempted purposes.¹⁷⁴ These purposes include, inter alia, research or study, criticism or review, parody or satire, and news reporting.¹⁷⁵ Under fair dealing, the infringing work must fall into one of these categories; but it is protected as fair use even if it is not for one of the listed purposes, as long as it satisfies the fairness factors.¹⁷⁶ Although it would be possible to accommodate 3Dp into the ambit of fair use, it would be more difficult to defend the technology under fair dealing due to the narrow scope of fair dealing.¹⁷⁷

One way of preventing conflicts between copyright holders and 3D printers would be by protecting experimental use of 3D printers by consumers as fair use¹⁷⁸ in countries that follow this doctrine, such as the United States.¹⁷⁹ In *Campbell v. Acuff-Rose Music*,¹⁸⁰ the U.S. Supreme Court held that “transformative” use of a work would weigh in the favor of fair use.¹⁸¹ A work is considered “transformative” when it “adds something new, with a further purpose or different character, altering the [original] with new expression, meaning, or message.”¹⁸² Any 3D printed item that is transformative and non-commercial and does not directly affect the market of the original product should be protected by fair use.

There is, however, a strong possibility that if courts apply the fair use defense in a restrictive sense, 3Dp would fail both these criteria. Mere conversion of 2D CAD files to 3D objects might not be transformative because “[c]ourts have been reluctant to find fair use when an original work is merely retransmitted in a different medium.”¹⁸³ Furthermore, U.S. courts have understood “commercial use” as enabling repeated exploitation of the work by others which would save consumers the expense of buying the original work.¹⁸⁴ Uploading CAD files would, accordingly, also fail to

work.

¹⁷⁴ *The New Fair Dealing Exception*, *supra* note 172.

¹⁷⁵ *Id.*

¹⁷⁶ *Id.*

¹⁷⁷ Matthew Rimmer, *Creation and Copyright Law: The Case of 3D Printing*, CONVERSATION (Nov. 7, 2012, 2:44 PM), <http://theconversation.com/creation-and-copyright-law-the-case-of-3d-printing-10305>.

¹⁷⁸ *Id.*

¹⁷⁹ See 17 U.S.C. § 107 (2012).

¹⁸⁰ *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569 (1994).

¹⁸¹ *Id.* at 579.

¹⁸² *Id.*

¹⁸³ JEFFREY A. HELEWITZ & LEAH K. EDWARDS, ENTERTAINMENT LAW 265 (2003).

¹⁸⁴ *Id.* at 266.

qualify as fair use because it would enable potential consumers to directly print the product instead of purchasing it from the authorized vendor.

Professor Edward Lee, thus, promulgates a separate test for fair use involving technology.¹⁸⁵ He argued that the “technological fair use” standard should consider the following factors:

(1) Whether the infringing use occurs as a part of a new technology; whether the technology has a reasonably perceivable public benefit; whether the infringing use arises as a creation, operation or output of the technology; and whether the use is commercial;

(2) The nature of the copyrighted work, which should be given less importance;

(3) The substantiality of copied material in the light of the first factor; and

(4) Whether the infringing use is likely to act as a market replacement; whether the technology would have a positive impact on the original works’ market; and whether a finding of fair use would affect the market of the technology.¹⁸⁶

This revised fair use test is useful in two key aspects: it takes into consideration the public interest and balances the harms that the copyright holder is likely to suffer with the benefits that the market would accrue.¹⁸⁷ To accommodate for technological developments such as 3Dp, it is necessary for copyright law to adopt a novel fair use standard such as the one promulgated by Professor Lee.

VI. RECOMMENDATIONS AND CONCLUSIONS

“According to Darwin’s *Origin of Species*, it is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself.”¹⁸⁸ Whether the industry likes it or not, 3Dp is here to stay. From fixing broken machines to creating limbs, the benefits accruing from this technology are far too many for it to die down.¹⁸⁹ The question, therefore, is how the industry

¹⁸⁵ Edward Lee, *Technological Fair Use*, 83 S. CAL. L. REV. 797, 797 (2010); see also Kyle Dolinsky, *CAD’s Cradle: Untangling Copyrightability, Derivative Works, and Fair Use in 3D Printing*, 71 WASH. & LEE L. REV. 591, 673–675 (2014), <http://scholarlycommons.law.wlu.edu/cgi/viewcontent.cgi?article=4379&context=wlulr>.

¹⁸⁶ See Lee, *supra* note 185, at 835–54.

¹⁸⁷ See *id.* at 832–33.

¹⁸⁸ Leon C. Megginson, *Lessons from Europe for American Business*, 44 SW. SOC. SCI. Q. 3, 4 (1963).

¹⁸⁹ See Graham, *supra* note 168.

must deal with it.

Past experiences have been unequivocally clear that launching an antagonistic campaign against potential infringers will not yield favorable results.¹⁹⁰ Despite the industry's many attempts, online piracy is far from dead, music downloading is rampant, and pirate software is still available at the click of a button.¹⁹¹ All the money, time, and effort spent in slaying these beasts have proven to be remarkably futile, if not counterproductive. This has been a result of applying age-old notions of copyright to modern developments. The public support for cheaper access to copyrighted material has threatened to destabilize the very idea of copyright, as the SOPA-PIPA protests clearly testify.¹⁹²

The copyright law that was once established to protect the interests of the creator in order to foster innovation is no longer serving that purpose. Innovations such as online piracy and 3Dp have made the link between the interests of the creator and the incentive to create tenuous. People are now creating at rates faster than lawmakers could have previously imagined, and 3Dp is only the latest product of this movement. As Professor Hargreaves notes, today's "framework, especially with regard to copyright, is falling behind what is needed."¹⁹³

When creators continue to follow this archaic conception of copyright, failure is inevitable. Even if creators are legally within their rights, asserting these rights could prove to be a strategic blunder.¹⁹⁴ For example, when Moulinsart sent the takedown notice against the Tintin moon rockets, Michael Weinberg noted that attacking these consumers was a mistake because the people printing the rockets were the company's biggest fans.¹⁹⁵ Instead of attacking them, the company should have sold the designs for other Tintin accessories so that the fans could print them out as well.¹⁹⁶

This Essay recommends that creators work towards securing mutual benefits for themselves and for potential infringers. Licensing, similar to the method that has been adopted by Shapeways, is one of the answers to this problem.¹⁹⁷ If copyrighted material is licensed at rates that are reasonable for users, even the problem of piracy may be significantly reduced.

¹⁹⁰ See *supra* Section III.A.

¹⁹¹ See *id.*

¹⁹² See Fahrenthold, *supra* note 57.

¹⁹³ HARGREAVES, *supra* note 89, at 1.

¹⁹⁴ See Henn, *supra* note 27.

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

¹⁹⁷ See *supra* notes 86–88 and accompanying text.

A similar solution has been adopted by YouTube in the form of Content ID.¹⁹⁸ When copyright owners find videos that infringe their copyright, YouTube gives them the option of monetizing the video by placing advertisements against the video.¹⁹⁹ This allows the copyright holder to create another source of revenue for distribution of his content. Developing such alternate sources in the 3Dp context is the need of the hour.

Further, a broader exemption should be allowed for CAD files that add transformative value to the original article. A copy should only be considered to be an infringement when it is an exact copy of the original. If there is a slight degree of transformation, such as use for a different purpose, change of shape, or any other difference that prevents it from being an exact copy, use should be allowed.

The implications of this can be understood through the Iron Throne iPhone dock example, where the creator designed the modified smaller version of the throne himself in Autodesk Maya.²⁰⁰ It was different from the original Throne used in Game of Thrones in its use and size. It can be argued that such use was sufficient to constitute fair use by the virtue of being sufficiently transformative.²⁰¹ Such copying should be allowed as fair use in countries that follow this doctrine. For countries that follow fair dealing, an express wider exemption should be created to allow 3Dp to operate freely.

The concern of having a narrow fair dealing exception was noted in Australia, where 3Dp developers are discouraged from conducting business because the law requires them to deal with risks and uncertainties in respect to litigation.²⁰² These problems arise because Australia does not have a broad, open-ended fair use defense.²⁰³ Similarly, countries such as India,²⁰⁴ Canada,²⁰⁵ and the United Kingdom²⁰⁶ also follow a narrow fair dealing defense to copyright infringement. This is likely to make it difficult for

¹⁹⁸ *How Content ID Works*, YOUTUBE HELP, <https://support.google.com/youtube/answer/2797370?hl=en> (last visited June 12, 2016).

¹⁹⁹ *Id.*

²⁰⁰ See Hurst, *supra* note 37.

²⁰¹ Deepak Gupta & Marc Tarlock, *3D Printing, Copyright Challenges, and the DMCA*, FARELLA BRAUN + MARTEL LLP PUBLICATIONS 1, 9 (Feb. 12, 2014), <http://www.fbm.com/files/Uploads/Documents/3D%20Printing%20Copyright%20Challenges%20and%20the%20DMCA.pdf>.

²⁰² See Rimmer, *supra* note 177.

²⁰³ *Id.*

²⁰⁴ See Copyright Act, No. 14 of 1957, § 52 INDIA CODE (1957).

²⁰⁵ See Copyright Act, R.S.C. 1985, c C-42 § 29 (Can.).

²⁰⁶ See Copyright, Designs and Patents Act 1988, c. 48, § 29–30 (UK).

developers to obtain protection for their work and discourage them from establishing operations in Australia and other countries following the fair dealing defense.

Finally, the courts themselves must play the role of liberalizing copyright. Within the scope of interpretation, they should gravitate toward those that favor a balanced outcome and lead to the furtherance of technological progress. Judging fair use on the basis of Professor Lee's "technological fair use" standard would certainly be a positive move. Overly restrictive interpretations hinder the growth of 3Dp, whereas judgments that are too liberal unjustly affect copyright holders. The balance that needs to be struck is the fine line between promoting the public interest and protecting the monopoly granted by copyright.