

3D Printing, Copyright Challenges, and the DMCA

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I. Introduction

The conventional photocopier makes copies of two-dimensional documents, and computers permit replication of digital audio and video files. Now three-dimensional (“3D”) printers can replicate at least some physical objects.¹ As this technology continues to improve and its adoption increases, copyright owners and consumers will have to rethink the viability of existing copyright regulations and enforcement mechanisms, just as the music and film industries did in response to the copyright challenges posed by the introduction of the Internet-connected computer. On the one hand, for digital content, the introduction of the Internet-connected computer facilitated the creation and widespread distribution of audio and video content. On the other hand, it also permitted consumers to easily copy and share such content, sometimes without authorization. In comparison to the copyright issues typically raised by digital audio and video content, evaluating copyright protection in physical objects will likely be more uncertain and complex.

After providing background on 3D printing technology and related distribution websites in Part II, Part III of this article discusses the copyright doctrines likely to be implicated to a greater degree by widespread physical replication. In particular, when evaluating the existence and extent of copyright protection in objects, courts struggle with fact-intensive copyright inquiries, such as whether the object is useful, or whether it has ornamental features that are conceptually or physically separable from the underlying useful object. These and other sometimes murky doctrines suggest that, in comparison to audio and video content, there is more likely to be a reasonable question as to the existence and extent of any copyright protection with a 3D object. Part IV then discusses the Digital Millennium Copyright Act (“DMCA”) notice and takedown procedure, and how the different copyright doctrines implicated by physical objects mean that self-policing of copyright infringement may prove to be a challenging fit for the 3D printing ecosystem of design-sharing and product distribution websites.

Copyright protection, which is available to protect the original expression of an idea, is of course only one type of intellectual property protection potentially applicable to a 3D-printed object. Utility patents are available for machines and other articles that are novel and useful, among other requirements, and design patents are available to protect the ornamental features of useful articles, such as the shape of a smartphone.² Additionally, trademark and trade dress can be used to protect designs, signs, and characteristics of visual appearance that signify a product’s source of origin.³ Trademark and trade dress laws are intended to prevent consumer confusion in purchasing goods and services.⁴ These different forms of protection, which are not mutually exclusive, have different eligibility requirements, and provide different benefits to the rights holder. Importantly, with copyright protection, in contrast to patent protection, the rights holder does not explicitly stake out the boundary of protection as a condition for receiving the copyright. This distinction is not often of practical significance in enforcing unauthorized

copying of digital content, but as discussed below, the potentially unclear scope of copyright protection for a 3D-printed object raises additional copyright challenges for content owners, hosting sites, and consumers.

II. 3D Printing Technology

3D printing, also known as additive manufacturing, allows consumers and companies to design and create 3D objects using a machine that “prints” (that is, deposits) many layers of material, typically plastic polymers, one on top of the other. In other words, 3D printing is the opposite of carved sculpture: instead of removing material to reveal the desired object, a 3D printer adds material to build the desired object layer by layer. This technology has the potential to revolutionize product distribution by allowing consumers and small businesses to cheaply manufacture and sell items including toys, house wares, spare parts for appliances, and even some medical devices. As two leading authors on the 3D printing economy write, with 3D printing, “[v]ariety is free,” because the technology “removes the over-head costs associated with re-training human machinists or retooling factory machines.”⁵

The 3D printing process begins with a specialized computer file called a “computer-aided design” (CAD) file, that provides a 3D model of an object.⁶ Designers can create wholly original CAD files, adapt the designs of others, or, using object-scanning technology, scan an existing 3D object so that it can be replicated.⁷ Several websites, such as Thingiverse, allow designers to upload and share CAD files online, and communities of “makers” are already sharing and modifying designs using such websites, much like the open source software movement.⁸

Both consumer and commercial-grade 3D printers are already publicly available. On the commercial end for example, envisionTEC, a German company, offers a suite of 3D printing hardware and software. For example, envisionTEC provides 3D printing technology to companies seeking to manufacture hearing aid components.⁹ Additionally, NASA has 3D printed rocket engine parts using nickel alloy.¹⁰ On the consumer end, Staples announced in May 2013 that it would be the first major U.S. retailer to offer 3D printers to the general public, selling the Cube 3D Printer for \$1,299.¹¹ And MakerBot Industries, creator of the “Replicator 2” Desktop printer, has been shipping 3D printers since 2009.¹² MakerBot was recently acquired by Stratasys, a maker of professional grade 3D printers; a press release noted that the merger “is expected to drive faster adoption of 3D printing for multiple applications and industries.”¹³ Consumers who do not have access to a 3D printer, or who want to create something using more varied materials than are generally available for home use, can order objects from 3D printing services such as Shapeways.¹⁴ Shapeways is a company that manufactures small batches of objects, and allows consumers to sell 3D-printed copies.¹⁵

In the future, 3D printing will likely offer higher quality replication, the ability to build larger objects, and “better and cheaper materials.”¹⁶ Although predictions about the growth of the 3D printing economy vary, Carl Bass, president and CEO of Autodesk, a company specializing in 3D design software, suggests that 3D printing may be to manufacturing what the microwave was to cooking: not a replacement as some may have initially predicted, but a complement.¹⁷ In any case, the 3D printing ecosystem is likely to continue expanding, with better software, better printing machines, and more users.

III. Copyright Law and 3D-Printed Objects

In comparison to audio and video files, the boundary of copyright protection around physical objects can be less defined in several important respects. For example, while the existence of copyright protection in a sound recording, musical composition, or movie is relatively well settled, for objects, particularly those in the broad “industrial design” category, the law is less clear. Part III.A discusses the general framework applicable to evaluating copyright protection in objects. In particular, with objects, courts may have to consider the “intrinsic” nature of the work, and the extent to which any artistic features can be physically or even conceptually separated from an object’s underlying utilitarian function. Judges have acknowledged that the separability analysis is particularly abstract.¹⁸ Part III.B then discusses the copyright protection in the underlying CAD file. Finally, Part III.C discusses how the power to create new objects derived from existing two and three-dimensional designs is likely to implicate the vague fair use doctrine to a greater degree than the enforcement of unauthorized copying of audio and video files.

A. **Copyright in “Pictorial, Graphic and Sculptural Works”**

Under the Copyright Act of 1976 (the “Copyright Act”), “pictorial, graphic, and sculptural works” are eligible for copyright protection.¹⁹ This includes by definition “three-dimensional works of fine, graphic, and applied art,” as well as “models.”²⁰ Depending on the nature of the object, evaluating the scope of copyright protection in a pictorial, graphic, or sculptural work may require considering several doctrines, which are discussed below.

Originality. The first requirement for such works is that they must satisfy the “originality” requirement—an “indispensable prerequisite for copyrightability.”²¹ Originality “requires independent creation plus a modicum of creativity.”²² Consistent with this requirement, the Copyright Act limits protection in compilations or “derivate works” (that is, works “based upon one or more preexisting works”) to the material contributed by the author, as opposed to any pre-existing material.²³

Originality is typically not an issue with audio and video content because most works of this nature are the result of some “modicum” of creativity. But many 3D-printed objects will likely be derivative versions of common objects, or even derivations of other 3D-printed objects. Sean Ragan, a member of the online 3D printing community, created a family tree showing that more than a dozen 3D printed objects (in this instance, heart or cube sculptures composed of working gears) can be traced to another design.²⁴ Ragan also notes that Thingiverse is itself tracking derivation information.²⁵ Such extensive use of preexisting elements is likely to limit copyright protection in the resulting derivative works. In the case of *Lamps Plus, Inc. v. Seattle Lighting Fixture Co.*, for example, the court found that a table lamp assembled from “four preexisting ceiling-lamp elements with a preexisting table-lamp base did not result in the expression of an original work of authorship.”²⁶

Utility. There is an important restriction in the protection for pictorial, graphic and sculptural works that are “useful” articles, defined by section 101 of the Copyright Act as those works having an “intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information.” Copyright protection for useful works exists “if, and only to

the extent that, such design incorporates ... sculptural features that can be identified separately from, and are capable of existing independently of, the utilitarian aspects of the article.”²⁷ In other words, separable ornamental features of a useful article are eligible for copyright protection, but there is no protection where the aesthetic features cannot be identified separately from the useful article, or where the article is purely useful.²⁸ Providing no protection to objects with an “intrinsic utilitarian function” reflects Congress’ intent to distinguish between “copyrightable works of applied art and uncopyrighted works of industrial design.”²⁹ Further, the “useful article doctrine serves the important policy of keeping patent and copyright separate by preventing parties from using copyright to obtain a ‘backdoor patent’ on a functional article that cannot be patented.”³⁰

Oftentimes it is easy to assess whether an article has a purely intrinsic utilitarian function and is therefore not eligible for copyright protection as a pictorial, graphic or sculptural work. Useful articles can include such industrial products as automobiles and food processors, as well as common household items like measuring spoons.³¹

But for certain classes of objects, such as toys, the utility analysis can become more difficult. Although no courts have applied the utility doctrine specifically to 3D-printed objects, existing cases shed important light on the utility doctrine as applied to the realm of physical objects generally. In *Gay Toys, Inc. v. Buddy L. Corp.*, for example, the Sixth Circuit reviewed a decision involving two toy airplane competitors, the first of which alleged that the second was infringing a copyright in an “Air Coupe” model airplane.³² The district court concluded that a toy airplane was a useful article—and therefore ineligible for copyright protection—because the toy plane “permits a child to dream.”³³ The Sixth Circuit reversed the district court’s decision, holding that the only use for the toy plane was to portray a real plane, and thus it was not a useful article under section 101 of the Copyright Act: “[t]he function of toys is much more similar to that of works of art than it is to the ‘intrinsic utilitarian function’ of industrial products.”³⁴

In the case of *Lanard Toys Ltd. v. Novelty Inc.*, the Central District of California built upon the Sixth Circuit’s analysis and added a layer of complexity.³⁵ There, following the *Gay Toys* decision, the court held that two of the toys at issue in a copyright dispute were not useful because they portrayed real airplanes or helicopters.³⁶ For the other toys at issue, though, a “Drop Copter” toy, “Wild Copters” launcher, and “Stunt Plane” launcher, the court found that a reasonable jury could find that these toys were useful, and therefore, not entitled to copyright protection.³⁷ The court’s analysis focused on the fact that the mechanical elements of these toys arguably had a utilitarian purpose: “the launchers are arguably ‘useful’ because they launch the toys into the air.”³⁸ The court’s finding that it could take a jury to evaluate whether the toys might be useful shows how difficult it can be to make an *ex ante* assessment of the scope of copyright protection in a 3D object.

Separability. Even where there is an underlying “useful article,” copyright protection may exist in separable artistic features. Separability can be one of two types: physical separability or conceptual separability.³⁹ Of the two types, it is typically easier to apply physical separability. “[W]hen a component of a useful article can actually be removed from the original item and separately sold, that physically separable design element may be copyrighted.”⁴⁰ For example, because it is physically separable, copyright protection extends to an original sculptural rendering of a banana leaf, even when it is affixed to table and floor lamps.⁴¹

As for conceptual separability, which is likely to arise in many copyright disputes involving 3D-printed objects, courts have long struggled with assessing whether an individual design element can be conceptualized as existing independently from a useful article.⁴² In 1980, the Second Circuit held that the “primary ornamental aspects” of two belt buckles were “conceptually separable from their subsidiary utilitarian function,” and thus the ornamental features were protected by copyright.⁴³ Later, in denying copyright protection for a metal bicycle rack, winner of an industrial design award, the Second Circuit explained: “if design elements reflect a merger of aesthetic and functional considerations, the artistic aspects of a work cannot be said to be conceptually separable from the utilitarian elements.”⁴⁴ This is a separate type of merger analysis from that discussed below, but still an important limitation for at least partially useful 3D objects.

Merger. The merger doctrine may also limit copyright protection in useful features of a pictorial, graphic, or sculptural work. Under the merger doctrine, “[w]hen the idea and the expression of the idea coincide, then the expression will not be protected in order to prevent creation of a monopoly on the underlying ‘art.’”⁴⁵ For example, the “argument was raised and accepted in many computer code copyright cases that within a given programming language, certain results (the ideas) cannot be achieved without using certain expressions (source code).”⁴⁶ So too with objects, where a particular expression or form “necessarily follow[s]” from the idea, there is no copyright protection.⁴⁷ In *Lanard Toys*, for example, the court found that the expressive elements of some of the toys at issue, such as the design of a toy helicopter component, may have been “dictated by their function of either shooting into the air and spinning down to the ground, or launching the toy planes into the air.”⁴⁸ If that was the case, under the merger doctrine, there can be no copyright protection.

Copyright Subsists Only In “Particularized Expression.” Where function does not dictate form and an artistic feature can be conceptualized independently of any useful article, there may be a narrow copyright in “the author’s particularized expression of the idea.”⁴⁹ For example, in *Mattel, Inc. v. Goldberger Doll Manufacturing Co.*, the Second Circuit held that Mattel was entitled to copyright protection for “its own particularized expression” on the face of a Barbie doll, including the “upturned nose, bow lips, and widely spaced eyes.”⁵⁰ The court was careful to note, however, that the protection that flows from Mattel’s copyright is “quite limited,” as “copyright does not protect ideas; it protects only the author’s particularized expression of the idea.”⁵¹ “Thus, Mattel’s copyright in a doll visage with an upturned nose, bow lips, and widely spaced eyes will not prevent a competitor from making dolls with upturned noses, bow lips, and widely spaced eyes, even if the competitor has taken the idea from Mattel’s example, so long as the competitor has not copied Mattel’s particularized expression.”⁵² This decision suggests that because copyright protection is “quite limited,” even minor variations in the design of a 3D-printed object may be sufficient to avoid the copyright.

Pictorial, graphic and sculptural works may be composed of many copyrights, each subject to the restrictions discussed above. Thus, assessing copyright protection in an object can potentially require a number of particularized judgments about utility and separability. For example, the District Court of Connecticut recently analyzed twelve potentially protectable elements of a Lego figurine.⁵³ The court concluded that the figurines’ “straight legs” are functional, and thus ineligible for copyright protection.⁵⁴ In contrast, the court held that the “square feet” and “arms slightly bent at the elbows” were sculptural, and thus copyrightable.⁵⁵

The cases dealing with separability and usefulness certainly provide guide posts for evaluating the extent of copyright protection in 3D-printed pictorial, graphic and sculptural works. But even courts that search for conceptual separation recognize that it is at times a “nebulous standard.”⁵⁶ The District of Rhode Island for example, in denying copyright protection to heart-shaped measuring spoons, acknowledged that the “analysis often sounds more like metaphysics than law.”⁵⁷ Additionally, in 2004, the Seventh Circuit reviewed several major cases from other circuits and noted that in each case, the court applied a different method to evaluate copyright protection.⁵⁸ For those who wish to assess the extent of any copyright protection in a 3D object, these decisions mean that as a practical matter there often will be no single answer to the copyright scope question until a judge rules or jury reaches a verdict. So long as a court finds some aspect of a pictorial, graphic or sculptural work to be separately copyrightable, though, printing a 3D replica will constitute copyright infringement.

B. Copyright in the Design File

Existing copyright doctrines also create some confusion over whether, and to what extent, the CAD design files for 3D printing are copyrightable. The code for software programs is now generally considered copyrightable.⁵⁹ A CAD file, like a software program, could be viewed as a set of instructions that determines the operation of a machine. As with software, copyright in a CAD file might therefore exist independent of whether the “output” of the file—that is, the 3D-printed object—is itself copyrightable. Courts could also apply the Learned Hand abstractions test, as they have with software, to determine the scope of copyright in CAD files.⁶⁰ In a case involving a playwright’s copyright infringement allegation related to a motion picture, Judge Learned Hand wrote:

[W]hen the plagiarist does not take out a block in suit, but an abstract of the whole, decision is more troublesome. Upon any work, and especially upon a play, a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out. ... [T]here is a point in this series of abstractions where they are no longer protected, since otherwise the playwright could prevent the use of his ‘ideas,’ to which, apart from their expression, his property is never extended.⁶¹

For software, these levels of abstraction may include: “(1) the program’s main purpose; (2) its system architecture; (3) various abstract data types; (4) various algorithms and data structures; (5) the source code; and (6) the object code.”⁶²

By analogy, in the realm of 3D printing, courts could find copyright protection for a CAD design file up to some level of abstraction but not beyond. For example, a particular sequence of specific CAD code to 3D print a model car might be copyrightable, subject to the requirements discussed in Part III.A. But the purpose of the instructions, to 3D print a car, would not be copyrightable. Under the Learned Hand test, what may be a closer call is whether a combination of structures within a CAD design file—for example, having blocks of code for the chassis, tail fin, wheels, and doors—is copyrightable, such that alternative code that includes the same combination would infringe.

Alternatively, one commentator has argued that because a CAD file is a “representation of a 3D object,” the copyrightability of the file will depend on whether the “underlying object depicted” is itself copyrightable.⁶³

C. Fair Use

If a 3D printed object is an exact replica of a copyrighted object, then the 3D printed object will infringe. Beyond exact replicas, in the “variety is free” 3D printing ecosystem, designers can easily and cheaply reproduce variations on copyrighted designs, artwork, or photos as elements of 3D objects. The fair use doctrine, applicable to such variations, presents another challenge in applying copyright law to 3D-printed objects. Under the four-factor test outlined in section 107 of the Copyright Act, an otherwise impermissible use of a copyrighted work may be exempt from infringement as a “fair use,” depending on (1) the purpose and character of the use; (2) the nature of the copyrighted work; (3) the amount of the copyrighted work used; and (4) the effect of the use on the market for the copyrighted work.

It is notoriously difficult and fact-intensive to predict with this four-factor test whether any particular use of a copyrighted work is fair use. As Judge Posner has observed, the four statutory factors “are not exhaustive and do not constitute an algorithm that enables decisions to be ground out mechanically.”⁶⁴ And numerous academics have criticized this test, describing it as little more than an *ex post* “lottery argument offered by accused infringers forced to gamble, after the fact, that they did not need permission before.”⁶⁵

Take, for example, the scenario where a 3D designer borrows a 2D graphic image, transforms it into a 3D form and imbues it with at least some element of new expression. Depending on the scope of the changes, fair use could be a close call. Under the first prong of the fair use test, courts must evaluate the nature and purpose of an allegedly infringing use to see “whether the new work merely ‘supersede[s] the objects’ of the original creation ... or instead adds something new, with a further purpose or different character, altering the first with new expression, meaning, or message; it asks, in other words, whether and to what extent the new work is ‘transformative.’”⁶⁶ The “transformativeness” of a work is an important but fact-intensive evaluation.⁶⁷ In *Cariou v. Prince*, the Second Circuit recently held that twenty-five of thirty visual works created by an “appropriation artist,” who altered photographs of people taken and copyrighted by another constituted fair use.⁶⁸ The court found that the uses “have a different character, give [the copyrighted] photographs a new expression, and employ new aesthetics with creative and communicative results distinct from” the original works.⁶⁹ In that case, the expressive transformations in the images were substantial, including the use of selected portions of originals, enlargements, tinting, and combining the originals with others’ photographs.⁷⁰ Analogous transformations could be implemented in the 3D printing context. Such changes would likely weigh in favor of fair use, but could be counter-balanced by the remaining fair use factors, depending on the circumstances.

Merely using a copyrighted work in a new medium is, of course, no guarantee of fair use, as the context is important to assessing fair use. For example, the defendants in *Louis Vuitton Malletier S.A. v. Haute Diggity Dog, LLC*, used the well-known and copyrighted Louis Vuitton design in their line of toys and other products for dogs.⁷¹ The court ultimately found the

products to be a fair use, relying primarily on the defendant's argument that their use was a parody of the copyrighted work, not on the transformative nature of the use.⁷²

IV. Is the DMCA Ready for 3D Printing?

The Digital Millennium Copyright Act ("DMCA") was enacted in 1998 "to foster cooperation among copyright holders and service providers in dealing with infringement on the Internet."⁷³ Since then, the DMCA notice and takedown process has become an important tool used by copyright holders to protect copyrights in digital books, sound recordings, movies and software. In the past few years, the takedown process has found increasing use as an instrument to address perceived copyright violations in 3D-printed objects. With 3D objects, however, enforcing intellectual property rights through the notice and takedown process presents even thornier challenges than with digital content.

The DMCA establishes safe harbors to shield certain "common activities" of Internet service providers ("ISPs") that are integral to the Internet's infrastructure.⁷⁴ For example, 17 U.S.C. § 512(c) provides a safe harbor for file-hosting and related activities so long as certain conditions are satisfied.⁷⁵ Most importantly, a service provider must expeditiously take down allegedly infringing content in response to a notice of infringement sent by a copyright owner.⁷⁶ So long as a service provider satisfies the safe harbor requirements, it has a complete shield for any copyright infringement damages arising from the content posted by the subscriber.⁷⁷ This procedure places "the burden of policing copyright infringement — identifying the potentially infringing material and adequately documenting infringement — squarely on the owners of the copyright"⁷⁸ Thingiverse.com has already implemented a DMCA notice and takedown policy.⁷⁹

The DMCA at 17 U.S.C. § 512(g) also provides a mechanism for the alleged infringer to respond to a takedown notice.⁸⁰ If an ISP disables content after receiving a takedown notice, the subscriber who posted that content may send a DMCA-compliant counter-notification requesting that the disabled content be placed back into service.⁸¹ If the subscriber provides counter-notification, the party who sent the notification of infringement has ten days to file a lawsuit seeking an injunction for copyright infringement and provide notice of this to the ISP.⁸² If the ten days elapse without such notice of a lawsuit by the party alleging copyright infringement, an ISP may re-enable the removed content in compliance with the counter-notification without risking copyright infringement liability.⁸³ By re-enabling the content within fourteen days of the counter-notification, the ISP will be absolved of any liability to the subscriber who posted the content for the period of time during which the material was disabled.⁸⁴

In general, we would expect copyright owners to know the scope of their rights and to be able to recognize when they are being infringed. In these cases, notice and takedown serves as an efficient "extra-judicial" cooperative mechanism for copyright enforcement. But 3D-printed objects push the limits of underlying copyright doctrines to such an extent (as explained in the previous sections), that the self-policing mechanisms of the DMCA notice and takedown process are starting to experience some strain.

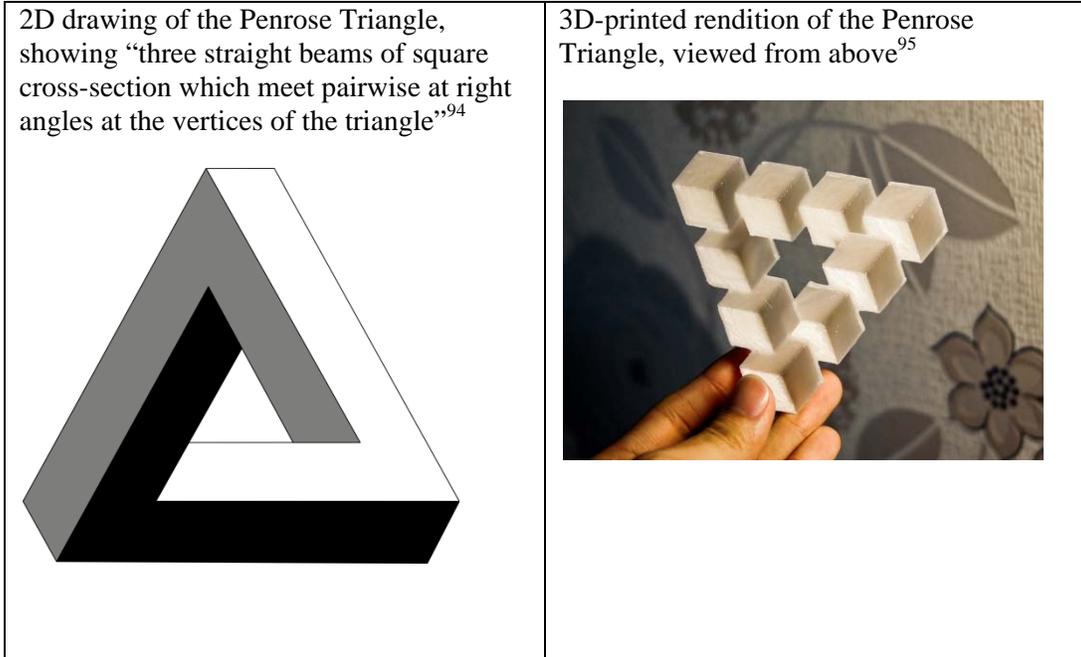
For example, in early 2013, influenced by HBO's Game of Thrones television series, one designer created an iPhone 5 dock shaped like the Iron Throne ceremonial chair, which is

featured prominently in the series.⁸⁵ The designer made available online step-by-step instructions and copies for sale.⁸⁶ HBO notified the website hosting the copies that it owned a copyright in “the Iron Throne design.”⁸⁷

There are several reasons why the DMCA takedown process may be a bad fit for HBO’s copyright allegation. First, a chair (or an iPhone dock) is a useful object. Copyright protection therefore exists only for design elements physically or conceptually separable from the furniture’s utilitarian functions. Identifying such separable elements can be challenging. For example, the Second Circuit recently affirmed a district court’s dismissal of a copyright complaint, alleging infringement of various high-end furniture copies, including a “Cocoon chair.”⁸⁸ The court found that “the complaint does not plausibly allege facts indicating that the furniture contains design elements that are conceptually separable”⁸⁹ Additionally, despite the issues around the throne’s usefulness, HBO may have a claim that its television prop is protected under the Ninth Circuit’s “character” doctrine, under which an “owner of a copyright in various works embodying a character can acquire copyright protection for the character itself.”⁹⁰ For example, one court recently concluded the Batmobile is a “character,” in part because “[t]he comic books portray the Batmobile as a superhero,” and it “exhibit[s] a series of readily identifiable and distinguishing traits.”⁹¹ But the “character” doctrine is evolving and fact-intensive, meaning that the extent of copyright protection can be unclear. The doctrine also appears to be in tension with the fact that the iPhone holder has a useful purpose distinct from serving as a replica of the movie prop.

The Game of Thrones iPhone dock also raises fair use issues, because the designer adapted the throne design to serve as an iPhone dock. The modified design could arguably be considered parodic or satirical, possibly commenting on the primacy of technology in our modern lives. That transformativeness would weigh in favor of fair use, but that would be just one factor of the fair use analysis. Other factors, including the commercial purpose of the copying, and the fact that the design is only modified in scale, provide a counterweight to any transformative aspects of the work. The fair use analysis is typically absent in the context of policing wholesale digital copying of audio and video files in their entirety, but may be far from atypical in the context of 3D printed designs.

Although HBO’s copyright infringement allegation does not implicate issues of sufficient originality, in other cases, that may be less clear. In 2011, an individual named Ulrich Schwanitz developed a CAD file to 3D print a “Penrose Triangle,” an optical illusion frequently portrayed in the art of M.C. Escher, a well-known graphic artist.⁹² Schwanitz posted a video of his creation to YouTube, and made his version available for purchase on Shapeways.com.⁹³



Based on the YouTube video, a 3D modeler named Artur Tchoukanov reverse engineered Schwanitz’s object and made the CAD file available in the public domain for anyone to download.⁹⁶ Upset that his creation had been copied and that anyone could use the free CAD file to manufacture a copy, Schwanitz sent a DMCA takedown notice to Thingiverse, which stopped distributing the design.⁹⁷

Although Schwanitz had a change of heart and released his design into the public domain shortly after Thingiverse complied with the takedown notice,⁹⁸ his actions demonstrate how the DMCA can be misused in the first instance, in situations where the extent of copyright protection in an object is unclear. Schwanitz based his design on the two-dimensional work of another; Schwanitz even borrowed the idea of creating a Penrose triangle using cube shapes to make up the three beams.⁹⁹ And even assuming Schwanitz added some new ornamental feature, his DMCA notice did not identify any such conceptually separable feature.¹⁰⁰ This would have allowed Tchoukanov to modify his design to remove the element in which Tchoukanov claimed to have the copyright.

For some 3D-printed objects, the existence and extent of copyright protection will not be difficult to assess. That said, the DMCA takedown process treats those cases no differently from cases where there is a bona fide question about the extent of copyright protection. Moreover, despite a pervasive lack of clarity of copyright principles in the context of 3D printing, the DMCA implements a self-policing procedure that relies on the judgments of non-copyright lawyers — such as hobbyists like Schwanitz — to enforce copyrights extra-judicially, and to respond to the assertions of others. Thus, we can anticipate that the DMCA framework will come under increasing pressure in the coming years.

V. Conclusion

Physical replication may still be far from the ease of pressing “control c + control v” to copy a digital file, but with 3D printing, the gap between the two is narrowing. As the market for 3D printing grows, and the technology improves, intellectual property rights holders will soon be forced to protect their copyrights using doctrines that do not always provide clear answers. Further, the fact-intensive, and sometimes seemingly metaphysical copyright doctrines applicable to 3D-printed objects have implications for the DMCA notice and takedown regime, created to address Internet-related copying of audio, video and other digital content. With 3D printing, questions of usefulness, originality, separability and fair use mean that self-policing of copyright infringement can be significantly more challenging for content owners, hosting sites, and consumers. The growing 3D printing economy thus presents an opportunity and the urgency for copyright stakeholders to shape the controlling legal regime and appropriate enforcement mechanisms.

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¹ Hod Lipson and Melba Kurman, *The Ten Principles of 3D Printing*, BIGTHINK (March 2, 2013, 12:00 AM), available at <http://bigthink.com/experts-corner/the-ten-principles-of-3d-printing>.

² See generally 35 U.S.C. §§ 101, 170 (2010).

³ See generally 15 U.S.C. § 1125 (2010).

⁴ See generally 15 U.S.C. §§ 1114, 1125(a) (2010).

⁵ Lipson and Kurman, *The Ten Principles of 3D Printing*.

⁶ Brian Rideout, *Printing the Impossible Triangle: The Copyright Implications of Three-Dimensional Printing*, 5 J. BUS. ENTREPRENEURSHIP & L. 161, 163 (2011).

⁷ Michael Weinberg, *It Will Be Awesome If They Don't Screw It Up*, PUBLIC KNOWLEDGE, 3 (Nov. 2010), <http://www.publicknowledge.org/files/docs/3DPrintingPaperPublicKnowledge.pdf>.

⁸ See <http://www.thingiverse.com>.

⁹ See ENVISIONTEC, <http://envisiontec.com/applications/hearing-aid/> (last visited July 10, 2013).

¹⁰ John Hewitt, *NASA 3D prints rocket parts – with steel, not plastic*, EXTREMETECH (Nov. 15, 2012, 10:47am), <http://www.extremetech.com/extreme/140084-nasa-3d-prints-rocket-parts-with-steel-not-plastic>.

¹¹ Press Release, Staples, Staples First Major U.S. Retailer to Announce Availability of 3D Printers, available at <http://www.businesswire.com/news/home/20130503005116/en/Staples-Major-U.S.-Retailer-Announce-Availability-3D>.

¹² *Frequently Asked Questions*, MAKERBOT, <http://www.makerbot.com/faq/> (last visited July 8, 2013).

¹³ *Stratsys to Acquire Makerboot, Merging Two Global 3D Printing Industry Leaders*, BUSINESS WIRE (June 19, 2013, 4:15pm), <http://www.businesswire.com/news/home/20130619006431/en/Stratasys-Acquire-MakerBot-Merging-Global-3D-Printing>.

¹⁴ *How Shapeways 3D Printing Works*, SHAPEWAYS, http://www.shapeways.com/about/how_does_it_work?li=home-learnmore (last visited July 8, 2013); *see also FAQs Shops*, SHAPEWAYS, http://www.shapeways.com/betashops/faq_s_shops (last visited July 8, 2013).

¹⁵ *Id.*

¹⁶ Carl Bass, *An Insider's View of the Myths and Truths of the 3-D Printing 'Phenomenon'*, WIRED (May 28, 2013, 6:30AM), <http://www.wired.com/opinion/2013/05/an-insiders-view-of-the-hype-and-realities-of-3-d-printing/>.

¹⁷ *Id.*

¹⁸ *Masquerade Novelty, Inc. v. Unique Indus., Inc.*, 912 F.2d 663, 670 (3d Cir. 1990) (noting courts “have twisted themselves into knots trying to create a test to effectively ascertain whether the artistic aspects of a useful article can be identified separately from and exist independently of the article's utilitarian function”).

¹⁹ 17 U.S.C. § 102 (2012).

²⁰ *Id.* at § 101.

²¹ *N. Coast Indus. v. Jason Maxwell, Inc.*, 972 F.2d 1031, 1033 (9th Cir. 1992).

²² *Feist Publications, Inc., v. Rural Telephone Service Co.*, 499 U.S. 340 (1991).

²³ 17 U.S.C. §§ 101, 103 (2012).

²⁴ Sean Michael Ragan, *The Thingiverse “Heart Gears” Phenomenon – A Physible Family Tree* (June 11, 2012), <http://www.smragan.com/2012/06/11/the-heart-gears-phenomenon-a-physible-family-tree/>.

²⁵ *Id.*

²⁶ *Lamps Plus, Inc. v. Seattle Lighting Fixture Co.*, 345 F.3d 1140, 1147 (9th Cir. 2003).

²⁷ 17 U.S.C. § 101 (2012).

²⁸ *Carol Barnhart Inc. v. Economy Cover Corp.*, 773 F.2d 411, 418 (2d Cir. 1985).

²⁹ *Gay Toys, Inc. v. Buddy L Corp.*, 703 F.2d 970, 972 (6th Cir. 1983) (quoting House Report) (internal quotation omitted).

³⁰ *Smith & Hawken, Ltd. v. Gardendance, Inc.*, 2005 WL 1806369, at *3 (N.D. Cal. July 28, 2005).

³¹ *Bonazoli v. R.S.V.P. Int'l, Inc.*, 353 F. Supp. 2d 218, 221 (D.R.I. 2005); *see Gay Toys, Inc.* at 973 (discussing legislative history).

³² *Gay Toys, Inc. v. Buddy L. Corp.*, 703 F.2d 970, 973 (6th Cir. 1983).

³³ *Gay Toys, Inc. v. Buddy L. Corp.*, 522 F. Supp. 622, 625 (E.D. Mich. 1981).

³⁴ See *Gay Toys, Inc.*, 703 F.2d at 973.

³⁵ *Lanard Toys Ltd. v. Novelty Inc.*, 511 F. Supp. 2d 1020, 1035-37 (C.D. Cal. 2007).

³⁶ *Id.* at 1036.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Carol Barnhart v. Economy Cover Corporation*, 773 F.2d 411, 418 (2d Cir.1985).

⁴⁰ *Chosun Int'l, Inc. v. Chrisha Creations, Ltd.*, 413 F.3d 324, 327 (2d Cir. 2005).

⁴¹ *Sunset Lamp Corp. v. Alsy Corp.*, 698 F. Supp. 1146, 1151 (S.D.N.Y. 1988); see also *Mazer v. Stein*, 347 U.S. 201, 202-03 (1954).

⁴² See Bass, *supra* note 16.

⁴³ *Kieselstein-Cord v. Accessories by Pearl, Inc.*, 632 F.2d 989, 993 (2d Cir. 1980).

⁴⁴ *Brandir Int'l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142, 1145 (2d Cir. 1987).

⁴⁵ *Educational Testing Services v. Katzman*, 793 F.2d 533, 539 (3d Cir. 1986).

⁴⁶ Michael D. Murray, Comment, *Copyright, Originality, and the End of the Scenes a Faire and Merger Doctrines for Visual Works*, 58 BAYLOR L. REV. 779, 792 (2006), available at <http://www.baylor.edu/content/services/document.php/116876.pdf>.

⁴⁷ *Lanard Toys Ltd. v. Novelty Inc.*, 511 F. Supp. 2d 1020, 1036 (C.D. Cal. 2007).

⁴⁸ *Id.*

⁴⁹ *Mattel, Inc. v. Goldberger Doll Manufacturing Co.*, 365 F.3d 133, 135-36 (2d Cir. 2004).

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.* at 136.

⁵³ *Lego A/S v. Best-Lock Construction Toys, Inc.*, 874 F. Supp. 2d 75, 99-103 (D. Conn. 2012).

⁵⁴ *Id.* at 102.

⁵⁵ *Id.* at 101-02.

⁵⁶ *Universal Furniture Int'l Inc. v. Collezione Europa USA, Inc.*, 618 F.3d 417, 431 (4th Cir. 2010).

⁵⁷ *Bonazoli v. R.S.V.P. Int'l, Inc.*, 353 F. Supp. 2d 218, 224 (D.R.I. 2005).

⁵⁸ *Pivot Point Int'l, Inc. v. Charlene Prods., Inc.*, 372 F.3d 913, 929 (7th Cir. 2004).

⁵⁹ Generally speaking, computer software code is copyrightable. *See, e.g.*, Final Report of the National Commission on New Technological Uses of Copyrighted Works, Final Report (1979), available at <http://people.ischool.berkeley.edu/~bcarver/mediawiki/images/8/89/CONTU.pdf>; *See also* Apple Computer, Inc. v. Franklin Computer Corp., 714 F.2d 1240 (3d Cir. 1983), and Apple Computer, Inc. v. Formula Int'l Inc., 725 F.2d 521, 524 (9th Cir. 1984). This is true of the machine language (composed of bits of 1s and 0s) that a computer actually reads, as well as the higher level assembly language and source code that programmers typically use when designing software. *See generally*, Note, *Copyright Protection of Computer Program Object Code*, 96 HARV. L. REV. 1723 (1983).

⁶⁰ *See generally*, John W.L. Ogilvie, Note, *Defining Computer Program Parts under Learned Hand's Abstractions Test in Software Copyright Infringement Cases*, 91 MICH. L. REV. 526 (1992); *see also* Nichols v. Universal Pictures Corp., 45 F.2d 119 (2d Cir. 1930), *cert. denied*, 282 U.S. 902 (1931).

⁶¹ Nichols v. Universal Pictures Corporation, 45 F.2d 119, 121 (2d Cir. 1930).

⁶² *See* Ogilvie, *supra*, note 60, at 533.

⁶³ *See* Rideout, *supra* note 6, at 167.

⁶⁴ Chicago Bd. of Educ. v. Substance, Inc., 354 F.3d 624, 629 (7th Cir. 2003).

⁶⁵ Michael J. Madison, *A Pattern-Oriented Approach to Fair Use*, 45 WM. & MARY L. REV. 1525, 1666 (2004); *see also* Paul Goldstein, *Fair Use in Context*, 31 COLUM. J.L. & ARTS 433 (2008) (“[f]air use is the great white whale of American copyright law. Enthralling, enigmatic, protean, it endlessly fascinates us even as it defeats our every attempt to subdue it.”) and Thomas F. Cotter, *Fair Use and Copyright Overenforcement*, 93 IOWA L. REV. 1271, 1284 (2008).

⁶⁶ Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569, 579 (1994) (internal citations omitted).

⁶⁷ Courts often emphasize the first prong of the fair use test and determine whether the use of the copyrighted work is “transformative.” *See, e.g.*, Pierre N. Leval, *Toward a Fair Use Standard*, 103 HARV. L. REV. 1105, 1111 (1990) (urging courts to consider whether a work is “transformative” as the most important element of the test); *see also* Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569, 579 (1994) (citing Leval and noting that “[a]lthough such transformative use is not absolutely necessary for a finding of fair use, . . . the goal of copyright, to promote science and the arts, is generally furthered by the creation of transformative works”) (citation omitted).

⁶⁸ Cariou v. Prince, 714 F.3d 694, 708 (2d Cir. 2013).

⁶⁹ *Id.*

⁷⁰ *Id.* at 700-11.

⁷¹ Louis Vuitton Malletier S.A. v. Haute Diggity Dog, LLC, 464 F. Supp. 2d 495 (E.D. Va. 2006),

⁷² *Id.* at 507 (“[T]he use of similar marks and name in a line of dog chew toys and beds parodies the high-end fashion status of LVM's products in a market that LVM does not participate—the market for pet toys and beds. This Court finds that the use of similar markings and colors to those copyrighted by LVM for Chewy Vuitton products is a parody.”).

⁷³ UMG Recordings Inc. et al. v. Shelter Capital Partners LLC et al. and Veoh Networks, Inc. ___ F.3d ___, 2011 WL 6357788, *10 (9th Cir. Dec. 20, 2011) (“*UMG Cir.*”) (citing S. Rep. No. 105-190, at 20).

⁷⁴ S. Rep. No. 105-190, at 19 (1998).

⁷⁵ 17 U.S.C. § 512(c) (2010).

⁷⁶ 17 U.S.C. § 512(c)(1) (2010).

⁷⁷ *Id.*

⁷⁸ *Perfect 10, Inc. v. CCBill LLC*, 488 F.3d 1102, 1113 (9th Cir. 2007); *UMG Recordings*, at *11.

⁷⁹ *See, e.g., Intellectual Property Policy*, THINGIVERSE, <http://www.thingiverse.com/legal/ip-policy> (last visited July 1, 2013).

⁸⁰ 17 U.S.C. § 512(g) (2010).

⁸¹ 17 U.S.C. § 512(g)(2), (3) (2010).

⁸² *Id.*

⁸³ *Id.*

⁸⁴ 17 U.S.C. § 512(g) (2010).

⁸⁵ *3D printing startup received takedown notice from HBO for IP infringement*, 3DERS.ORG (Feb. 13, 2013), <http://www.3ders.org/articles/20130213-new-3d-printing-company-received-takedown-notice-from-hbo-for-ip-infringement.html>.

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ *Heptagon Creations Ltd. v. Core Group Marketing LLC*, 2013 WL 135409, at *1 (2d Cir. 2013).

⁸⁹ *Id.* at *2.

⁹⁰ *See DC Comics v. Towle*, No. cv-11-03934, 2013 WL 541430 at *39 (C.D. Cal. Feb. 7, 2013).

⁹¹ *Id.* at *15.

⁹² *See Rideout*, *supra* note 6, at 165-66.

⁹³ Peter Hanna, *The next Napster? Copyright questions as 3D printing comes of age*, ARS TECHNICA (April 5, 2011, 9:35pm), <http://arstechnica.com/tech-policy/2011/04/the-next-napster-copyright-questions-as-3d-printing-comes-of-age/>.

⁹⁴ WIKIPEDIA, https://en.wikipedia.org/wiki/Penrose_triangle (last visited July 18, 2013); WIKIPEDIA, <http://en.wikipedia.org/wiki/File:Penrose-dreieck.svg> (last visited July 1, 2013) (file is licensed under the Creative Commons Attribution-Share Alike 2.5 Generic license; the author of the file is "Tobias R. – Metoc").

⁹⁵ WIKIPEDIA, <http://en.wikipedia.org/wiki/File:Penrosetrianglemodel.jpg> (last visited on July 1, 2013) (file is licensed under the Creative Commons Attribution-Share Alike 2.5 Generic license; the author of the file is "Chylld").

⁹⁶ *See Hanna*, *supra* note 93.

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *See Rideout, supra* note 6, at 170 & n.69.

¹⁰⁰ *Id.* at 166 & n.39.