Indistinguishable from Magic: A Wizard's Guide to Copyright and 3D Printing

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> "Any sufficiently advanced technology is indistinguishable from magic."[1]

The defining characteristic of a 3D printer is that it turns bits into stuff. This causal connection between the world of thoughts and the world of things is more than a little uncanny. 3D printing is a technology of such surprise and wonder that it verges on the magical.

It is also, Kyle Dolinsky argues, a problem for copyright law.[2] The heart of his Note is a search for analogies to CAD files in copyright case law. He works methodically through architectural plans, technical drawings, recipes, and computer programs[3]—all things that consist of instructions for making other things. These analogies have something else in common, too: they're difficult, contested ground in copyright, which has never dealt cleanly with multiple media or multiple layers of meaning.

This bad news is also good news. 3D printing is as hard as some of the most notoriously difficult parts of copyright—but it is also no harder. To the extent that the copyright system is capable of resolving these other controversial cases, it is also capable of

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1. Arthur C. Clarke, *Hazards of Prophecy: The Failure of the Imagination*, *in* PROFILES OF THE FUTURE: AN INQUIRY INTO THE LIMITS OF THE POSSIBLE 12, 21 n.1 (rev. ed. 1973).

2. *See generally* Kyle A. Dolinsky, Note, *CAD's Cradle: Untangling Copyrightability, Derivative Works, and Fair Use in 3D Printing*, 71 WASH. & LEE L. REV __, __ (2014).

3. *See id.* at __ (comparing CAD files to these other types of works and concluding that all of the analogies are imperfect).

resolving 3D printing cases. To see why, it helps to abstract away from the details of 3D printing itself. Instead, let us start from the wisdom of Clarke's Third Law;[4] that beyond a certain point, the technological details no longer matter. What if 3D printers are actually *are* magic?

I.

Ulrich has a Replicio wand. When he waves it with the right flick of his wrist, it makes a perfect duplicate of the object he waves it at.

The copyright treatment of the Replicio wand is simple. When Ulrich uses it to duplicate an object, he has created a "copy."[5] His only good argument that his copy is noninfringing will be that the object is not subject to copyright in the first place.[6] The strength of this argument depends on what the object is. A first-century bust of Homer is in the public domain; duplicating it with my wand violates no one's rights. A twenty-first-century bust of Homer Simpson is copyrighted; duplicating it with the wand makes me an infringer.

There is nothing special about three-dimensional objects in this respect.[7] If Ulrich waves the wand at Rembrandt's two-dimensional public-domain painting *Aristotle Contemplating a Bust of Homer*, his duplicate will not infringe. To be sure, some three-dimensional objects are uncopyrightable for a distinctive reason: because they are "useful articles" whose practical aspects are inseparable from their aesthetic features,[8] such as bicycle

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4. *See supra* note 1 and accompanying text ("Any sufficiently advanced technology is indistinguishable from magic.").

5. *See* 17 U.S.C. § 101 (2012) (defining "copies" as "material objects . . . in which a work is fixed by any method now known or later developed, and from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device").

6. *See id.* § 106(1) (providing that, except for fair use and other limitations, the owner of a valid copyright has the exclusive right to "reproduce the copyrighted work in copies").

7. *See id.* § 101 (defining "[p]ictorial, graphic, and sculptural works"); *id.* § 102(a)(5) (making them protectable).

8. *See id.* § 101 (defining "useful article[s]" as objects "having an intrinsic utilitarian function" and excluding them from protection unless "such design incorporates pictorial, graphic, or sculptural features that can be identified

racks[9] and casino uniforms.[10] But to understand the Replicio wand, we need to know only whether a three-dimensional object is copyrighted; nothing turns on why.

Thus, if we are capable of deciding which three-dimensional objects are copyrighted—a question to which copyright law already purports to have an answer—we are capable of saying that using a 3D printer to duplicate them infringes. Like the wand, it reproduces every last scrap of expression; a duplicate infringes if and only if the initial object was copyrightable.[11] This is not by any means an easy question, but it is no harder than current copyright doctrine.

II.

3D printing is not, however, quite this simple. 3D printers do not work directly from objects any more than regular 2D printers work directly from books. Instead, 3D printers start from specialized CAD files: the 3D equivalents of PDFs.[12]

The magical equivalent of a CAD file is a long scroll containing an intricate spell. When read aloud, the scroll conjures up an object. What kind of object depends on the spell: a chair scroll makes a chair, a broom scroll makes a broom. Read a broom scroll twice and you have two brooms.

When I use my Replicio wand to duplicate a bust of Homer Simpson, I infringe. But what if Gandalf and Saruman break the process into two steps? Gandalf makes a scroll to create busts of

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separately from, and are capable of existing independently of, the utilitarian aspects of the article").

9. *See* Brandir Int'l v. Cascade Pac. Lumber Co., 834 F.2d 1142, 1147–48 (2d Cir. 1987).

10. *See* Galiano v. Harrah's Operating Co., Inc., 416 F.3d 411, 422 (5th Cir. 2005).

11. *See, e.g.*, *id.* at 413 ("To prove copyright infringement, a plaintiff must show ownership of a valid copyright and actionable copying.").

12. *See* Dolinsky, *supra* note 2, at __ (comparing the STL format to the 3D version of a PDF) (quoting Michael Weinberg, *What's the Deal with Copyright and 3D Printing?*, PUBLIC KNOWLEDGE 14 (Jan. 29, 2013), http://www.publicknowledge.org/files/What's%20the%20Deal%20with%20Copyright_%20Final%20version2.pdf).

Homer Simpson, and Saruman uses the scroll to make a bust. Are these infringing "copies" of the initial bust?[13]

A.

Saruman's case is simpler. Just as it doesn't matter whether I use a Replicio wand, a 3D printer, or hammer and chisel to produce infringing *Simpsons* memorabilia, it doesn't matter that Saruman works from a scroll. At the end of the process, he has a bust of Homer Simpson where none existed before. That bust is still a copy; it still infringes. As before, Saruman is in trouble if and only if the object Gandalf started from was copyrightable.

B.

Gandalf's case is more interesting, but in the end the result is the same. The apparent difficulty is that the scroll doesn't look like the object it describes. A chair scroll and a broom scroll are far more similar in appearance than a chair and a broom. If you showed me a scroll to make a bust of Homer Simpson, I wouldn't recognize it.

There was a time when copyright law distinguished between a copy that humans would recognize and a copy they would not, but that time was 1908. In that year, the Supreme Court held that player piano rolls weren't "copies" of the music encoded in them, writing that "even those skilled in the making of these rolls are unable to read them as musical compositions."[14] Unlike sheet music, which is "addressed to the eye," piano rolls were only "part of a machine."[15]

Congress promptly obliterated the idea that mere "mechanical reproductions" of music were immune from copyright, creating a system of royalties for them in the

13. *See* 17 U.S.C. § 101 (2012) (defining "copies" as "material objects . . . from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device").

14. White-Smith Music Publ'g Co. v. Apollo Co., 209 U.S. 1, 18 (1908).

15. *Id.* at 12 (quoting Kennedy v. McTammany, 33 F. 584, 584 (C.C.D. Mass. 1888)).

Copyright Act of 1909.[16] Two years later, the Supreme Court held that a celluloid film-stock version of *Ben Hur* infringed on the book,[17] and since then shifting between media has not generally been a defense to a copyright lawsuit.[18] The modern Copyright Act explicitly repudiates the distinction between human-intelligible and technological copies. Today a "copy" infringes whether it can be perceived "directly" or whether it requires "the aid of a machine or device."[19] A 3D printer is just such a device.

Nor does it matter how the scroll is produced. Some wizards, like Hermione Granger, are capable of taking an object and writing out longhand the corresponding scroll to make another. Others, more like Ron Weasley, prefer to use a Transcriptio wand to make their scrolls for them. (The distinction, of course, corresponds to the difference between hand-authored and scanned CAD files.)[20] Either way, the scroll is treated like the object it makes: both of them infringe if the object they were made from is copyrightable.

C.

Thus, despite the superficial difference between 2D and 3D, copyright law treats these scrolls just like the objects they make. The duplicate bust of Homer Simpson and the scroll that makes a duplicate bust of Homer Simpson are both infringing "copies" of the initial bust. The initial bust and the duplicate bust are both sculptural works, while the scroll merely "portrays" a sculptural work, but that makes no difference. All three contain the same

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16. Copyright Act of 1909, 17 U.S.C. § 1(e) (1974) (current version at 17 U.S.C. § 106(5)–(6) (2012)).

17. Kalem Co. v Harper Bros., 222 U.S. 55, 62–63 (1911); *see also* Harper & Bros. v. Kalem Co., 169 F. 61, 62 (2d Cir. 1909) (describing motion picture technology).

18. *See, e.g.*, UMG Recordings, Inc. v. MP3.com, Inc., 92 F. Supp. 2d 349, 352–53 (S.D.N.Y. 2000) (concluding that defendant infringed by converting tens of thousands of CDs into MP3 files).

19. 17 U.S.C. § 101 (2012). Reading a scroll aloud "reproduce[s]" the object it describes; a 3D printer is a "machine or device" used to "reproduce[]" a CAD file. *Id.*; *see also* Dolinsky, *supra* note 2, at ___ (describing the 3D printing process).

20. *See* Dolinsky, *supra* note 2, at __ (discussing the differences).

copyrightable expression. The unauthorized CAD file made from a Homer Simpson bust infringes, even before you print out the bust itself.

III.

But there is more. There is always more. So far, we have been considering claims by the copyright owner of the initial object against the team of Gandalf and Saruman. But what about the copyright owners of scrolls? Suppose that Morgaine has composed a scroll to make an object. Will copyright protect her from pirate wizards?

A.

Merlin is crafty: he realizes that his Replicio wand works just as well on scrolls as it does on busts.[21] So even though no bust of Homer Simpson is available for him to duplicate, Merlin is undeterred. He simply uses his wand to duplicate Morgaine's bust-making scroll.

When challenged, Merlin might argue that he has copied nothing copyrightable, since Morgaine never had a bust of Homer Simpson in the first place. But just as a bust of Homer Simpson and a scroll describing a bust of Homer Simpson are equally infringing, so too a bust and a scroll describing a bust are equally protected as originals. Others infringe when they copy it.[22] As long as the object Morgaine had in mind was copyrightable, Merlin's copy of her scroll to create it infringes.

Again, there is nothing special about magic scrolls or 3D printers. As long as something is copyrightable, sufficiently

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21. As this example shows, the distinction between two and three dimensions gives way when pressed. All objects are three-dimensional, and thus so are all the copies of any work. Any particular copy of *Aristotle Contemplating a Bust of Homer*, the original included, is a three-dimensional object. Calling it "two-dimensional" is a way of saying the third dimension is irrelevant. The expression in the words of a novel is independent of the thickness of the paper they are printed on.

22. *See* 17 U.S.C. § 101 ("The term 'copies' includes the material object . . . in which the work is first fixed by any method now known or later developed . . . .").

detailed instructions for making it are copyrightable, too. Architectural plans are copyrightable because buildings are.[23] JPEG files are copyrightable because images are. It is true that copyright does not protect functional material.[24] But the "functionality" of scrolls and CAD files is a red herring when their function is to produce copyrightable objects. Saying that a CAD file is functional to make a bust of Homer Simpson is like saying that MP3 files are functional to make music. So they are: it is the expression in the underlying busts and songs that makes the files copyrightable in some hands and infringing in others.

B.

But this is not the end of the story because this is not the only way that Morgaine's scroll could be copyrightable. Suppose, for example, that it has decorative flourishes that are completely unrelated to the object it produces: swash caps and line drawings of sea monsters in the margins.[25]

When a scroll contains decorative features that are wholly incidental to what it does, the scroll itself is independently expressive, like an antique map or an illuminated manuscript.[26] Indeed, even if Morgaine's artistic vision outstrips her magical talent so that the scroll she writes is beautiful but does nothing when read aloud, it is still a work of authorship—a "pictorial" or "graphic" work, to be precise.[27] A collector might hang it on her

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23. *See id.* § 101 (defining "architectural work[s]"); *id.* § 102(a)(8) (making them protectable).

24. *See, e.g.*, *id.* § 102(b) ("In no case does copyright protection . . . extend to any . . . procedure, process, system, [or] method of operation . . . .").

25. In Dolinsky's taxonomy, the 3D printer equivalent would be to decorative touches in the design drawings used to produce the computer code in the CAD files. *See* Dolinsky, *supra* note 2, at __ (arguing that authorship and copyrightability of computer code in a CAD file, respectively, will depend on the extent to which CAD software programmers and CAD designers, respectively, are responsible for recognizable segments of code).

26. *But see* Zhang v. Heineken N.V., No. CV 08-6506 GAF (RCx), 2010 WL 4457460, at *5–6 (C.D. Cal. May 12, 2010) (concluding that work of Chinese calligraphy was uncopyrightable).

27. *See* 17 U.S.C. § 101 (2012) (defining "pictorial" and "graphical" works), *id* § 102(a) (making copyrightable "original works of authorship fixed in any tangible medium of expression").

wall for decoration, not even knowing what Morgaine intended it to do.

If so, then Merlin will still infringe by duplicating the scroll—even when the underlying object is uncopyrightable. The low-level CAD files used in 3D printers, however, tend not to have this incidental kind of unrelated expression embedded in them. They are like scrolls printed in a uniform mechanical typeface, with no decorative features whatsoever.

C.

There is also a third way that Morgaine's scroll could implicate the kind of expression that copyright cares about. The necessary originality to make it copyrightable could be found not in the object it describes or in its purely decorative features, but in the words it uses to describe the object. That is, the scroll is not just a portrayal of a 3D sculptural work, and not just a 2D pictorial work, but also a 1D literary work.

Different scrolls may use different words to do the same thing. Morgaine and Gandalf will not describe a chair in the same way; the scrolls they write out will have different instructions for recreating it. When I read aloud from Morgaine's scroll I will speak different syllables than when I read from Gandalf's scroll, even though the chairs I end up with are identical in every way. Does the difference in wording matter?

One approach to the question treats a chair scroll like a photograph of the chair: both purport to represent the chair's appearance. In copyright terms, they are "derivative works" based on the chair.[28] Just as a photograph of an uncopyrightable vodka bottle can be copyrightable because it embodies the photographer's choices "about lighting, shading, angle, background, and so forth,"[29] the scroll embodies Morgaine's choices about how to describe the chair.

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28. *See* 17 U.S.C. § 101 (defining "derivative work" as "a work based upon one or more preexisting works" including any "form in which a work may be recast, transformed, or adapted"); *id.* § 103(a) (making derivative works copyrightable).

29. Ets-Hokin v. Skyy Spirits, Inc., 225 F.3d 1068, 1077 (9th Cir. 2000).

Another approach inverts the question; it looks not to how a scroll was made but to how it is to be used. The words on the scroll, like the text of a computer program, are speech acts: they cause something to happen when read in the right way. Whether they are a proper subject of copyright is precisely the question that Congress asked the Commission on New Technological Uses (CONTU) to confront in the 1970s.[30] CONTU recommended,[31] and Congress agreed,[32] that computer programs should be protected in this way—as literary works.[33] The choice was and is controversial, but the law is settled.[34]

Either way, if Morgaine's scroll has distinctive wording, Merlin the plagiarist will infringe. Of course, not all scrolls will actually feature this kind of expression. Some will fall beneath the threshold of minimal originality: a scroll to make a cube is likely to be completely generic.[35] Others will involve no meaningful human authorship, as where a particularly stodgy wizard uses a Transcriptio wand to make a "slavish cop[y]" of the chair in front of her.[36] Still others will describe the object using the same words that any other wizard would have to use to

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30. *See* NAT'L COMM'N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, FINAL REPORT 1 (1978) (noting that CONTU's purpose was to "address the problems raised by the use of new technolog[y] of . . . computers").

31. *See ID.* AT 9–12 (recommending copyright protection for computer programs).

32. *See* 17 U.S.C. § 101 (2012) (defining "computer program").

33. *See, e.g.*, Apple Computer, Inc. v. Franklin Computer Corp., 714 F.2d 1240, 1249 (3d Cir. 1983) ("Thus a computer program . . . is a 'literary work' and is protected from unauthorized copying.").

34. *Compare, e.g.*, Pamela Samuelson, *CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form*, 1984 DUKE L.J. 663, 703–53 (criticizing software copyright), *with, e.g.*, Arthur R. Miller, *Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?*, 106 HARV. L. REV. 977, 982–85 (1993) (defending software copyright).

35. *See, e.g.*, Yankee Candle Co., Inc. v. Bridgewater Candle Co., LLC, 259 F.3d 25, 35 (1st Cir. 2001) (stating that "common geometric shapes" are uncopyrightable, and collecting cases).

36. Bridgeman Art Library, Ltd. v. Corel Corp., 36 F. Supp. 2d 191, 196 (S.D.N.Y. 1999). Yet again, nothing turns on the number of dimensions. There is no more originality in a perfectly detailed scan of a car than in a perfectly detailed photograph of a painting. *See* Meshwerks, Inc. v. Toyota Motor Sales USA, Inc., 528 F. 3d 1258, 1267 (10th Cir. 2008) (calling a scan of a 3D object "a peculiar type of copying").

describe it: a chair has "four" "legs" and not "five" "arms." These expressive details merge with the idea of describing a chair; they too are uncopyrightable.[37] And finally, the rules of magic will sharply constrain the permissible descriptions of a chair; it would hardly do for a chair-making scroll to contain a sequence of syllables that summons up a herd of rampaging wildebeests. All of these uncopyrightable elements will need to be filtered from the scroll's wording in assessing its overall copyrightability.[38]

D.

To summarize, a scroll might be copyrightable because it makes a copyrightable object, because it uses copyrightable words to describe the object, or because it adds copyrightable decoration to those words. With CAD files, the first will be present frequently, the second occasionally, and the third rarely. If any of the three are present, those who copy the CAD file are infringers.

It does not make a major difference whether the chicken or the egg comes first. Some wizards create scrolls "drawn from the life"[39] based on existing 3D objects. Others can work "entirely from [their] own original mental conception"[40] and compose a scroll from scratch, a scroll that will produce an object whose like has never before existed in the world. Obviously, a wizard who works from a preexisting object cannot lay claim to the copyrightable features of the object itself (unless she was also the author of the object), but both she and the wizard who works from scratch have a copyright in their choice of wording and any decorative flourishes.[41]

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37. *See, e.g.*, Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 707–08 (2d Cir. 1992) (explaining that elements dictated by efficiency are not copyrightable because the potentially copyrightable expression has merged with the uncopyrightable idea).

38. *Cf. id.* at 707–10 (describing the filtration step of the abstraction–filtration–comparison test for computer software, in which the uncopyrightable elements of code are filtered out).

39. Bleistein v. Donaldson Lithography Co., 188 U.S. 239, 249 (1903). There, the Court concluded that works based on existing objects are not thereby excluded from copyrightability. *Id.* at 252.

40. Burrow-Giles Lithography Co. v. Sarony, 111 U.S. 53, 60 (1884).

41. In copyright terms, these works "portraying" a sculptural work are copyrightable to the extent that they are original literary or pictorial works. *See*

IV.

There is one more important possibility. Consider Saruman again, who reads aloud a scroll. Unlike Merlin, who duplicated the scroll itself, Saruman never creates a potentially infringing copy of the scroll. Certainly, he infringes if the object the scroll describes is copyrightable. (Morgaine, who made the scroll, may be the copyright owner of the object it describes, or she may not. That affects only who has standing to sue Saruman, not whether he infringes.[42])

But, as we have seen, there are other ways a scroll could be copyrightable besides simply depicting a copyrightable object. Its decorative features as a pictorial or graphic work—its swoops and whirls and marginalia—are irrelevant to Saruman. When he reads the scroll's words aloud, he will ignore the swash caps and doodles. None of these details will end up in the object that results. The resulting object does not infringe because it is not substantially similar to the scroll's copyrightable elements: they are copyrightable but not copied.

It might at first seem that the wording stands on the same footing as the decorations. The bust of Homer Simpson remembers neither the words used to make it nor what the scroll they were written on looked like. There is no way to reconstruct the scroll's wording or flourishes no matter how closely you study the bust. A wizard setting out to make a fresh scroll would have to start from square one and would end up with a scroll that

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17 U.S.C. § 101 (2012) (requiring only originality and fixation in a tangible medium for copyrightability). In practice, courts apply a heightened filter of originality when the author starts from a preexisting work not of her own making because of the need to distinguish the original features of the underlying work from the original features of the work that portrays it. *See, e.g.*, ATC Distrib. Group. v. Whatever It Takes Transmissions & Parts, Inc., 402 F.3d 700, 712 (6th Cir. 2005) (requiring "great skill" or "substantial variation" (quoting L. Batlin & Son v. Snyder, 536 F.2d 486, 492 (2d Cir. 1976); Alva Studios, Inc. v. Winninger, 177 F. Supp. 265, 267 (S.D.N.Y. 1959)); Entm't Research Grp. v. Genesis Creative Grp., 122 F.3d 1211, 1220 (9th Cir. 1997) (requiring that the original aspects of the derivative work be more than trivial and that the derivative does not affect the scope of the protection in the original) (citing Durham Indus. v. Tomy Corp., 630 F.2d 905, 909 (2d Cir. 1980)).

42. *See* 17 U.S.C. § 501(b) (2012) (providing that "[t]he legal or beneficial owner of an exclusive right under a copyright is entitled" to sue for infringement of that right).

resembled Morgaine's scroll only by similarity of subject and by coincidence—neither of which would suffice to infringe.

But the wording is different in one important way: Saruman reads it aloud. This means that he "performs" the literary features of the scroll by reading it.[43] And if this recital takes place at Arthur's court before the assembled knights, it will be a "public" performance and will infringe.[44] Saruman will need to stay in his tower to steer clear of copyright danger by making only a private performance.

Thus, there are important differences between Saruman, who reads Morgaine's scroll aloud to make a duplicate of the object it describes, and Merlin, who makes a duplicate of the object itself. When that object is a bust of Homer rather than one of Homer Simpson (i.e. it is not copyrighted), Saruman can read the scroll aloud without implicating its copyrightable flourishes, whereas Merlin cannot zap the scroll with a Replicio wand without also copying those flourishes. The Copyright Act is far from a model of clarity on this point,[45] and so is the case law construing it,[46] but the courts generally have decided that Saruman does not infringe but Merlin might.[47]

Thus, in theory, users are free to print uncopyrightable 3D objects from copyrightable CAD files without fear of infringing.

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43. *See id.* § 101 ("To 'perform' a work means to recite, render, play, dance, or act it . . . .").

44. *See id.* § 101 (defining "public[]" performances); *id.* § 106 (giving the copyright owner the exclusive right to "perform the copyrighted work publicly").

45. These cases turn on one of the most obscure sentences in the 1976 Copyright Act:

> This title does not afford, to the owner of copyright in a work that portrays a useful article as such, any greater or lesser rights with respect to the making, distribution, or display of the useful article so portrayed than those afforded to such works under the law, whether title 17 or the common law or statutes of a State, in effect on December 31, 1977, as held applicable and construed by a court in an action brought under this title.

Id. § 113(b).

46. The general consensus is that the pre-1978 law carried forward by § 113(b) adopted the rule stated in the text. *See, e.g.*, Gusler v. Fischer, 580 F. Supp. 2d 309, 315 (S.D.N.Y. 2008) (explaining that plaintiff's copyright in a technical drawing does not prohibit defendants from manufacturing the article that the drawing depicts).

47. *Cf.* Nat'l Med. Care, Inc. v. Espiritu, 284 F. Supp. 2d 424, 433–38 (S.D. W. Va. 2003) (concluding that defendant's cabinets did not infringe on plaintiff's copyright in a technical drawing of those cabinets).

Courts tend to say that using technical diagrams to make an uncopyrightable object does not infringe but that copying the diagrams themselves does.[48] If so, then woe betide the defendant who makes a copy of the plaintiff's copyrighted technical drawings in order to manufacture the uncopyrightable useful articles they describe.

This is, however, the point at which the magical analogy to 3D printing breaks down. People can read a scroll aloud without copying it, but a 3D printer needs an electronic copy of a CAD file to make the object.[49] Thus, under the so-called *MAI* doctrine, even temporary versions in a computer's memory are potentially infringing copies, 3D printers are Merlins rather than Sarumans.[50] A CAD file is quite possibly protected against unauthorized 3D printing, even where the resulting object is not copyrightable.[51]

V.

One further concern is pragmatic rather than conceptual: enforcement. Music and movies have had enforcement problems in spades since Napster[52] and its nephews. Now that the world of bits is colonizing the world of atoms, the makers of things are about to learn that they are less special than they may have thought.[53] They confront exactly the same enforcement

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48. *See, e.g.*, Forest River, Inc. v. Heartland Recreational Vehicles, 753 F. Supp. 2d 753, 760 (N.D. Ind. 2010) (distinguishing technical drawings (there, of a recreational vehicle), which accord no protection in the vehicle itself, from architectural plans, which accord protection in the completed structure under a specific exception to the general rule).

49. *See* Dolinsky, *supra* note 2, at __ (describing the 3D printing process).

50. The doctrine takes its name from *MAI Sys. Corp. v. Peak Computer, Inc.*, 991 F.2d 511 (9th Cir. 1993). *But see* Cartoon Network LP, LLLP v. CSC Holdings, Inc., 536 F. 3d 121, 127–30 (2d Cir. 2008) (distinguishing *MAI* for short-lived copies).

51. Another line of cases suggests that these intermediate copies might be fair uses because they are mere way stations on the road to noninfringing final uses. *See, e.g.*, Sega Enters. Ltd. v. Accolade, Inc., 977 F.2d 1510, 1525 (9th Cir. 1992) (finding fair use where "humans . . . cannot gain access to the unprotected ideas . . . contained in [software] without . . . making copies").

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

53. *See* Deven R. Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. (forthcoming 2014)

challenges: consumerized infringement-facilitating technologies; all-but-undetectable end-user copying; and an instantaneous worldwide distribution network. The 3D printer is the new CD-ROM drive.

The doctrinal details are daunting, from assessing whether a wandmaker's design has significant noninfringing uses[54] to checking scroll dealers' compliance with the ins and outs of the Digital Magic Copyright Act's notice-and-takedown regime.[55] But copyright's overall framework of secondary liability and statutory remedies does not significantly change when file-sharers are swapping magic spells or CAD files rather than episodes of *Game of Thrones*.

VI.

I have not rung all of the changes on these ideas that Dolinsky does; he considers, in addition, the two-step process of making scrolls from drawings, and the considerations that will enter into case-by-case fair use determinations.[56] But I take it that he and I are in substantial agreement on the issues I have described. That we have reached similar conclusions despite our very different ways of approaching the problem strikes me as an encouraging sign. Copyright law, we agree, still has a little magic left in it.

It may be surprising that so little in copyright law needs to change to accommodate 3D printers. But copyright law has long been comfortable with 3D printing's defining relationship between ideas and items. For centuries, the metaphysical

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(manuscript at 27–32, 50–52), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2338067 (comparing the intellectual property problems posed by 3D printing to other issues that courts have resolved in the past, and proposing a "Patent and Trademark DMCA" to help manage 3D printing).

54. *Cf.* Sony Corp. of Am. v. Universal City Studios, 464 U.S. 417, 456 (1984) (concluding that because Sony's Betamax VCR was capable of substantial noninfringing uses, Sony was not liable for contributory infringement).

55. *Cf.* Digital Millennium Copyright Act, 17 U.S.C. § 512 (2012) (requiring online service providers to remove potentially infringing content if they receive from the copyright owner a take-down notice that complies with statutory requirements).

56. *See* Dolinsky, *supra* note 2, at __ (discussing derivative works and fair use in the context of 3D printing).

magicians of copyright have drawn a sharp distinction between tangible copies and intangible works.[57] Printed objects are copies; so too, are CAD files. Moving back and forth from one to the other is just Transfiguration; the work's identity remains.

The copy may disintegrate as the focus of copyright, and perhaps should. But as long as there is something we can call copyright, it will still summon up works of authorship from the vasty deep. You cannot see, touch, or hear a work—only a particular copy or performance of it. But copyright has no doubt that works exist; they are immanent in every copy even as they transcend this physical world. The foundation of copyright law is the claim that this invisible essence can be reduced to ownership by human hands. Is this magic, or magical thinking?

57. *See* 17 U.S.C. § 202 (2012) ("Transfer of ownership of any material object, including the copy or phonorecord in which the work is first fixed, does not of itself convey any rights in the copyrighted work embodied in the object.").