The Replicator and the First Amendment

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As 3D printing technology improves, the theoretical endpoint comes into view: a machine that, like the "replicators" of Star Trek, *can produce anything the user asks for out of thin air from a digital blueprint. Real-life technology may never reach that endpoint, but our progress toward it has accelerated sharply over the past few years—sharply enough, indeed, for legal scholars to weigh in on the phenomenon's disruptive potential in areas ranging from intellectual property to gun rights.*

This Article is concerned with the First Amendment status of the digital blueprints. As of August 2014, it is the first law review article to address the intersection of 3D printing with free speech beyond the specific context of 3D-printed guns. I show that as "replicator" technologies pick up, the distribution of digital blueprints will begin to replace the distribution of goods as a central regulatory concern. This transition, in turn, will inspire First Amendment challenges to efforts by the government to restrain or penalize the distribution of the files. A handgun licensing law, for instance, might be said to violate the First Amendment prohibition against prior restraints if it were applied against a digital blueprint's "informational" content.

Such arguments should fail, and fail badly, in most situations. Indeed they will have to, lest free speech become a wide Lochner-*esque freedom to manufacture. Instead, I will argue that the "informational" appearance of a digital blueprint is constitutionally irrelevant, and that the First Amendment should not even come into play absent some extrinsic reason to think that the digital blueprint is being used for an expres-*

sive purpose. The presence of a digital blueprint in a fact pattern, in other words, should not in itself affect the First Amendment analysis either positively or negatively. I nonetheless express some skepticism, drawing on turn-of-the-century case law on software and recent case law on medical data, that the Supreme Court will maintain this attitude of equanimity with perfect consistency.

INTRODUCTION

3D printing, also known as "additive manufacturing," is a roughly thirty-year-old technology for manufacturing objects from digital models known as "CAD" files.[1] The most common variety of 3D printer works much like a traditional inkjet printer. Just as an inkjet printer extrudes ink onto a paper surface in two-dimensional shapes, a 3D printer prints thin, flat shapes with molten plastic goo. Each two-dimensional shape is only one layer in a three-dimensional object, and each layer is printed on top of the last. Thus, given a CAD model of a cone pointed upward, a 3D printer prints first a circle, and then a slightly smaller circle on top of the first, and then a slightly smaller circle on top of the second, and so on until a plastic cone has been built from the digital image.[2]

Until a few years ago, these technologies cost too much and took up too much room for small consumer use.[3] Today, an entry-level desktop 3D printer costs under $1,000 and the plastic filament costs about $15 per pound.[4] The entry of 3D printing to a small-consumer market, together with recent advances allowing industrial-level 3D printers to print metal objects, has the hype cycle in full swing.[5]

And as 3D printing technology improves, the theoretical end-point comes into view: a machine that, like the "replicators" of *Star Trek*, can produce anything the user asks for out of thin air from a digital blueprint.[6] *Star Trek*'s replicators, after all, are the

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[1]   CAMPBELL ET AL., ATLANTIC COUNCIL, COULD 3D PRINTING CHANGE THE WORLD? TECHNOLOGIES, POTENTIAL, AND IMPLICATIONS OF ADDITIVE MANUFACTURING 1 (2011), *available at* http://www.atlanticcouncil.org/images/files/publication_pdfs/403/101711_ACUS_3DPrinting.PDF. CAD stands for "computer-aided design."

[2]   *See The Printed World*, ECONOMIST, Feb. 10, 2011, http://www.economist.com/node/18114221.

[3]   *See* CAMPBELL ET AL., *supra* note 1, at 5 (introducing "Desktop-scale 3D Printers," and noting that 3D printing was, "in the past . . . relegated to large design and manufacturing firms").

[4]   *3D Printers & Supplies*, AMAZON.COM, http://www.amazon.com/b?ie=UTF8&node=6066126011 (last visited Sept. 9, 2014). These prices are volatile, but representative of what was available on Amazon as of September 9, 2014.

[5]   *See* CAMPBELL ET AL., *supra* note 1, at 1.

[6]   *See, e.g.*, *Replicator*, MEMORY ALPHA, http://en.memory-alpha.org/wiki/Replicator (last visited Sept. 6, 2014); *see also Star Trek: The Next Generation: Data's Day* (CBS television broadcast Jan. 5, 1991) (Data and Worf shop for wedding gifts using a replicator

logical conclusion of the 3D printer's premise. All improvements in manufacturing technology, including improvements developed before 3D printing, consist of cost reduction.[7] The 3D printer (or more accurately, the 3D printer of the near future) stands out from these past improvements only in that 1) the reduction in manufacturing cost is so precipitous that individual users can manufacture objects more cheaply than they could purchase them from a larger-scale industrial manufacturer and 2) it offers a "single tool" means that can produce any shape without changing any aspect of the production process.[8] 3D printers and their successors along the close approach to zero marginal cost can all be thought of as approximations of the replicator, which reduces the cost to all the way to zero.[9]

A true zero-marginal-cost replicator would extend the speed and abundance of the Internet beyond the traditionally "informational" sphere into the physical world. Just as Internet users know very little scarcity of access to public information, replicator users would know very little scarcity with respect to material goods. These goods would be distributed, copied and shared in all the same ways, and with the same degree of ease, as the "informational" content distributed over the Internet today. The Internet's economic and legal disruptions—think Napster and newspapers—would spill over from the media and telecommunications industries into markets for every other sort of good as the technological "firewall"[10] between information goods and physical goods industries fell away.

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console); *Star Trek: The Next Generation: The Defector* (CBS television broadcast Jan. 1, 1990) (Romulan Sublieutenant Setal replicates a glass of cold water).

[7]   *See* Jeremy Rifkin, *Say Goodbye to Capitalism as We Know It*, MARKET WATCH (May 15, 2014, 6:29 AM), http://www.marketwatch.com/story/say-goodbye-to-capitalism-as-we-know-it-2014-05-15/print ("Businesses have always sought new technologies that could increase productivity and reduce the marginal cost of producing and distributing goods and services, in order to lower their prices, win over consumers and market share, and return profits to their investors.").

[8]   *See* CAMPBELL ET AL., *supra* note 1, at 1.

[9]   *See, e.g.*, Rifkin, *supra* note 7.

[10]   *See id.* ("Economists acknowledge the powerful impact Zero Marginal Cost has had on the information goods industries, but until recently, have argued that it would not cross into the brick-and-mortar economy of energy, and physical goods and services. That firewall has now been breached.").

Real-life technology may never get all the way to a zero-marginal-cost replicator. Today's 3D printers are far from it. Nevertheless, we have accelerated sharply in the replicator's direction over the past few years—sharply enough, indeed, for President Obama's 2013 State of the Union address to celebrate 3D printing's "potential to revolutionize the way we make almost everything."[11] This "revolution" is already occurring at the industrial level, where enterprise-level 3D printers have been used to build medical prosthetics,[12] automotive components, and quick prototypes in various sectors.[13] A Chinese firm recently built ten houses in a day using four giant 3D printers.[14]

The "revolution" is further off at the consumer level, where the available materials are shoddy, print times are long, and the learning curve is steep.[15] A paper has argued that for a typical household, an entry-level 3D printer pays for itself over the course of a year by reducing the prices of a typical basket of consumer goods—salt shakers, a safety razor, lots of iPhone cases, pot holders.[16] These items are available on Thingiverse.com, the Disneyland of 3D printing.[17] It is hard to know what to make of the authors' conclusion. Much of their "basket" appears to be filled with dollar-store chintz as opposed to useful or necessary goods, and the authors admit the fact that contemporary 3D printing still requires a considerable degree of human intervention to reach a finished

[11]   Barack Obama, President, United States, State of the Union Address 2013 (Feb. 12, 2013), *available at* http://www.whitehouse.gov/state-of-the-union-2013 [hereinafter *2013 State of the Union*].

[12]   Ariel Rothfield, *Huntington Doctor Among First to Use 3D Printing Knee Replacement Surgery*, WOWKTV.com (July 2, 2014, 6:50 PM), http://www.wowktv.com/story/25929980/huntington-doctor-among-first-to-use-3D-printing-knee-replacement-surgery.

[13]   CAMPBELL ET AL., *supra* note 1, at 4.

[14]   Melissa Goldin, *Chinese Company Builds Houses Quickly With 3D Printing*, MASHABLE (Apr. 28, 2014), http://mashable.com/2014/04/28/3D printing-houses-china/.

[15]   *See* Conner Forrest, *What's Holding Back 3D Printing from Fulfilling Its Promise?*, ZDNET (Aug. 1, 2014), http://www.zdnet.com/article/whats-holding-back-3d-printing-from-fulfilling-its-promise/

[16]   Wittbrodt et al., *Life-Cycle Economic Analysis of Distributed Manufacturing with Open-Source 3-D Printers*, 23 MECHATRONICS 713 (2013), *available at* http://www.sciencedirect.com/science/article/pii/S0957415813001153.

[17]   *See generally* THINGIVERSE, http://www.thingiverse.com (last visited Sept. 6, 2014).

product.[18] At the consumer level, it is hard at this point to see any real savings. But a more mature replicator technology, one that could tool a wider range of goods at higher quality and near-zero cost, would dramatically change a household's entire pattern of consumption[19] and, as President Obama said, "revolutionize the way we make *everything*."[20]

Such a "revolution" implies a separate revolution in the way we regulate everything that we make. Despite the present fixation on gun manufacturing, intellectual property "piracy" and other intentionally subversive uses of replicator technology, the bulk of the disruption will be more mundane, and will reach all corners of the law of products. Professor Engstrom, for instance, has noted that the "democratization" of manufacturing will upend many of the industrial-age economic premises that underlie various impositions of strict product liability on merchants.[21]

In a replicator economy, the distribution of digital blueprints will replace the distribution of goods as a central regulatory concern. This transition, in turn, will inspire First Amendment challenges to efforts by the government to restrain or penalize the distribution of the files. A handgun licensing law, for instance, might be said to violate the First Amendment prohibition against prior restraints if it were applied against a digital blueprint's "informational" content.

In Part I of this Article, I will assess the merit of claims that CAD files should fall under the First Amendment's coverage—roughly speaking, whether they should be considered "speech"—in light of their informational content. If so, then the most aggressive interpretations of contemporary First Amendment doctrine

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[18]   As my wife observed, a student leaving for college probably would save a good deal of money printing the things in the items in the basket, but the savings are less credible later in the lifecycle. The basket included the following eighteen items: iPhone 5 dock, iPhone 4 dock, iPhone 5 case, jewelry organizer, garlic press, caliper, wall plate; 12 shower curtain rings, shower head, key hanger, iPad stand, orthotic, safety razor, pickup, train track toy, Nano watchband, iPhone tripod, paper towel holder, pierogi mold, and spoon holder.

[19]   *See* CAMPBELL ET AL., *supra* note 1, at 9–11; *see also* Rifkin, *supra* note 7.

[20]   *2013 State of the Union*, *supra* note 11 (emphasis added).

[21]   *See* Nora Freeman Engstrom, *3-D Printing and Product Liability: Identifying the Obstacles*, 162 U. PA. L. REV. 35, 41 (2013).

could grind almost all attempts to regulate replicated goods to a halt. I then brief the merits of the coverage question, discussing along the way the lower courts' attempts since the 1990s to grapple with similar questions in the context of computer software. I conclude that the "informational" appearance of a digital blueprint should be disregarded as constitutionally irrelevant, and that the First Amendment should not even come into play absent some extrinsic reason to think that the CAD file is being used for an expressive purpose. The simple presence of a CAD file in a fact pattern, in other words, should not in itself affect the First Amendment analysis either positively or negatively.

The point of Part II is to demonstrate that there is no way around regulating CAD files in a replicator-based economy. Over time, the extent of online policing will escalate in a roughly inverse proportion to the ongoing decline in manufacturing's marginal cost. This escalation will eventually force the First Amendment issues briefed in Part I into the courts. Finally, in Part III, I outline some jurisprudential pitfalls that I hope the courts can avoid when the time comes.

A note on terminology: most of the arguments I make in this Article are not specifically addressed to present-day 3D printers and their accompanying limitations. As my cursory discussion above of the mechanics of 3D printing should make clear, I do not consider the contemporary technical specifications of 3D printers to be important to the First Amendment discussion.[22] In fact, the points I raise here apply with increasing force to later-generation "replicators"[23] that have transcended present-day limitations. As a theoretical construct, I will for much of the discussion assume that we are dealing with household-affordable "replicators" that, just as on *Star Trek*, produce objects out of thin air, and I will call them by

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[22]   *See* James Grimmelmann, *Indistinguishable from Magic: A Wizard's Guide to Copyright and 3D Printing*, 71 WASH. & LEE L. REV. 683, 684 (2014) ("[L]et us start from the wisdom of Clarke's Third Law: that beyond a certain point, the technological details no longer matter. What if 3D printers actually *are* magic?").

[23]   So long as I am talking about *Star Trek*-style "replicators," I might as well call them "replicators" rather than "3D printers" to keep things straight. I would hate for readers picking up in the middle of this paper to think I am overestimating present-day technology. At any rate, I cannot imagine that the clunky expression "3D printers" will survive for long in a culture seemingly at the cusp of abandoning the "2D printer."

that name: "replicators." To be clear, the point of this construct is to call into the sharpest possible relief the First Amendment issues raised by near-zero-marginal-cost manufacturing; the point is emphatically not to make any long-term technological forecast.

I. CAD FILES AS FIRST AMENDMENT SUBJECT MATTER

We have yet to see any serious legislative or regulatory efforts to control the distribution of CAD files. (Philadelphia's breathless attempt to stop the importation of 3D printed guns imposed fines for the printing rather than the downloading.)[24] We have seen one early enforcement action, but the distributor backed down out of court. Specifically, the State Department demanded in 2013 that University of Texas law student Cody Wilson take down the CAD files for ten weapons designs[25] from his website, DEFCAD.org.[26] The agency cited a set of export restrictions under the International Trade in Arms Regulations that require official authorization be-

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[24]   Philadelphia's law, PHILA., PA., CODE tit. 10, ch. 10-2000 (2013), is so poorly crafted that you almost have to laugh. Aside from the obvious—how do you enforce a law against the printing, but not the possession, of a 3D printed gun?—the law's coverage is all wrong. By targeting *all* "3D printing" of firearms, and by defining "3D printing" to include *all* production of physical objects from digital designs, the Philadelphia law reaches at least some mainstream, industrial-scale gun commerce. Solid Concepts, Inc., for instance, has begun to produce metal handguns using an industrial-grade 3D printer and to sell them for over $10,000. *World's First 3D Printed Metal Gun Manufactured by Solid Concepts*, SOLID CONCEPTS, http://www.solidconcepts.com/news-releases/worlds-first-3D-printed-metal-gun-manufactured-solid-concepts/ (last visited Sept. 6, 2014); *3D Printed Metal Gun Will Sell to Lucky 100*, SOLID CONCEPTS, https://www.solidconcepts.com/news-releases/3d-printed-metal-gun-will-sell-lucky-100/ (last visited Oct. 4, 2014); *see also* Robert Farago, *Gun Review: Solid Concepts 1911 DMLS*, TRUTH ABOUT GUNS (Dec. 10, 2013), http://www.thetruthaboutguns.com/2013/12/robert-farago/gun-review-solid-concepts-1911-dmls-direct-metal-laser-sintering/. Solid Concepts' gun raises none of the special concerns about home printing and unregistered weaponry that inspired Philadelphia's law. Congressman Steve Israel's well-publicized bill to amend the Undetectable Firearms Act also addresses the printing of gun components rather than the CAD files themselves. H.R. 1474, 113th Cong. (2013). The bill, at any rate, is unlikely to pass.

[25]   These included a pistol, a silencer adapter, and an anti-tank warhead. Letter from U.S. Dep't of State to Cody Wilson (May 8, 2013), *available at* http://www.scribd.com/doc/140471313/Letter-from-Department-of-State-to-Defense-Distributed.

[26]   *Id.*

fore "technical data" relating to weapons can be "exported."[27] Wilson quickly complied.[28]

It is in some ways surprising that Wilson did not try to make a First Amendment test case out of this incident. Wilson is above all else a political activist, and he frames the DEFCAD project in free speech terms.[29] DEFCAD's website, for a time, linked to John Milton's *Areopagitica*,[30] the seminal 17th-century defense of a free press, as its "manifesto."[31] Following the State Department's takedown letter, Wilson joked on Twitter that "some shapes are more dangerous than others"[32]: a joke that seems to align CAD files with a world of forms—speech stuff—rather than of material things.[33]

It makes sense for Wilson to invite these associations. It is a powerful thing to frame your adversary as an enemy of free speech, perhaps the most highly revered value in American political rhetoric.[34] Wilson would not be the first to wrap a whole new platform in

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[27]   *Id.*

[28]   Cody R. Wilson (@Radomysisky), TWITTER (May 9, 2013, 10:54 AM), https://twitter.com/Radomysisky/status/332554133192183808.

[29]   *See The Glenn Beck Program* (The Blaze television broadcast Jan. 17, 2013), *available at* http://www.video.theblaze.com/media/video.jsp?content_id=25560075&topic_id=24584158 (interview by Glenn Beck with Cody Wilson) ("I think liberty is itself under siege: human liberty, human spontaneity, the freedom to do things.").

[30]   JOHN MILTON, AREOPAGITICA, (Project Gutenberg eBook ed. 2013) (1644), *available at* http://www.gutenberg.org/files/608/608-h/608-h.htm.

[31]   Mark Lepage, *3D Home Printing Turns Ideas Into Substance*, VANCOUVER SUN, Aug. 2, 2013, http://www.vancouversun.com/mobile/business/vs-business/home+printing+turns+ideas+into+substance/8744254/story.html.

[32]   Wilson, *supra* note 28.

[33]   You are not supposed to dwell too long on any of this. Only one part of Milton's argument against England's press licensing law relates to the gun-control issue, and then only very broadly. As for the "shapes" zinger, it seems to presume the same Platonic dichotomy between matter and information that the DEFCAD project generally seems designed to refute. Wilson seems to have learned, whether consciously or not, that audiences respond well when you hit them with a name drop and run. See the interview by Glenn Beck with Cody Wilson, *supra* note 29, where Wilson tells Beck to read more Michel Foucault: "There's a guy named Michel Foucault, and I'd recommend that you read him sometime."

[34]   See Frederick Schauer, *The Boundaries of the First Amendment: A Preliminary Exploration of Constitutional Salience*, 117 HARV. L. REV. 1765, 1790 (2004) ("To an extent unmatched in a world that often views America's obsession with free speech as reflecting an insensitive neglect of other important conflicting values, the First Amendment, freedom of speech, and freedom of the press provide considerable rhetorical power and

that flag.[35] Free speech claims have worked for campaign dona-
tions,[36] encryption code,[37] and prescription drug data.[38] The plain
meaning of the First Amendment's word "speech" is so broad and
indeterminate that boundary-pushing litigants can make weird
claims about its scope without having those claims rejected as fri-
volous.[39]

A. *Distinguishing First Amendment Coverage from First Amendment Protection*

Most of the discussion in this section concerns what Professor
Schauer has referred to as First Amendment "coverage" rather
than First Amendment "protection."[40] By "protection" I mean
that after the application of the various tests and doctrines that fill
out a traditional course in First Amendment law, a court will con-
clude that the First Amendment protects the speaker from regula-
tion. Protection means that the speaker wins.

By "coverage" I refer to the threshold question of whether a
given case is "about" the First Amendment at all. It is common to
frame the question of coverage as concerning whether a certain ac-
tivity "is speech" or not.[41] This approach is intuitive because it
allows the coverage/protection distinction to be mapped onto the
constitutional phrase "the freedom of speech," with "speech" re-

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argumentative authority. The individual or group on the side of free speech often seems
to believe, and often correctly, that it has secured the upper hand in public debate. The
First Amendment not only attracts attention, but also strikes fear in the hearts of many
who do not want to be seen as opposing the freedoms it enshrines.").

[35]   *See* Gregory P. Magarian, *Speaking Truth to Firepower: How the First Amendment
Destabilizes the Second*, 91 TEX. L. REV. 49, 54–55 (2012) (discussing an appropriation of
free-speech rhetoric by gun-rights activists) ("The First Amendment has also generated a
deep, detailed body of judicial doctrine over a period of almost a century, and the right of
expressive freedom carries a great sense of legal and cultural gravitas. Accordingly,
analogizing the Second Amendment to the First has not only practical utility but strategic
appeal for advocates of a robust right to keep and bear arms.").

[36]   *See, e.g.*, McCutcheon v. Fed. Election Comm'n, 134 S. Ct. 1434 (2014).

[37]   *See, e.g.*, Bernstein v. U.S. Dep't of Justice, 176 F.3d 1132, 1139, *reh'g granted*,
opinion withdrawn, 192 F.3d 1308 (9th Cir. 1999).

[38]   Sorrell v. IMS Health Inc., 131 S. Ct. 2653 (2011).

[39]   *See, e.g.*, Schauer, *supra* note 34, at 1797–98.

[40]   *See id.* at 1769–74.

[41]   *See, e.g.*, R. George Wright, *What Counts As "Speech" in the First Place?: Determining
the Scope of the Free Speech Clause*, 37 PEPP. L. REV. 1217 (2010).

ferring to coverage and "the freedom" referring to the scope of protection. The problem with this shorthand is that many instances of "speech," taken in the ordinary meaning of the word, never merit any First Amendment discussion at all.[42] These include contractual speech, speech in furtherance of a criminal conspiracy, speech barred by antitrust laws, speech in corporate proxy elections, and so on.[43] And by the same token, First Amendment coverage extends *beyond* the ordinary meaning of the word as well to reach the visual arts, expressive conduct, and so on.[44]

The coverage question is mostly handled subliminally; it is rare for a court to spend any energy on it. As such, there is very little doctrine on the question of coverage, and what little there is does not envision a systematic approach.[45] Academic commentary on the question is insightful but scarce, and suggests that coverage is a historically moving target that defies systematic exposition.[46]

But if we do not know where coverage comes from, we nonetheless know what it looks like: where there is a lack of coverage, First Amendment arguments are treated as frivolous[47] or, more frequently, are left unraised.[48] Where coverage is present, on the other hand, courts must at least consider First Amendment arguments before rejecting them.[49] There is some middle ground between these two poles, of course, as in the common situation where a dismissive judge considers a "meritless" First Amendment point purely for the sake of argument;[50] but the presence or absence of

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[42]   *See* Schauer, *supra* note 34, at 1773 ("That the boundaries of the First Amendment are delineated by the ordinary language meaning of the word 'speech' is simply implausible.").

[43]   *Id.* at 1779–83; *see also* Kent Greenawalt, *Speech and Crime*, 4 AM. B. FOUND. RES. J. 645, 784 (1980) ("Language serves a variety of functions, only some of which are covered by the special reasons for freedom of speech.").

[44]   *See, e.g.*, Ryan J. Walsh, Comment, *Painting on a Canvas of Skin: Tattooing and the First Amendment*, 78 U. CHI. L. REV. 1063, 1063 (2011).

[45]   See *infra* note 140 for a brief discussion of *Spence v. Washington*, 418 U.S. 405 (1974), which is sometimes cited as the authoritative "speech test."

[46]   *See* Schauer, *supra* note 34, at 1765.

[47]   *See* Schauer, *supra* note 34, at 1797–98.

[48]   *See id.*

[49]   *See id.*

[50]   *See, e.g.*, Karn v. U.S. Dep't of State, 925 F. Supp. 1 (D.D.C. 1996). For criticisms of such attempts to "bypass" the coverage issue, see also Wright, *supra* note 41, at 1226–31.

coverage is nonetheless an easy thing to discern, if not to explain, in the vast majority of cases.[51]

To date there is no case law engaging the coverage question in the precise context of CAD files. There are several lower court opinions discussing the First Amendment status of other applications of computer code, though. These opinions divide on the question of protection, but almost all of them agree that source code, if not object code,[52] is as at least covered.[53]

1.   Why Coverage Matters

First Amendment coverage implies a rebuttable presumption that a given activity cannot be regulated consistently with the First Amendment.[54] Successful rebuttal ultimately depends on a balancing of regulatory interests against expressive interests.[55] The balancing is right there on the surface in the "normal" run of First Amendment cases, which, as a matter of black-letter law, always trigger either strict or intermediate scrutiny or occasionally some heightened variation on rational-basis review.[56] Here, the balance of harms is too sensitive to resolve through the application of any on-or-off rule, so we see judges weighing the seriousness of the government's purpose and the fit of means to ends explicitly and case-by-case.[57]

But there is a balancing by other means even in simple cases involving the "unprotected categories" of speech: obscenity, fighting words and so on. It is just that as far as the unprotected categories

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[51]   *See* Schauer, *supra* note 34, at 1800–01.

[52]   For a discussion of the distinction between source code and object code, see *infra* note 158.

[53]   *See, e.g.*, United States v. Elcom Ltd., 203 F. Supp. 2d 1111, 1126 (N.D. Cal. 2002) (source and object code); Universal City Studios, Inc. v. Reimerdes, 111 F. Supp. 2d 294, 326–27, *judgment entered*, 111 F. Supp. 2d 346 (S.D.N.Y. 2000) (source code), *aff'd sub nom.,* Universal City Studios, Inc. v. Corley, 273 F.3d 429 (2d Cir. 2001); Bernstein v. U.S. Dep't of State, 922 F. Supp. 1426, 1435 (N.D. Cal. 1996) (source and object code).

[54]   *See* Geoffrey Stone, *Content Regulation and the First Amendment*, 25 WM. & MARY L. REV. 189, 194–95 (1983).

[55]   *Id.*

[56]   *See* Christian Legal Soc. Chapter of the Univ. of Cal., Hastings Coll. of the Law v. Martinez, 5 U.S. 661, 130 S. Ct. 2971, 2984 (2010) (holding restrictions on access to a "limited public forum" do not offend the First Amendment if they are reasonable and viewpoint-neutral).

[57]   *See* Stone, *supra* note 54, at 192.

are concerned, the balancing is categorical and predetermined rather than case-by-case.[58] Thus, under *Chaplinsky v. New Hampshire*, "certain well-defined and narrowly limited classes of speech . . . are of such *slight social value* as a step to truth *that any benefit* that may be derived from them *is clearly outweighed* by the social interest in order and morality."[59] The significance of an unprotected category, therefore, is that the harms resulting from speech within the category so consistently and dramatically exceed the benefits that courts may predetermine the question of protection for every future case.[60]

At the bottom line, First Amendment coverage means simply that a regulation must pass at least one extra test beyond the ordinary rational-basis review if it is going to be upheld.[61] If the regulation under challenge cannot pass either strict or intermediate scrutiny or a heightened rationality review, then the activity being regulated must pass a test to establish its fit into one of the unprotected categories.[62] And even if the activity being regulated is shown to meet the definition of, for instance, the unprotected category of obscenity, the government may still have to reckon with a heigh-

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[58]   *See generally* Norman T. Deutsch, *Professor Nimmer Meets Professor Schauer (and Others): An Analysis of "Definitional Balancing" as a Methodology for Determining the "Visible Boundaries of the First Amendment,"* 39 AKRON L. REV. 483, 484–85 (2006) (Professor Nimmer used the phrase "definitional balancing" to describe what he thought was the appropriate methodology for the United States Supreme Court to use in "defining which forms of speech are to be regarded as 'speech' within the meaning of the First Amendment." However, the Court has never explicitly said that it applies such a methodology. Nonetheless, Professor Nimmer found its application implicit in the Court's decisions.).

[59]   Chaplinsky v. New Hampshire, 315 U.S. 568, 572 (1942) (emphasis added).

[60]   The Court in *United States v. Stevens*, 559 U.S. 460 (2010), declined to extend a *Chaplinsky*-like approach to videos of animal cruelty, and denounced the categorical balancing approach in strong language, opting instead for an approach purporting to recognize that the various unprotected categories had existed since 1791: "[A]s a free-floating test for First Amendment coverage, [categorical balancing] is startling and dangerous. The First Amendment's guarantee of free speech does not extend only to categories of speech that survive an ad hoc balancing of relative social costs and benefits." *Id.* at 470. Nonetheless, *Stevens* represents a change of course, as categorical balancing is the approach the Court "obviously took to speech protection for so many decades." Leslie Kendrick, *Free Speech and Guilty Minds*, 114 COLUM. L. REV. 1255, 1295 n.1 (2014).

[61]   *See* Schauer, *supra* note 34, at 1769–70.

[62]   *Id.*

tened means-testing if the challenger shows that the regulation operates as a prior restraint.[63]

Let me take a moment to elaborate on how established First Amendment doctrine might bear on the regulation of CAD files if CAD files, categorically, were taken to lie within the First Amendment's coverage. (Note that I am talking about categorical *coverage* rather than the trivial scenario in which CAD files are categorically *protected*.) The point of this aside is to illustrate the hypothetical consequences of coverage if the rules of protection were applied at their logical extremes. The point is not to forecast the law's actual development. Instead, I hope to demonstrate the absurd results that judges will be concerned with *avoiding* as they reckon with replicator technologies.

a) CAD Regulation as Automatic Content Discrimination

The distinction between "content-based" and "content-neutral" regulations of speech is a pillar of modern First Amendment doctrine.[64] Content-based regulations, of course, are subject to a strict scrutiny in which the government's means must be narrowly tailored to promote a "compelling" government interest.[65] After *R.A.V. v. St. Paul*,[66] content-based regulations are subject to strict scrutiny even if the content discrimination takes place within an unprotected category.[67] In *R.A.V.*, the Supreme Court struck down a hate speech ordinance, holding that even though "fighting words" made up a proscribable category of speech, the hate speech ordinance discriminated on content by regulating racist fighting words exclusively; Justice Scalia wrote for the majority that the ordinance could have avoided the problem by applying the same set of rules to fighting words on both sides of the "debate" between racists and anti-racists.[68] The opinion went on to establish a number of dodgy exceptions to its rule, at least one of which could con-

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[63]   *See infra* text accompanying note 96.

[64]   *See, e.g.*, Stone, *supra* note 54, at 189.

[65]   *See, e.g.*, United States v. Playboy Entm't Grp., Inc., 529 U.S. 803, 813 (2000); Sable Commc'ns of Cal., Inc. v. FCC, 492 U.S. 115, 126 (1989).

[66]   R.A.V. v. City of St. Paul, Minn., 505 U.S. 377 (1992).

[67]   *Id.* at 400.

[68]   *Id.* at 392 ("St. Paul has no such authority to license one side of a debate to fight freestyle, while requiring the other to follow Marquis of Queensberry rules.").

ceivably ease the government's load in certain CAD cases.[69] But a broad reading of the *R.A.V.* principle—recall that I am setting out the extreme case—indicates that, if CAD is *covered*, then the government will have to worry about content discrimination even if CAD files comprise or otherwise occupy an unprotected category.

Since its development in the mid-twentieth-century,[70] the content discrimination idea has proved to be reasonably workable. But its basic terms remain surprisingly indefinite. Content discrimination sometimes seems to refer to viewpoint discrimination, in which one side of a debate is privileged over another.[71] At other times, it seems to refer to subject-matter discrimination, in which

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[69]   I refer, first, to *R.A.V.*'s "special virulence" exception, which applies when "the basis for the content discrimination [within an unprotected category] consists entirely of the very reason the entire class of speech at issue is proscribable." *Id.* at 388. It is easy enough to imagine a circumstance in which CAD files generally were defined as an unprotected category due to the excess of physical risk versus speech value, and in which the most "dangerous" CAD files might be singled out because they represented the most extreme instance of this excess. It is also easy to imagine the logic of *Renton*'s "secondary effects" test, *see City of Renton v. Playtime Theatres*, 475 U.S. 41 (1986), discussed *infra* note 77, applied against certain types of CAD files. *R.A.V.* carves out an exception here, too. *Id.* at 389. The problem, though, is that *Renton* is traditionally confined in its application to sexual speech. Finally, *R.A.V.* makes an exception to its rule for cases in which "the nature of the content discrimination is such that there is no realistic possibility that official suppression of ideas is afoot." *Id.* at 390. Justice Scalia's bizarre example of the phenomenon—he "cannot think of any First Amendment interest that would stand in the way of a State's prohibiting only those obscene motion pictures with blue-eyed actresses"—makes it hard to say how seriously he or the Court takes this final exception to the *R.A.V.* rule. But it is at any rate sketched in such broad terms that it could easily encompass distinctions among CAD files and shield them from *R.A.V.*'s scrutiny if that were how the Court wanted to address the problem.

[70]   The distinction between content-based and content-neutral laws originates in *United States v. O'Brien*, 391 U.S. 367 (1968), in which a Vietnam War protester was arrested and convicted of burning his draft card in violation of the Selective Service Act. The Court upheld the conviction, reasoning that the Act's prohibition against destroying draft cards was not aimed at any expressive political content, but rather at draft card destruction generally, an activity that was typically nonexpressive. Because the prohibition was "content-neutral," it received a relatively deferential review that we today refer to as intermediate scrutiny.

[71]   *See* Leslie Kendrick, *Content Discrimination Revisited*, 98 Va. L. Rev. 231, 242–43 (2012) ("One potential definition is that the government usually cannot discriminate among instances of expression on the basis of viewpoint. There is a great deal of agreement that viewpoint discrimination is at the core of what the First Amendment forbids. A few commentators have gone further to argue that viewpoint discrimination is the only impermissible kind. Among members of the Court, Justice Stevens was notable for sometimes making this contention.").

an entire topic of discussion is placed off-limits.[72] Between these two possible modes of content discrimination, it makes sense to suppose that viewpoint discrimination should receive closer scrutiny than subject-matter discrimination because viewpoint discrimination is more distortive of public discussion.[73] Perhaps viewpoint discrimination should *always* fail strict scrutiny because distorting public discussion is always an impermissible governmental purpose.[74] But the Supreme Court has left these questions suprisingly open.[75]

The content-discrimination inquiry at times presents itself as an inquiry into motive.[76] Thus, in *City of Renton v. Playtime Theatres*,[77] the Supreme Court deemed content-neutral a municipal zoning regulation limiting land use by adult entertainment establishments. Renton's regulation, which reached theaters showing adult content but not other types of content, was, by any intuitive definition, content-based. Yet the Court held otherwise, reasoning that the City was not interested in the ideological content of the films being shown, but rather in the "secondary effects" created by adult film theaters: prostitution, diminished property values, and so on.[78] So long as the government's *interest* was in the secondary effects rather than in the expression itself, the law would be treated as content-neutral.

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[72]   *See id.* (discussing how some commentators argue that it is difficult to distinguish between subject-matter and viewpoint discrimination, and whether they constitute the entirety or just a part of content discrimination).

[73]   *See* Rosenberger v. Rector & Visitors of Univ. of Va., 515 U.S. 819, 829 (1995) ("When the government targets not subject matter, but particular views taken by speakers on a subject, the violation of the First Amendment is all the more blatant . . . Viewpoint discrimination is thus an egregious form of content discrimination. The government must abstain from regulating speech when the specific motivating ideology or the opinion or perspective of the speaker is the rationale for the restriction."); *see generally* Stone, *supra* note 54.

[74]   *See* Elena Kagan, *Private Speech, Public Purpose: The Role of Governmental Motive in First Amendment Doctrine*, 63 U. CHI. L. REV. 413, 428 (1996) (discussing that viewpoint discrimination is an impermissible government motive for speech restriction).

[75]   *See id.* at 427 (discussing that the "Court has not fully addressed, much less resolved, the question" of what motives are impermissible).

[76]   *See id.* at 425 (discussing that some approaches to the content-discrimination inquiry involves analysis of motive).

[77]   475 U.S. 41 (1986).

[78]   *See id.* at 52. Also see *City of Erie v. Pap's AM*, 529 U.S. 277 (2000), for a near-parody of *Renton*.

In practice, *Renton*'s "secondary effects" approach to content neutrality is generally treated as a "fiction"[79] written to justify close regulation of erotic expression, and is not applied in any other context. Yet *Renton* is at times cited outside the erotic expression context for the proposition that "[t]he First Amendment requires heightened scrutiny whenever the government creates a regulation of speech because of disagreement with the message it conveys. . . . '[C]ontent-neutral' speech regulations are those that are *justified* without reference to the content of the regulated speech."[80] If this were the meaning of content neutrality, then one would expect a much clearer and generally more permissive free speech jurisprudence in which laws received strict scrutiny only if they discriminated on viewpoint. Under such an approach, laws that discriminated even-handedly on the basis of subject matter would presumably be regarded as content-neutral. At times—including in a few cases concerning computer code—*Renton* is invoked to support this more deferential approach.[81]

But at other times, the Supreme Court has approvingly cited *Renton*'s language on viewpoint discrimination even as they applied strict scrutiny to laws having nothing to do with viewpoint at all. In *Sorrell v. IMS Health Inc.*,[82] for instance, the Supreme Court held that a Vermont law regulating the disclosure of pharmacists' prescription records discriminated not only based on content, but also on viewpoint.[83] These records, which pharmacists are required to keep by law, include data indicating which prescribing doctors have prescribed which medications, and how often.[84] Pharmaceutical companies want this "prescriber-identifying data" so that their

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[79]   *See* City of L.A. v. Alameda Books, Inc., 535 U.S. 425, 448 (2002) (Kennedy, J., concurring in the judgment).

[80]   Sorrell v. IMS Health Inc., 131 S. Ct. 2653, 2664 (2011) (citations omitted) (quoting, inter alia, Renton v. Playtime Theatres, Inc., 475 U.S. 41, 48 (1986)) (internal quotation marks omitted).

[81]   *See, e.g.*, Universal City Studios, Inc. v. Reimerdes, 111 F. Supp. 2d 294, 329, *judgment entered*, 111 F. Supp. 2d 346 (S.D.N.Y. 2000), *aff'd sub nom.*, Universal City Studios, Inc. v. Corley, 273 F.3d 429 (2d Cir. 2001).

[82]   131 S. Ct. 2653 (2011).

[83]   *See id.* at 2663 ("In its practical operation, Vermont's law goes even beyond mere content discrimination, to actual viewpoint discrimination.") (citation omitted) (internal quotation marks omitted).

[84]   *See id.* at 2660.

sales representatives can hone their pitch to individual prescribing doctors.[85] Data miners buy the prescription records from pharmacies and lease the most useful information to drug companies.[86] Vermont's legislature, concerned that these sales practices drive up health care costs by inducing doctors to pass over generic alternatives, enacted a law barring the sale of the data and the disclosure of the data "for marketing."[87] By suppressing the exchange of the data "for marketing purposes," wrote Justice Kennedy, Vermont had made pharmaceutical representatives' sales pitches less effective.[88] For Justice Kennedy, this meant that Vermont's law discriminated on content by singling out speech about selling pharmaceuticals.[89] Indeed, Justice Kennedy wrote that the law had discriminated against pharmaceutical representatives on account of their "disfavored" viewpoint relative to state-funded advocates of generic drugs.[90]

Justice Kennedy's version of content and viewpoint discrimination in *IMS Health* stretches those terms about as far as they will go, and, in my view, further than they should go. (The serious charge of "viewpoint discrimination," in particular, seems to have devolved into a laurel to be bestowed on victorious First Amendment challengers.) But Justice Kennedy does not break them, as the terms "content," "viewpoint," and "discrimination," much like "speech," are almost infinitely plastic.[91]

Recall that my point in this section is to discuss logical extremes. If we assume that CAD files are all within First Amendment coverage, and if we take *IMS Health* as representative of the broadest possible vision of content discrimination, then any number of restrictions on CAD files might meet the bill. Some CAD files for dangerous articles would surely be regulated more closely than others. Some regulations would reach the *sale* of CAD files

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[85]   *See id.*
[86]   *See id.*
[87]   *See id.*
[88]   *See id.* at 2663.
[89]   *See id.*
[90]   *See id.* at 2660, 2680.
[91]   *See generally* Dan V. Kozlowski, *Content and Viewpoint Discrimination: Malleable Terms Beget Malleable Doctrine*, 13 COMM. L. & POL'Y 131, 132–33 (2008) (discussing the malleability of terms).

but not the *sharing* of CAD files. Each of these distinctions, like Vermont's law in *IMS Health*, would address directly the sharing of "information" and discriminate based either on what "information" is being shared or what purpose that information is being put to. It is by no means obvious that *any* CAD-specific law (short of, perhaps, a law outlawing CAD files altogether, which would at any rate fail an overbreadth challenge) should be seen as content-neutral under *IMS Health*'s principle.

Supposing, then, that all CAD laws' content-based regulations are considered content-based, they must survive strict scrutiny; they must, in other words, promote compelling governmental interests by the narrowest possible means.[92] Some CAD laws may well get by; the Supreme Court has at times set a low bar for "compelling," a term that approves not only matters of life and limb but small-bore interests such as the protection of minors from "indecent" magazines.[93] But wherever the bar is set, strict scrutiny nonetheless invites a close judicial investigation of the challenged regulation's policy merits, and generally spells defeat for the government.[94] So while CAD regulations may succeed in certain sensational cases—firearms, for instance—mundane economic regulations likely would not. A major takeaway from the commercial speech cases is that the Supreme Court rarely defers to market-interventive governmental rationales, and often disapproves them even under an intermediate standard of scrutiny.[95] All economic

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[92]   *See* Sable Commc'ns of Cal., Inc., v. FCC, 492 U.S. 115, 126 (1989); *see also* United States v. Playboy Entm't Grp., Inc., 529 U.S. 803, 813 (2000).

[93]   *Sable Commc'ns*, 492 U.S. at 126 ("We have recognized that there is a compelling interest in protecting the physical and psychological well-being of minors. This interest extends to shielding minors from the influence of literature that is not obscene by adult standards.").

[94]   *See id.* ("The Government may serve this legitimate interest, but to withstand constitutional scrutiny, it must do so by narrowly drawn regulations designed to serve those interests without unnecessarily interfering with First Amendment freedoms. It is not enough to show that the Government's ends are compelling; the means must be carefully tailored to achieve those ends.") (citations omitted) (internal quotation marks omitted).

[95]   *See, e.g.*, Va. Bd. of Pharmacy v. Va. Citizens Consumer Council, Inc., 425 U.S. 748, 767–70 (1976) ("It appears to be feared that if the pharmacist who wishes to provide low cost, and assertedly low quality, services is permitted to advertise, he will be taken up on his offer by too many unwitting customers. They will choose the low-cost, low-quality service and drive the 'professional' pharmacist out of business. They will respond only to

regulations, of course, are market interventions, so full First Amendment coverage for CAD could invite a skeptical judicial review of almost all manufacturing laws in a replicator economy. That review may be especially difficult to pass in the transitional years as the government experiments with new policies.

b) CAD regulation as prior restraint

If we continue for the sake of argument to entertain the assumption that all CAD files lie within the First Amendment's coverage, then the prior restraint doctrine does not need any stretching at all to condemn a broad range of CAD laws. The Supreme Court has held that "it is the chief purpose of the [First Amendment's free press] guaranty to prevent previous restraints upon publication."[96] As such, prior restraints are said to carry a "heavy presumption against [their] constitutional validity."[97]

The Supreme Court has framed the prior restraint doctrine's origins historically, observing that "the core abuse against which [the freedom of speech and press] was directed was the scheme of licensing laws implemented by the monarch and Parliament to contain the 'evils' of the printing press in 16th- and 17th-century England."[98] The premise seems to be that scrutiny against government action must be more severe in this "core" of First Amendment concern than in any other area.[99] Today, of course, the prior restraint doctrine reaches a wide and poorly defined range of government action that has next to nothing in common with licensing practices. These range from post-conviction injunctions[100] to regu-

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costly and excessive advertising, and end up paying the price. . . . There is, of course, an alternative to this highly paternalistic approach. That alternative is to assume that this information is not in itself harmful, that people will perceive their own best interests if only they are well enough informed, and that the best means to that end is to open the channels of communication rather than to close them.") (expressing skepticism that law against advertising prescription drug prices helped to maintain a healthy pharmaceutical services market); *see also* Linmark Assocs., Inc. v. Willingboro Twp., 431 U.S. 85, 95–96 (1977) (expressing skepticism about a ban on "for sale" signs as a counter to a spiral of "white flight").

[96]   Near v. Minn. *ex rel.* Olson, 283 U.S. 697, 713 (1931).

[97]   *See* Se. Promotions, Ltd. v. Conrad, 420 U.S. 546, 558 (1975); *see also* Org. for a Better Austin v. Keefe, 402 U.S. 415, 419 (1971) (citations omitted).

[98]   Thomas v. Chi. Park Dist., 534 U.S. 316, 320 (2002).

[99]   *See id.*

[100]   *See, e.g.*, *Near*, 283 U.S. at 713.

latory schemes that in their forbidding complexity are said to *deter* speech.[101]

A party may challenge a regulatory scheme as a prior restraint:

> whenever a licensing law gives a government official or agency substantial power to discriminate based on the content or viewpoint of speech by suppressing disfavored speech or disliked speakers. . . . [Second,] the law must have a close enough nexus to expression, or to conduct commonly associated with expression, to pose a real and substantial threat of the identified censorship risks.[102]

If you grant, again, the assumption that CAD files count as a form of expression, then an application of prior restraint doctrine to a broad range of CAD regulation becomes extremely straightforward. The Cody Wilson incident, for instance, involved a demand from the State Department that Wilson submit a set of ten CAD files to the Directorate of Defense Trade Controls (DDTC) for classification before continuing to publish them online.[103] If CAD files are First Amendment subject matter, then it is hard to see a clear distinction between the DDTC's classification scheme and the 16th- and 17th-century press licensing schemes that inspired the prior restraint doctrine in the first place.[104] Indeed, the same broadly discretionary International Traffic in Arms Regulations (ITAR) scheme cited against Cody Wilson would have been characterized as prior restraints in past cases involving the

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[101]   *See, e.g.*, Citizens United v. Fed. Election Comm'n, 558 U.S. 310, 335 (2010) ("This regulatory scheme may not be a prior restraint on speech in the strict sense of that term, for prospective speakers are not compelled by law to seek an advisory opinion from the FEC before the speech takes place. As a practical matter, however, given the complexity of the regulations and the deference courts show to administrative determinations, a speaker who wants to avoid threats of criminal liability and the heavy costs of defending against FEC enforcement must ask a governmental agency for prior permission to speak. These onerous restrictions thus function as the equivalent of prior restraint by giving the FEC power analogous to licensing laws implemented in 16th- and 17th-century England, laws and governmental practices of the sort that the First Amendment was drawn to prohibit.") (citations omitted).

[102]   City of Lakewood v. Plain Dealer Pub. Co., 486 U.S. 750, 759 (1988).

[103]   *See* Letter from the U.S. Dep't of State to Cody Wilson, *supra* note 25.

[104]   Thomas v. Chi. Park Dist., 534 U.S. 316, 320 (2002).

distribution of cryptographic source code.[105] And such arguments could easily also be made in more mundane contexts. The Federal Aviation Administration certifies designs for airplane parts.[106] The Environmental Protection Agency (EPA) licenses pesticides, insecticides and rodenticides.[107] The Alcohol, Tobacco, and Firearms Administration licenses the sale of fireworks.[108]

Another aspect of the overall regulatory scheme could also trigger prior restraint analysis. As detailed in Part II, the policing of CAD files would most likely involve some variation on the notice-and-takedown regime currently followed under the Digital Millennium Copyright Act (DMCA). Under this model, the government would offer Internet service providers and search engines a "safe harbor" from liability for noncompliant CADs they hosted or linked to, but only so long as they comply with orders to remove the offending material.[109] (Intellectual property owners have already pursued infringing CADs fairly aggressively under the DMCA's safe harbor procedure.)[110] The Cody Wilson confronta-

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[105]   *See, e.g.*, Bernstein v. U.S. Dep't of Justice, 176 F.3d 1132, 1139, *reh'g granted*, *opinion withdrawn*, 192 F.3d 1308 (9th Cir. 1999) ("The EAR regulations at issue plainly satisfy the first requirement—'the determination of who may speak and who may not is left to the unbridled discretion of a government official.' BXA administrators are empowered to deny licenses whenever export might be inconsistent with 'U.S. national security and foreign policy interests.' No more specific guidance is provided.") (citation omitted).

[106]   *See* GATX/Airlog Co. v. United States, 286 F.3d 1168, 1172–73 (9th Cir. 2002).

[107]   *See* Woodstream Corp. v. Jackson, 845 F. Supp. 2d 174, 176 (D.D.C. 2012) ("The EPA is directed to approve the registration of a pesticide if, *inter alia*, '(A) its composition is such as to warrant the proposed claims for it; (B) its labeling and other material required to be submitted comply with the requirements of this subchapter; (C) it will perform its intended function without unreasonable adverse effects on the environment; and (D) when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment.' 7 U.S.C. § 136a(c)(5).").

[108]   United States v. Droganes, 728 F.3d 580, 583 (6th Cir. 2013) ("Certain acts involving 'explosive materials' are prohibited by statute, including 'dealing' them without a license, 18 U.S.C. § 842(a)(1), 'transporting' them without a license, [18 U.S.C.] § 842(a)(3)(A), and 'distributing' them to other unlicensed persons, [18 U.S.C.] § 842(a)(3)(B). What constitutes an 'explosive material,' in turn, is defined by federal regulations."), *cert. denied*, 134 S. Ct. 2287 (2014).

[109]   *See* 17 U.S.C. § 512(c) (2012) (outlining DMCA "safe harbor" protections).

[110]   *See, e.g.*, Daniel Harris Brean, *Asserting Patents to Combat Infringement Via 3D Printing: It's No "Use"*, 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 771, 811–13 (2013) (discussing Games Workshop's pursuit of Thomas Valerty, who posted on

tion, though it proceeded under ITAR and did not implicate any copyright issue, followed a script that closely resembled the DMCA's.

A number of commentators have argued persuasively that the DMCA's safe harbor provisions result in a "prior restraint by proxy" against alleged copyright infringers.[111] Every advantage under the notice-and-takedown approach goes to the enforcer. First, the notice-and-takedown approach allows the enforcing party to deal with infrastructure owners ("online service providers" in the DMCA) such as search engines, file-hosting services, and streaming websites rather than with the parties who actually upload the offending data.[112] This means that in most cases that the enforcer is

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Thingiverse his designs for two small figurines in the style of the tabletop strategy game Warhammer 40,000).

[111]   *See* Wendy Seltzer, *Free Speech Unmoored in Copyright's Safe Harbor: Chilling Effects of the DMCA on the First Amendment*, 24 HARV. J.L. & TECH. 171, 191 (2010) ("In his early and influential review of prior restraint doctrine, Thomas Emerson outlined the key characteristics distinguishing prior restraint from subsequent punishment: (1) breadth, (2) timing and delay, (3) propensity toward adverse decision, (4) limited procedure, (5) limited opportunity for public appraisal and criticism, (6) the "dynamics of prior restraint," (7) certainty and risk, and (8) effectiveness. These elements contribute to prior restraint's particular threat to free expression. The DMCA notice-and-takedown regime exhibits similar flaws: (1) Overbreadth: facially conformant but erroneous notices routinely prompt takedown; any posted content is potentially susceptible. (2) Delay: the ten-to-fourteen-business-day takedown can be timed strategically, to remove speech at the time of greatest impact to an ongoing debate. (3) Nearly all general-purpose providers take down content almost automatically upon receipt of a conformant notice. (4) The poster generally receives no notice or opportunity to respond until after content is taken down, and may receive few specifics even then; the only opportunity to contest is through counter-notice, which is biased against the poster, or in court. (5) Private actions are even less open to public appraisal than those of government censors; the indirect nature of the regulation diverts criticism. (6) The posting of information regarding DMCA agents and procedures invites their use. (7) The risk involved with filing a counter-notification is made to appear greater than the risk of initial posting. (8) On a case-by-case basis, the takedown scheme is effective. Almost every instance targeted by a notification is removed, and yet, in gross, the system fails to stop infringement of mass content because more targets re-appear from new sources.") (citations omitted).

[112]   *See* Mike Scott, *Safe Harbors Under the Digital Millennium Copyright Act*, 9 N.Y.U. J. LEGIS. & PUB. POL'Y 99, 119 (2006) (Section 512 of the statute ultimately identified safe harbors for five specific categories of OSPs: (1) those involved in 'transitory digital network communications;' (2) those providing 'system caching' services; (3) those providing space on their systems or networks for the storage of digital material 'at the direction of users;' (4) those providing 'information location tools;' and (5) nonprofit educational institutions providing such services to its faculty and graduate students.); *see also* 17 U.S.C. § 512 (a)–(e) (2012).

dealing with a for-profit entity with a return address rather than with a relatively anonymous and unpredictable content uploader.[113] Second, notice-and-takedown allows the ISP, a party whose only interest is in avoiding litigation, to stand in as an intermediary for the interested speaker who is accused of infringement.[114] Third, because ISPs have every incentive to remove the offending content as quickly as possible, the DMCA's safe harbor provisions mean that the matter is closed quickly and outside of court on the basis of an allegation and little more.[115] If the DMCA's safe harbor provisions were exported from the copyright context to a state-based policing context, the prior restraint concerns would be hard to ignore.

Once a prior restraint is found, the "heavy presumption" against it can still be overcome. "In order to be held lawful, respondents' action, first, must fit within one of the narrowly defined

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[113]   *See* Scott, *supra* note 111, at 136 ("For example, the ease with which copyright holders are able to obtain the identification of alleged infringers threatens the ability of individuals to speak anonymously on the Internet. As some commentators have noted, '[T]here are many reasons for anonymity, including political reasons; anonymizing services are used by dissidents under oppressive regimes for example.'").

[114]   *See* Wendy Seltzer, *Free Speech Unmoored in Copyright's Safe Harbor: Chilling Effects of the DMCA on the First Amendment*, 24 HARV. J.L. & TECH. 171, 181 (2010) ("The service provider is a third-party intermediary on the critical path to online speech. Service providers are imperfect agents for their poster-principals. These intermediaries to online speech likely have different incentives and risk sensitivities from their users, and the additional layer they represent increases information costs. The DMCA plays upon these divergences to suppress speech and deprive the public of positive externalities from speech.").

[115]   *See* Mike Scott, *Safe Harbors Under the Digital Millennium Copyright Act*, 9 N.Y.U. J. LEGIS. & PUB. POL'Y 99, 135 (2006) ("Speaking about the impact of the safe harbors on Yahoo!, an in-house counsel for the OSP explained: 'As a practical matter, notice and take down begins and ends the debate over whether a site stays up. Most service providers have little incentive to incur the costs and risks of litigation and will opt for the safe harbor, taking the site down. Users can provide a "counter notification" giving the copyright owner 10 days to obtain a court order to keep the site down, but very few users choose this option in Yahoo!'s experience. . . . This may be expedient and efficient, but to some extent it represents a "might makes right" resolution that gives little or no consideration to the validity of the copyright interest being asserted, its ownership, the permissible scope of protection, or defenses such as parody, fair use, de minimis use, and so on.") (quoting BATUR OKTAY & GREG WRENN, WORLD INTELLECTUAL PROP. ORG., WORKSHOP ON SERVICE PROVIDER LIABILITY: A LOOK BACK AT THE NOTICE-TAKEDOWN PROVISIONS OF THE U.S. DIGITAL MILLENNIUM COPYRIGHT ACT ONE YEAR AFTER THE ENACTMENT 17 (1999), *available at* http://www.wipo.int/edocs/mdocs/mdocs/en/osp_lia/osp_lia_2.pdf).

exceptions to the prohibition against prior restraints."[116] These exceptions include the regulation of obscenity,[117] the protection of judicial proceedings,[118] and, in theory, protection against imminent national security threats.[119] Even if the regulation fits into one of these exceptional categories, the restraint "must [be] accomplished with procedural safeguards that reduce the danger of suppressing constitutionally protected speech."[120] These "procedural safeguards" require 1) that the licensing decision be made quickly; 2) a prompt judicial review; and 3) that the burden of defending the licensing denial in court must be placed on the licensor.[121]

If all CAD files are recognized as First Amendment subject matter, then the prior restraint doctrine at its limit could invalidate almost any licensing or classification requirement in a replicator economy as well as the notice-and-takedown procedures that make up the most likely approach to enforcement. Even those enforcement measures that could survive scrutiny would come at enormous cost to the government, which would be forced to defend in court almost every adverse exercise of discretion.

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[116] Se. Promotions, Ltd. v. Conrad, 420 U.S. 546, 559 (1975).

[117] *See* Freedman v. Maryland, 380 U.S. 51, 54 (1965); Times Film Corp. v. City of Chi., 365 U.S. 43, 49 (1961).

[118] *See* Neb. Press Ass'n v. Stuart, 427 U.S. 539, 570 (1976) ("[T]he barriers to prior restraint remain high and the presumption against its use continues intact. We hold that, with respect to the order entered in this case prohibiting reporting or commentary on judicial proceedings held in public, the barriers have not been overcome; to the extent that this order restrained publication of such material, it is clearly invalid. To the extent that it prohibited publication based on information gained from other sources, we conclude that the heavy burden imposed as a condition to securing a prior restraint was not met.").

[119] *See* Near v. Minn. *ex rel.* Olson, 283 U.S. 697, 697 (1931) ("No one would question but that a government might prevent actual obstruction to its recruiting service or the publication of the sailing dates of transports or the number and location of troops.").

[120] *Se. Promotions*, 420 U.S. at 559.

[121] *See* FW/PBS, Inc. v. City of Dall., 493 U.S. 215, 227 (1990) ("[W]e determined that the following three procedural safeguards were necessary to ensure expeditious decisionmaking by the motion picture censorship board: (1) any restraint prior to judicial review can be imposed only for a specified brief period during which the status quo must be maintained; (2) expeditious judicial review of that decision must be available; and (3) the censor must bear the burden of going to court to suppress the speech and must bear the burden of proof once in court.") (citation omitted) (discussing *Freedman*, 380 U.S. at 55–61), *overruled on other grounds*, City of Littleton v. Z.J. Gifts D-4, L.L.C., 541 U.S. 774, 780–81 (2004).

c) Summing Up the Costs of Coverage

It would be naive to assume that the nightmare scenarios described in subsections a) and b) might actually come to pass even if the Supreme Court *did* ultimately hold that CAD files (and by extension, computer code) were *per se* covered under the First Amendment. A recent paper, urging a hybrid First-and-Second Amendment right to CAD files of guns, argues that "3D CAD files of guns are, in truth, nothing more than information—'pictures of guns' defined in lines of source code, rather than graphic visuals . . . Regulation on the 3D CAD source files is really a regulation on information, and therefore must satisfy constitutional scrutiny."[122] Such arguments, sound only from their own chosen level of generalization, ignore everything that actually matters in a constitutional system meant to govern relationships between human beings. CAD files are "nothing more than" information only to the same extent that humans are "nothing more than" animals and that toxic waste is really just "matter out of place."[123] No judiciary would remake the law of products based on an observation that CAD files are "really" pictures.

None of this is to say, however, that the courts will not pay lip service to the "picture" theory. Quite the contrary. As I discuss below, the trial and appellate courts have nearly unanimously taken the position that all computer code "is speech" for First Amendment purposes. The Supreme Court, in another context, has said, "[t]his Court has held that the creation and dissemination of information are speech within the meaning of the First Amendment."[124] Activist litigants in a replicator economy will surely attempt to exploit the replicator's faint First Amendment salience as a pretext to constitutionalize various spheres of economic activity, and they will likely acheive a few victories. The "picture" argument will probably reach the Supreme Court someday, and the Supreme Court will likely take it seriously.

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[122]   Josh Blackman, *The 1st Amendment, 2nd Amendment, and 3d Printed Guns*, 81 TENN. L. REV. 479, 501–02 (2014).

[123]   *See* MARY DOUGLAS, PURITY AND DANGER: AN ANALYSIS OF CONCEPTS OF POLLUTION AND TABOO 36 (1966).

[124]   Sorrell v. IMS Health Inc., 131 S. Ct. 2653, 2667 (2011).

At this point, the judiciary will have to explain *how*, if CAD files are First Amendment subject matter, the regulatory state can avoid withering under First Amendment scrutiny. The process of "clarification" would no doubt involve uncertain years of new exceptions, new categories, and new tests. I see no point in attempting to predict the shape of this new doctrine, because at any rate, the Court, once it goes down that path, will have premised it on a crucial mistake: namely, the mistake of extending coverage over CAD files categorically in the first place.

In the following sections, I discuss briefly the theoretical argument in favor of covering CAD categorically, as well as the arguments for exempting CAD categorically from coverage. I then argue that both approaches are misguided. I then discuss the majority position in the courts, which generally favor universal coverage.

B. *Categorical Approaches to CAD and Coverage*

1. Arguments from Resemblance to Natural Language

CAD files resemble the written word, and their source code is more directly human-comprehensible than one might think. The prevailing format for 3D modeling in the early 21st century, for instance, is the .stl (Stereo Lithography) format.[125] .stl files describe three-dimensional shapes as polygonal sets of adjacent triangles in a three-dimensional space.[126] Because the three-dimensional object consists entirely of two-dimensional triangular surfaces, no part of the object is truly rounded. Instead, the appearance of a rounded surface is always to some degree an approximation. Composing a rounded object from a small number of triangles, then, will result in a faceted, gemstone-like appearance:[127]

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[125]   *See* Ennex Corp., *STL Format: Standard Data Format for Fabbers*, FABBERS.COM, http://www.ennex.com/~fabbers/StL.asp (last visited Sept. 6, 2014) (reprinting MARSHALL BURNS, AUTOMATED FABRICATION: IMPROVING PRODUCTIVITY IN MANUFACTURING § 6.5 (1993)).

[126]   *See id.*

[127]   *CAD to STL*, ISPACE/ARTLAB, http://www.ispaceartlab.com/FabC/cad2stl.html (last visited Sept. 6, 2014).
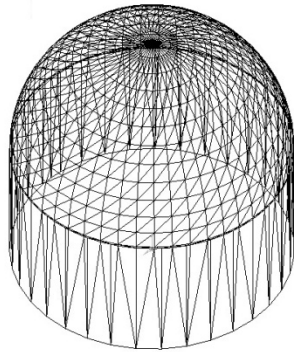
128

Composing the object from a high number of triangles will make the facets so small that the 3D printer is incapable of printing them "accurately" and the resultant physical object is actually rounded as the designer intended.[129]
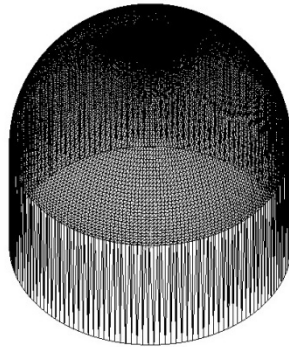
130

.stl files can be prepared in plain ASCII text, which is easier for humans to read but more storage-intensive than the more compact "binary" format, which is expressed in ones and zeroes.[131] An ASCII .stl example of the simplest possible polygon is given below (it is unrelated to the illustrations above). For each triangular surface, the file describes a set of vertices as well as a "normal," a vector that (perhaps redundantly) describes which face of the triangle

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[128]   *Id.*

[129]   *Id.*

[130]   *Id.*

[131]   Ennex Corp., *STL Format: Standard Data Format for Fabbers*, *supra* note 125.

faces outside the three-dimensional polygon.[132] The vertices and the normal are all given in Cartesian (x, y, z) coordinates.[133]

```
solid example
facet normal 0.0 -1.0 0.0
 outer loop
  vertex 0.0 0.0 0.0
  vertex 1.0 0.0 0.0
  vertex 0.0 0.0 1.0
 endloop
endfacet
facet normal 0.0 0.0 -1.0
 outer loop
  vertex 0.0 0.0 0.0
  vertex 0.0 1.0 0.0
  vertex 1.0 0.0 0.0
 endloop
endfacet
facet normal -1.0 0.0 0.0
 outer loop
  vertex 0.0 0.0 0.0
  vertex 0.0 0.0 1.0
  vertex 0.0 1.0 0.0
 endloop
endfacet
facet normal 0.577 0.577 0.577
 outer loop
  vertex 1.0 0.0 0.0
  vertex 0.0 1.0 0.0
  vertex 0.0 0.0 1.0
 endloop
endfacet
endsolid
```
[134]

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[132]   *See CAD to STL, supra* note 127.

[133]   *See id.*

[134]   *See* John Burkhardt, *ASCII Stereolithography Files*, FLORIDA STATE UNIV. DEP'T OF SCIENTIFIC COMPUTING, http://people.sc.fsu.edu/~jburkardt/data/stla/stla.html (last visited Sept. 6, 2014).

Again, there is literally no such thing as an .stl script simpler than this example. The example shows, though, that the .stl format is plain-spoken enough to read at some level without an education in any sort of computer science. If you "cheat"[135] by counting the number of sides described here, you can get the gist of it without thinking too hard: you must be looking some sort of four-sided pyramid. And you could in a few minutes verify everything else about the pyramid—namely, its surfaces' internal angles and those surfaces' areas relative to each other—with the aid of a pen and paper. It is not wholly trivial, then, to describe at least the ASCII .stl files, or in principle any other sort of source code, as human-readable text. .stl files are writable and viewable in text editors,[136] and it may often make sense to tweak parts of them in that format. This why the human-friendly ASCII format exists.[137]

### 2. Objections from Comprehensibility; the Spence "Test"

Yet the degree of possible or probable "direct" human interface with these files is obviously sharply limited. CAD files are not books. Most users are unlikely ever to read the file's source code, and they would struggle if they tried. A thorough reading even of the trivially simple code given above would be far easier through a graphical user interface on a computer. It is hard to imagine anyone but a savant "reading" even a minimally more complex ASCII .stl file and understanding what was going on without help from a computer.[138] It is highly unlikely (though impossible to verify) that anyone has *ever* written from scratch or read from plain text an .stl containing, say, a thousand surfaces. A thousand surfaces, moreover, is a low number; the simple bottle illustrated below uses 1240 triangular faces.

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[135]   I am inclined to think of the side-counting as cheating because the number of a polygon's sides seems to me to drop off in significance as the complexity of a polygon increases. Thus, you know most of what you need to know about a four-sided polygon if you know that it has four sides, but knowing that a thousand-sided polygon has a thousand sides is trivial. The four-sided polygon has to be some sort of pyramid. The thousand-sided polygon could be a gun receiver or it could be Boba Fett's helmet.

[136]   *See* John Burkhardt, *Humanoid_tri.PNG*, FLORIDA STATE UNIV. DEP'T OF SCIENTIFIC COMPUTING, http://people.sc.fsu.edu?~jburkardt/data/stla/humanoid_tri .png (last visited Sept. 6, 2014).

[137]   *See id.*

[138]   *See, e.g., id.*
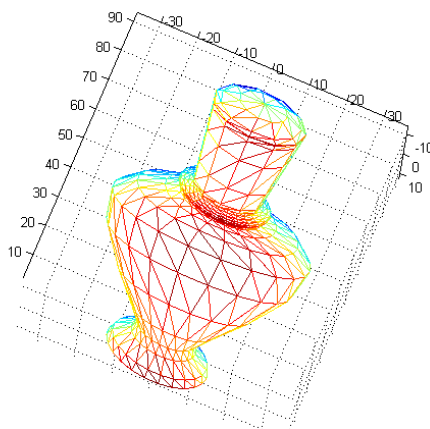
139

The fact that most .stl files are in the hard binary rather than the easy ASCII format makes this natural comprehension still less likely.

Such are the facts that underlie the most common arguments that computer source code "is not speech" for First Amendment purposes. One strand of argument would hold that source code cannot be speech because the likelihood is so low that anyone in the "audience" is capable of understanding its "message." Dicta from the Supreme Court in *Spence v. Washington* offers some weak support here, suggesting that speech occurs when "a particularized message [is] present, and in the surrounding circumstances the likelihood [is] great that the message be understood by those who view[] it."[140] This language is sometimes set out in commentary and in lower court opinions—rather surprisingly—as the Supreme Court's "test" to determine what is and what is not speech for purposes of the First Amendment.[141]

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[139]   John Burkhardt, *Bottle*, FLORIDA STATE UNIV. DEP'T OF SCIENTIFIC COMPUTING, http://people.sc.fsu.edu/~jburkardt/data/stla/bottle.png (last visited Sept. 6, 2014).

[140]   Spence v. Washington, 418 U.S. 405, 410–11 (1974).

[141]   *See* Jed Rubenfeld, *The First Amendment's Purpose*, 53 STAN. L. REV. 767, 772–75 (2001). In fairness, Professor Rubenfeld's insightful article later acknowledges that *Spence* makes for a "profoundly unsatisfactory" test of expression; I only disagree in that I believe Rubenfeld reads and refutes a strawman in *Spence* where an alternative and more reasonable interpretation was available. Specifically, the *Spence* elements can be read to articulate *sufficient but not necessary* indicia of expression. At any rate, even if *Spence* had been meant as a coverage limit, that limit would have been overruled in *Hurley v. Irish-American Gay, Lesbian & Bisexual Group of Boston, Inc. See* Hurley v. Irish-Am. Gay,

But there is no evidence that the Supreme Court ever intended *Spence* to establish an outer boundary for "speech." When the Court has relied on the *Spence* language, it has always been to affirm that expression is present.[142] The Court has never suggested that failing the *Spence* "test" means that expression is absent.[143] And rightly so, for if the First Amendment required a high likelihood of comprehension, it would be blind to all sorts of muddled messages that the Supreme Court has explicitly blessed with First Amendment coverage.[144]

It is at any rate unclear which way a "likelihood of understanding" criterion would even cut in a case about computer language. The whole point of computer code, whether source code or machine code,[145] is absolute precision.[146] The CPU reading machine code or the compiler reading source code is designed to follow the instructions it receives without variation from the letter.[147] A human reading source code, then, finds a text that contains zero ambiguity, assuming there are no errors. In many respects, source code achieves a clarity that natural language cannot.[148] In two early

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Lesbian & Bisexual Grp. of Bos., Inc., 515 U.S. 557, 569 (1995) ("[A] narrow, succinctly articulable message is not a condition of constitutional protection, which if confined to expressions conveying a 'particularized message' would never reach the unquestionably shielded painting of Jackson Pollock, music of Arnold Schoenberg, or Jabberwocky verse of Lewis Carroll." (citation omitted) (quoting *Spence*, 418 U.S. at 411)).

[142]   *See* Texas v. Johnson, 491 U.S. 397, 404 (1989).

[143]   *Id.*

[144]   See *Hurley*, 515 U.S. at 569 ("[A] narrow, succinctly articulable message is not a condition of constitutional protection, which if confined to expressions conveying a 'particularized message' would never reach the unquestionably shielded painting of Jackson Pollock, music of Arnold Schoenberg, or Jabberwocky verse of Lewis Carroll.") (citation omitted) (quoting *Spence*, 418 U.S. at 411); *see also Morse v. Frederick*, 551 U.S. 393, 400 (2007) (extending coverage, but not protection, to a banner reading "BONG HiTS 4 JESUS").

[145]   *See* discussion *infra* note 158.

[146]   *See* Lee Tien, *Publishing Software as a Speech Act*, 15 BERKELEY TECH. L.J. 629, 662–663 (2000).

[147]   *See id.* at 660.

[148]   *See id.* at 662–63 ("Instead of expressing mundane everyday thoughts, programming languages express procedures and ideas about procedures without the ambiguity plaguing natural languages. For instance, programming languages avoid the difficulties that English has in describing algorithms and may stand as the only practical means of expressing certain algorithms that require precise articulation. Programming languages provide the best means for communicating highly technical ideas—such as mathematical concepts—within the community of computer scientists and programmers.").

source code cases academics sought to publish encryption source code for tutorial purposes in a mathematics journal and on a faculty home page.[149] If anything, a *Spence* "test" would seem to find this code *unusually* expressive: a message is intended and it is *certain* to be understood by its audience largely *because of*, and not in spite of, the fact that it is communicated in source code.

The fact that CAD files are in most instances unlikely to be understood by human readers, then, is a poor basis to conclude that all CAD files lie categorically beyond the coverage or even the protection of the First Amendment.[150] The argument proves far too much.[151]

3. Objections from Functionality

A related set of arguments against First Amendment coverage for source code has to do with its "functionality." This argument operates by analogy to the "functionality" doctrine of copyright, which denies copyright protection to an article's functional elements.[152] In the famous case of *Brandir International, Inc. v. Cascade Pacific Lumber Co.*,[153] a company sought copyright protection for an inventive bicycle rack made of a single length of steam pipe bent into an "undulating shape."[154] The company took the position that the bike rack was a form of "applied art," an originally expressive item later put to a utilitarian purpose.[155] The court rejected this argument, holding that "no artistic element of the RIBBON

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[149]   *See* Bernstein v. U.S. Dep't of State, 922 F. Supp. 1426, 1430 (N.D. Cal. 1996); *see also* Junger v. Daley, 209 F.3d 481, 484–85 (6th Cir. 2000); discussion *infra* note 158.

[150]   *See* Tien, *supra* note 146, at 678–84.

[151]   *See* Rubenfeld, *supra* note 141, at 773 ("[Spence's 'particularized message'] is a profoundly unsatisfactory test for deciding what nonverbal stuff counts as sufficiently 'expressive' to trigger First Amendment scrutiny . . . unless courts are to wall off art as its own special First Amendment category to which Spence does not apply—a highly unappealing idea, unless you think judges could successfully determine what is and is not art—then we are obliged to recognize that the Spence test merely states sufficient, not necessary, criteria for determining if conduct is expressive.").

[152]   *See* Am. Dental Ass'n v. Delta Dental Plans Ass'n, 126 F.3d 977, 980 (7th Cir. 1997).

[153]   *See* Brandir Int'l Inc. v. Cascade Pac. Lumber Co., 834 F.2d 1142 (2d Cir. 1987).

[154]   *See id.* at 1147.

[155]   *See id.*

Rack [] can be identified as separate and capable of existing independently, of, the utilitarian aspects of the article."[156]

Software is the best possible illustration of the fact that textual and functional properties can inhabit the same article. A whole line of cases, for instance, considers arguments that sharing cryptographic source code is the most effective way for computer scientists and mathematicians to communicate with each other about cryptographic science.[157] Very little of what is communicative in this sense is "capable of existing independently of" the functional aspects of source code.[158] This much is at least as true in the CAD context, and that is assuming that we recognize some expressive value in a CAD's source.

But analogies from copyright to the First Amendment can be misleading, as copyright only reaches a subset of First Amendment activity. Most notably, copyright requires protected expression to contain at least some minimal degree of originality,[159] a require-

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[156]   *See id.* at 1147–48 (citation omitted) (internal quotation marks omitted).

[157]   *See* Universal City Studios, Inc. v. Corley, 273 F.3d 429, 446 (2d Cir. 2001); Junger v. Daley, 209 F.3d 481, 484–85 (6th Cir. 2000); 321 Studios v. Metro Goldwyn Mayer Studios, Inc., 307 F. Supp. 2d 1085, 1099–1100 (N.D. Cal. 2004); Karn v. U.S. Dep't of State, 925 F. Supp. 1, 9 (D.D.C. 1996); Bernstein v. U.S. Dep't of State, 922 F. Supp. 1426, 1435 (N.D. Cal. 1996).

[158]   I should address two minor points here. First is the distinction between source and machine code, which is probably more widely understood today than when the cryptography cases were heard, but that nonetheless merits some discussion. When a computer's CPU executes a program, it works with a set of instructions that are written in a radically austere language made up of zeroes and ones. *See Junger*, 209 F.3d at 484. This is the machine code. It is human-readable in theory but cumbersome. Coders therefore write and edit in various more human-readable computer languages such as Java, Python, and C, which "compiler" software then translates into an exportable binary file. *See id.* ASCII .stl files, discussed above in discussion surrounding note 125, are source, while binary .stl files are objects written in machine code. Most challengers in the early First Amendment cases on source code seized on the distinction between source and machine code to conclude that source code is not, in fact, functional, but this strikes me as overstated. A second point, also raised in the source code litigation, is that source code generally contains a number of natural language "comments" to aid human readers. *See Karn*, 925 F. Supp. at 9. These comments—essentially a programmer's "note to self"—are bracketed off from the rest of the code by ampersands or some other "ignore me" flag, and the compiler completely ignores them. *See id.* But if functionality is what matters, the comments can hardly be said to change the equation.

[159]   *See* 17 U.S.C. § 102(a) (2012) ("Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now

ment that makes no sense in the First Amendment context.[160] As for the "functionality" doctrine, its purpose in copyright law seems to be to guard against misuses of copyright in areas meant to belong to patent and trademark.[161] It is possible to make a broad analogy here; much of this Article, after all, is a warning against the expansion of the law of the First Amendment into areas where it should not go. But such an analogy would be *extremely* broad. Most legal reasoning is about cordoning off a particular mode of analysis to make sure it is not extended over an area where it should not go. The fact that functionality is an appropriate boundary for intellectual property cannot imply that it is an appropriate boundary for everything else as well.

Beyond the analogy from copyright, there is no independent reason to suppose that a thing's functionality should be in itself determinative of any First Amendment issue. Functional things are used all the time in the service of expression—money,[162] sound trucks,[163] sleeping bags,[164] hands.[165] It would be an error to suppose that the First Amendment shuts off whenever these functional objects are present in a fact pattern.[166] It is a weak criticism of the Supreme Court's campaign-finance jurisprudence, for instance, to say that "money is not speech" simply because it is not *always* used for expressive purposes; when money is used to finance expression,

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known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.").

[160]   *See generally* Rebecca Tushnet, *Copy This Essay: How Fair Use Doctrine Harms Free Speech and How Copying Serves It*, 114 YALE L.J. 535, 545 (2004) (discussing the "First Amendment value of copying" as evidence of a stark conflict between First Amendment and copyright priorities).

[161]   *See* Am. Dental Ass'n v. Delta Dental Plans Ass'n, 126 F.3d 977, 980 (7th Cir. 1997).

[162]   *See, e.g.*, Citizens United v. Fed. Election Comm'n, 558 U.S. 301, 365 (2010); Buckley v. Valeo, 424 U.S. 1, 39 (1976).

[163]   *See* R.A.V. v. City of St. Paul, Minn., 505 U.S. 377, 386 (1992) ("Fighting words are thus analogous to a noisy sound truck: Each is, as Justice Frankfurter recognized, a 'mode of speech'; both can be used to convey an idea; but neither has, in and of itself, a claim upon the First Amendment. As with the sound truck, however, so also with fighting words: The government may not regulate use based on hostility—or favoritism—towards the underlying message expressed.") (citation omitted).

[164]   *See* Clark v. Cmty. for Creative Non-Violence, 468 U.S. 288, 293 (1984).

[165]   *See* Tien, *supra* note 146, at 683 ("Things that have no utterance meaning, like one's hands, may be used in illocutionary acts.").

[166]   *See id.* at 685.

the First Amendment must at least be in play.[167] This point applies with equal force in the software context.

4. General Weaknesses of a Categorical Approach to Code and Free Speech

The resemblance argument as well as the objections from comprehensibility and functionality fail because they all assume that the coverage question can be determined by certain ontological qualities that are common to all computer code—its textual appearance, its mysterious vocabulary, its power to move a CPU. If that were the case, then it would make sense to approach code categorically for First Amendment purposes: i.e., it is either always covered or never covered.

But expression should not be defined relative to the objects that show up in a fact pattern. Without settling on a general definition of expression, one can say safely that expression consists in a behavior or an event rather than a thing-in-itself, and that its occurrence or nonoccurrence is a highly fact-specific question.[168] As Lee Tien argued persuasively over a decade ago, there are instances in which code is used in the service of a speech act, and there are instances in which code is *not* used in the service of a speech act.[169]

Thus, the case of Cody Wilson seems to involve a speech act. His intent seems to have been to demonstrate the futility of gun control against the Internet.[170] Just as importantly, Wilson's message is clearly understood. The gun is more performance art than a viable weapon, allegedly prone to catastrophic failure and even in its good moments a poor shot.[171] The intermediate scrutiny standard of *O'Brien*[172] fits these facts well. Just as the performative

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[167]   *See* Nixon v. Shrink Mo. Gov't PAC, 528 U.S. 377, 400 (2000) (Breyer, J., concurring) ("[A] decision to contribute money to a campaign is a matter of First Amendment concern—not because money *is* speech (it is not); but because it *enables* speech.").

[168]   *See* Tien, *supra* note 146, at 689 n.242.

[169]   *See generally id.*

[170]   *See* Interview by Glenn Beck with Cody Wilson, *supra* note 33.

[171]   This information comes from the Bureau of Alcohol, Tobacco and Firearms. Wilson disputes it. *See* Adam Clark Estes, *The ATF Has Yet to Be Convinced that 3D-Printed Guns Compare to the Real Thing*, MOTHERBOARD (Mar. 25, 2013, 11:55 AM), http://motherboard.vice.com/blog/the-atf-is-unconvinced-3d-guns-compare-to-real-thing.

[172]   *See* United States v. O'Brien, 391 U.S. 367, 377 (1968).

burning of draft cards in *United States v. O'Brien* was not a major threat to the bureaucracy of the Selective Service Administration,[173] the Liberator taken on its own does not seriously undermine international arms regulations. Each is primarily a statement. Each is also in violation of a law backed by "a sufficiently important governmental interest in regulating the nonspeech element,"[174] and can therefore be regulated even under intermediate scrutiny.[175] Yet each also receives a measure of extra process as called for under the free speech principle. This feels appropriate, and more so in almost every sense in Wilson's case than in O'Brien's.

And importantly, Wilson's case (which is unlikely to happen at this point) would have been exceptional among the possible litigation that might someday arise concerning replicated weapons: exceptional for its politically active plaintiff, and exceptional for the fact that it would have come so early in the evolution of the replicator that the gun in question is essentially a novelty item. Extending First Amendment coverage to a party in Wilson's unusual position does not need to imply a *Lochner*ization[176] of the entire field of CAD.

Suppose a more mundane party using a fully realized replicator in the hypothetical future: one who downloads (or streams) a gun precursor just for the sake of owning a gun (let's say this plaintiff is a collector). The replicator builds the gun in a few seconds from thin air. Here, there is no intent to make a speech act[177] and no context that might lead someone to believe the collector *intends* a speech act.[178] It is fully consistent to treat the collector's claim as frivolous and Wilson's claim as serious.

Note that the analysis in each of these cases—O'Brien's and the collector's—would not change even if we assumed a manufacturing method that avoided the use of software. This is because the textual appearance of CAD is a red herring. The presence of mon-

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173   *See id.* at 377 (upholding the statute against First Amendment challenge as it was "a legitimate and substantial administrative aid in the functioning" of the draft system).
174   *See id.* at 376.
175   *See id.* at 377.
176   *See generally* Lochner v. New York, 198 U.S. 45 (1905).
177   *See* Tien, *supra* note 146, at 637.
178   *See id.*

ey or code or any other *thing* should not add or subtract anything to or from the free speech analysis. As Tien observed, "software poses no special First Amendment problems if we resist the impulse to treat speech as a thing."[179] But many courts considering the issue have shown poor impulse control.

5.   The Temptation to Think Categorically About Code

It would therefore be an error to assume the First Amendment is never in play in cases involving money.[180] It would be worse still to say that the First Amendment is *always* in play in cases involving money,[181] and few lawyers would ever make such a claim.[182] But code shares with the spoken word a textual aspect that other "objects" such as money and sound trucks lack. The presence of text—text readable, in some cases, by novices—can appear at first impression as an unmistakeable marker of speech. On account of its textual appearance, the great majority of courts to consider First Amendment challenges to regulations of computer code have therefore made categorical-sounding statements that "code is speech for First Amendment purposes."[183] In *Bernstein v. United*

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[179]   *See id.* at 712.

[180]   *See* Nixon v. Shrink Mo. Gov't PAC, 528 U.S. 377, 400 (2000) (Breyer, J., concurring) ("[A] decision to contribute money to a campaign is a matter of First Amendment concern—not because money *is* speech (it is not); but because it *enables* speech.").

[181]   *Pro se* litigants are another matter. For an opinion dismissing a *pro se* claim apparently proceeding on such a full-on "money is speech" theory, see Ballard v. Global Tel Link, No. 4:13-CV-974-NAB, 2013 WL 2368983, at *1 (E.D. Mo. May 29, 2013) ("The named defendants are Global Tel Link, Western Union, and Toyota Motor Company. Plaintiff alleges that defendants 'participated in illegal actions of intentionally failing to NOT ask for (verified) personal identification when each defendant debited the plaintiff['s] bank account.' Plaintiff claims that defendants violated his First Amendment rights, because 'money is speech' . . . .").

[182]   For an opinion dismissing a *pro se* claim apparently proceeding on such a theory, see *id.*

[183]   Bernstein v. U.S. Dep't of State, 922 F. Supp. 1426, 1426 (N.D. Cal. 1996) ("For the purposes of First Amendment analysis, this court finds that source code is speech."); *see also* United States v. Alavi, CR 07-429-PHX-NVW, 2008 WL 1989773 (D. Ariz. May 5, 2008) ("It is true that software source code is speech subject to First Amendment protections."); 321 Studios v. Metro Goldwyn Mayer Studios, Inc., 307 F. Supp. 2d 1085, 1099–1100 (N.D. Cal. 2004) ("Courts have found that both the executable object code and the more readable source code merit First Amendment protection . . . As with other kinds of speech, the scope of the protection for computer code depends upon whether the restriction on the code is because of its content."); United States v. Elcom Ltd., 203 F.

States Department of State, for instance, a federal district court explicitly staked out the position that the First Amendment concerned all writings in any language, and that programming languages and machine code alike are for First Amendment purposes languages.[184] And in *Universal City Studios v. Reimerdes*, the court went so far as to say that "[i]t cannot seriously be argued that any form of computer code may be regulated without reference to First Amendment doctrine."[185]

It is not always clear where these statements lie individually on the spectrum of authority from dicta to holdings, as many of the broadest assertions of coverage come in the context of opinions that nonetheless decline to extend protection to the challenger's code.[186] In these opinions, which extend coverage while withholding protection, it may be that the judge writing the opinion is taking the path of least resistance. Treating the First Amendment claim as wholly frivolous would invite a more aggressive appeal, and especially so when, as in the early cryptography cases, the challenging party is looking to make new law.[187] "Acknowledging" that code is categorically speech may help the First Amendment challenger to save face. For these reasons there is rarely any incentive for a judge to make a negative coverage determination, as the same negative result can always be reached, and with an appearance of greater even-handedness, simply by declining to extend protection. Even in cases where First Amendment challengers have lost on the ques-

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Supp. 2d 1111, 1126 (N.D. Cal. 2002) ("Computer software is expression that is protected by the copyright laws and is therefore 'speech' at some level, speech that is protected at some level by the First Amendment."); Universal City Studios, Inc. v. Reimerdes, 111 F. Supp. 2d 294, 326–27 (S.D.N.Y. 2000) ("It cannot seriously be argued that any form of computer code may be regulated without reference to First Amendment doctrine.").

[184] *Bernstein*, 922 F. Supp. at 1426. On appeal, the Ninth Circuit made a point of walking this position back. Bernstein v. U.S. Dep't of Justice, 176 F.3d 1132, 1145 (9th Cir. 1999) ("We emphasize the narrowness of our First Amendment holding. We do not hold that all software is expressive.").

[185] *Reimerdes*, 111 F. Supp. 2d at 326–27 ("It cannot seriously be argued that any form of computer code may be regulated without reference to First Amendment doctrine.").

[186] *See, e.g., id.*

[187] The electronic-rights advocacy organization Electronic Frontier Foundation represented challengers in the *Junger* and *Bernstein* cases. *See All EFF's Legal Cases*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/cases (last visited Oct. 5, 2014).

tion of protection, then, the trend has been to enlarge the scope of coverage.

In other cases, First Amendment challengers have won on the question of protection. Here, too, we see affirmative determinations on the question of coverage, as coverage is a prerequisite to protection.[188] These affirmative determinations do not have to go beyond the facts of the case, and in at least some opinions, courts have taken care to avoid making any sweeping judgments about the speechness of code at large.[189] But for the most part, courts extending *protection* to specific instances of code speech have not bothered to hold back on the question of *coverage*.[190]

Over time, then, we have seen far more judicial language suggesting that the First Amendment reaches *all* computer code than language suggesting the First Amendment reaches only *some* computer code.[191] The net effect of these opinions has been to push coverage outward and set an expectation that where computers go, the First Amendment will follow.[192] It is a fine example of a general phenomenon that Professor Schauer has described as "the magnetism of the First Amendment,"[193] in which the range of cases we perceive as involving a constitutional free speech issue is constantly undergoing expansion.

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[188]   *See, e.g.*, Universal City Studios v. Corley, 273 F.3d 429, 449–50 (2d Cir. 2001).

[189]   *See, e.g.*, *Bernstein*, 176 F.3d at 1139; *see also Corley*, 273 F.3d at 449–50 ("Having concluded that computer code *conveying information* [to human readers] is 'speech' within the meaning of the First Amendment, we next consider, to a limited extent, the scope of the protection that code enjoys.") (emphasis added).

[190]   *See, e.g.*, United States v. Elcom Ltd., 203 F. Supp. 2d 1111, 1126 (N.D. Cal. 2002).

[191]   *See, e.g.*, *Corley*, 273 F.3d at 445–46 ("Communication does not lose constitutional protection as 'speech' simply because it is expressed in the language of computer code. Mathematical formulae and musical scores are written in 'code,' i.e., symbolic notations not comprehensible to the uninitiated, and yet both are covered by the First Amendment. If someone chose to write a novel entirely in computer object code by using strings of 1's and 0's for each letter of each word, the resulting work would be no different for constitutional purposes than if it had been written in English.").

[192]   *See, e.g.*, 321 Studios v. Metro Goldwyn Mayer Studios, Inc., 307 F. Supp. 2d 1085, 1099–1100 (N.D. Cal. 2004) ("Courts have found that both the executable object code and the more readable source code merit First Amendment protection . . . As with other kinds of speech, the scope of the protection for computer code depends upon whether the restriction on the code is because of its content."); *Alavi*, 2008 WL 1989773, at *1 ("It is true that software source code is speech subject to First Amendment protections.").

[193]   Schauer, *supra* note 34, at 1787.

The excessive tendency in the source code cases is captured well in the Northern District of California's early opinion in *Bernstein v. United States Department of State*:

> Language is by definition speech, and the regulation of any language is the regulation of speech. Nor does the particular language one chooses change the nature of language for First Amendment purposes. This court can find no meaningful difference between computer language, particularly high-level languages as defined above, and German or French. All participate in a complex system of understood meanings within specific communities. Even object code, which directly instructs the computer, operates as a "language." When the source code is converted into the object code "language," the object program still contains the text of the source program. The expression of ideas, commands, objectives and other contents of the source program are merely translated into machine-readable code . . . Instructions, do-it-yourself manuals, recipes, even technical information about hydrogen bomb construction, are often purely functional; they are also speech.[194]

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[194]   Bernstein v. U.S. Dep't of State, 922 F. Supp. 1426, 1435 (N.D. Cal. 1996) (citation omitted). *See also* Junger v. Daley, 209 F.3d 481, 484–85 (6th Cir. 2000) ("The Supreme Court has expressed the versatile scope of the First Amendment by labeling as "unquestionably shielded" the artwork of Jackson Pollock, the music of Arnold Schoenberg, or the Jabberwocky verse of Lewis Carroll. Hurley v. Irish-Am. Gay, Lesbian & Bisexual Grp., 515 U.S. 557, 569 (1995). Though unquestionably expressive, these things identified by the Court are not traditional speech. Particularly, a musical score cannot be read by the majority of the public but can be used as a means of communication among musicians. Likewise, computer source code, though unintelligible to many, is the preferred method of communication among computer programmers. Because computer source code is an expressive means for the exchange of information and ideas about computer programming, we hold that it is protected by the First Amendment."); Universal City Studios, Inc. v. Reimerdes, 111 F. Supp. 2d 294, 326 (S.D.N.Y. 2000) ("It cannot seriously be argued that any form of computer code may be regulated without reference to First Amendment doctrine.") (striking, via a content-neutrality argument, a DMCA provision against trafficking in DRM circumvention technologies); Sony Computer Entm't Inc. v. Connectix Corp., 203 F.3d 596, 602 (9th Cir. 2000) (recognizing that object code may be copyrighted as expression under 17 U.S.C. § 102(b)

You can sense that these judges feel they have drafted forward-looking opinions by keeping an open mind about emerging technology. The irony is that their broad statements to the effect that code "is" speech tend to operate on blind analogies to paper media.[195] It is sometimes tempting to assume, after decades of expansion in First Amendment doctrine, that anything at all that might be put on paper—or perhaps in copyright's "tangible medium of expression"[196]—must be at least *covered*, if not protected, by the First Amendment. This is, of course, a bad instinct, not least because the First Amendment completely ignores huge swaths of communication, as I have discussed above.[197] But the instinct also fails because it places too much emphasis on the tangible medium as a store of rights. When Judge Patel in *Bernstein* characterizes machine-handled object code as expression, she reifies something that should be thought of as an act, making speech into something that can be *kept* somewhere, whether in electronic storage media or in a book, and that enjoys passive rights as a thing-in-itself.[198] But even a book is not speech when it is used as a doorstop or as an implement for hitting someone over the head. Speech is not found in objects. Equating information storage media with constitutional speech may well have been a harmless conceit in the year 1900, when data storage or transmission by paper was always part of a speech act, and it may have *appeared* harmless in the 1990s when *Bernstein* came down. But it is extremely problematic today, when the overwhelming majority of data transmission and storage throughout the world consists of object code, and when we have the ability to reduce *all* "information," including the roughly three

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(2012)), *cert. denied*, 531 U.S. 871 (2000); *see also Elcom*, 203 F. Supp. at 1126 ("While there is some disagreement over whether object code, as opposed to source code, is deserving of First Amendment protection, the better reasoned approach is that it is protected. Object code is merely one additional translation of speech into a new, and different, language.").

[195]   *See Elcom*, 203 F. Supp. at 1131.

[196]   17 U.S.C. § 101 (2012).

[197]   *See* discussion *supra* Part II.A.

[198]   *See Bernstein*, 922 F. Supp. at 1435.

gigabytes stored on the human DNA molecule,[199] to a common coin.[200]

It is important to consider that *Bernstein*, *Karn*, *Junger*, *Reimerdes* and the few other software opinions were written in an economy bearing even less of a resemblance to the replicator economy I have hypothesized throughout this piece. Each of those cases dealt with either academics or hobbyists, and they were infrequent.[201] They went to perceivedly marginal issues—namely, cryptography and DRM cracking.[202] In a replicator economy, the First Amendment challenges would come more frequently, and they would put far more at stake. A categorical approach to CAD files, whether it extends or withholds First Amendment coverage, will not do in the long run.

II. Why Policing of Replication Cannot Sidestep the Internet

Before I reach the final section of this paper, I want to put to rest any hope that replicative manufacturing might be regulated in a way that avoids the CAD question and its entanglements.

Think of replication as a two-step process: first, you download or otherwise call up the CAD that you need, and second, you manufacture the tangible object from the CAD. To the extent that replicators present a new speech issue, it concerns the first step. Now, to be sure, it is fully possible for a tangible object to contain expres-

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[199]   Nova, *Genome Facts*, PBS, http://www.pbs.org/wgbh/nova/genome/facts.html (last visited Aug. 4, 2014).

[200]   *See* R. Polk Wagner, *The Medium is the Mistake: The Law of Software for the First Amendment*, 51 STAN. L. REV. 387, 403 (1999) ("The First Amendment is not about the canonization—via constitutional status—of what can be printed out on paper, but about preventing the government from proscribing expression—regardless of form—because of disapproval of the ideas expressed. Focusing on formalistic categories such as the written and spoken word is not only inconsistent with the core values of the First Amendment, but may also result in the limiting of other forms of expression, especially new media technologies.").

[201]   *See, e.g.*, *Bernstein*, 922 F. Supp. at 1426 (mathematician); Junger v. Daley, 209 F.3d 481, 483 (6th Cir. 2000) (law professor); Karn v. U.S. Dep't of State, 925 F. Supp. 1, 1 (D.D.C. 1996) (hobbyist).

[202]   *See, e.g.*, *Bernstein*, 922 F. Supp. at 1426 (cryptography); Universal City Studios, Inc. v. Reimerdes, 111 F. Supp. 2d 294, 303 (S.D.N.Y. 2000) (DRM cracking).

sive value whether it is replicated or whittled. But a statue produced by a replicator is neither more nor less expressive in light of its material origin. Its expressive qualities have nothing to do with the replication process. It is therefore hard to imagine even a bad argument that the manufacturing half of the replication process involves a speech issue. It is, on the other hand, quite easy to imagine the arguments, flawed as they are, that would lead someone to say the *first* half of the process—the downloading or writing of a CAD file—constitutes a form of speech.

One might argue, then, that the regulatory state should strive to police the second step as opposed to the first step—the manufacturing as opposed to the downloading—in order to avoid stepping on activity that carries even the aura of expressiveness. That sort of strategy is likely to fail. The regulatory state in a replicator economy will of necessity be deep in the business of regulating code, making the speech question unavoidable.

A. The Futility of Traditional Policing Against a Diffuse Point of Manufacture

Suppose that a design for a cigarette lighter poses a safety hazard to children. Today, the Consumer Product Safety Commission can order a recall and establish standards preventing lighters with the design defect from being manufactured and sold in the future.[203] In a pre-replicator world, it is hard to imagine, going forward, that the defective lighters will continue to be manufactured on a large scale in the United States. The new standard will most likely be observed.

The efficacy of such a regulation owes almost everything to the fact that pre-replicator industrial manufacturing entails large fixed costs that can only be covered by a large-scale operation.[204] The market for any given commodity will only carry as many firms as can operate at this minimum efficient scale.[205] These firms comprise an oligopoly in which there are few enough domestic points of

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[203]   *See* 15 U.S.C. § 2056 (2012) (establishing CPSC authority to promulgate standards); Safety Standard for Cigarette Lighters, 16 C.F.R. § 1210 (2012) (establishing child safety certification standards for cigarette lighters).

[204]   *See* discussion *supra* Introduction.

[205]   *See id.*

manufacture that the matter will be relatively easy for regulators to monitor. Even assuming that defective merchandise does not bear any clear mark identifying its manufacturer, it should be possible to trace the chain of distribution and manufacture to the source.

At the same time, the investment sunk into manufacturing and selling a run of lighters will tend to run high enough to incent manufacturers to stay informed of the relevant code. Given the scale of the operation and the scope of the accompanying risk, a rational and informed manufacturer would usually rather comply than risk a recall.

Things play out very differently if people are producing defective lighters on a small scale in millions of home replicators at zero or near-zero cost. Monitoring millions of home replicators is neither desirable nor feasible.

Nor is the designer of the lighter's CAD precursor (let alone the actual end-user replicating the thing at home) as likely to track the legal standards as a conventional manufacturer would. Such a designer's operation will be on a smaller scale, reducing the designer's incentive and ability to self-inform. This will be especially true in the case of a casual "prosumer"[206] designer who either does not seek a profit or who, perhaps, is paid untrackably.[207]

Consider the transformation of the journalism industry following the spread of Internet access. The traditional subscription-based mode of compensation presumes a set of technological limitations and fixed costs that impose limits on access and barriers to entry. Those traditional technological limitations thin the market to a small number of geographically proximate and well-capitalized newspaper publishers.[208] In such a market, even local papers have both the resources and the incentive to invest in investigative reporting. Once the technological limits are eliminated—that is, once

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[206]   JEREMY RIFKIN, THE ZERO MARGINAL COST SOCIETY: THE INTERNET OF THINGS, THE COLLABORATIVE COMMONS, AND THE ECLIPSE OF CAPITALISM 135 (2014).

[207]   Neal Stephenson's *Cryptonomicon* is an influential fictional portrayal of an effort to create an untrackable virtual currency. *See* NEAL STEPHENSON, CRYPTONOMICON (2012). Dark Wallet, now in development, is a real-life attempt to make the virtual currency Bitcoin untrackable. Andy Greenberg, *"Dark Wallet" Is About to Make Bitcoin Money Laundering Easier Than Ever*, WIRED (Apr. 29, 2014), http://www.wired.com/2014/04/dark-wallet/ (last visited Sept. 6, 2014).

[208]   *See* Rifkin, *supra* note 7.

"news" is available for free and once Internet publishers are able to publish at radically decreased cost—the market becomes less oligopolistic and more "efficient."[209] The old subscription pricing model mostly drops out and is replaced with a new trickle of online advertising revenues which, as any college microeconomics textbook would predict, approach marginal cost and eliminate the profit margin in the process.[210] Newspapers must now cut costs to restore the profit margin. A news market emerges in which light journalism is free and plentiful but investigative journalism is scarce and on a pay-to-read basis.[211]

Barring some dramatic market intervention, it is easy to see the same dynamic playing out in the manufacturing sector. The introduction of low- or zero-cost manufacturing would tend to produce a highly populated market favoring small and light firms that underinvest in research, development, and quality control: a cheaper market for consumers, but a flimsier one. Already, an experimental Zippo-type lighter is available on Thingiverse, where the designer's description includes the following notice:

> Did I mention this print is probably extremely dangerous since plastic for the most part is flamma-

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[209]   *See id.*

[210]   John Bellamy Foster, Robert W. McChesney & R. Jamil Jonna, *Monopoly and Competition in Twenty-First Century Capitalism*, MONTHLY REVIEW (Apr. 1, 2011), http://monthlyreview.org/2011/04/01/monopoly-and-competition-in-twenty-first-century-capitalism/#fn48 (last visited Sept. 6, 2014) ("As billionaire Warren Buffett, the voice of monopoly-finance capital, declared in February 2011: 'The single most important decision in evaluating a business is pricing power. If you've got the power to raise prices without losing business to a competitor, you've got a very good business. And if you have to have a prayer session before raising the price by 10 percent, then you've got a terrible business.' For Buffett, it is all about monopoly power, not management. 'If you own the only newspaper in town, up until the last five years or so, you had pricing power and you didn't have to go to the office and worry about management issues.'") (quoting Andrew Frye & Dakin Campbell, *Buffet Says Pricing Power More Important Than Good Management*, BLOOMBERG.COM (Feb. 18, 2011), http://www.bloomberg.com/news/print/2011-02-18/buffet-says-pricing-power-more-important-than-good-management.html).

[211]   Investigative journalism still takes place at a number of large-scale media organizations, but the share of expenditures put toward investigative journalism is lower: a "synergy" of mergers. *See* C. Edwin Baker, *Media Concentration: Giving Up on Democracy*, 54 FLA. L. REV. 839, 906 (2002) ("A likely 'synergy' of media mergers is to reduce resources committed to investigative journalism. Each outlet of the merged firm can often sell the same investigative journalism, the same exposes, thereby reducing the total amount the merged firm needs to spend on information gathering.").

ble? . . . I'm fairly certain this is a major fire hazard. Fill something flammable with flammable liquid and light it on fire? Probably not a good idea, but make it and see! It is not my fault if you burn down a small town due to inability to use common sense in the construction of this lighter.[212]

In short, the replicator's diffusing of the point of manufacture and scaling down of the cost of production will weaken much of the traditional manufacturing-based regulatory model in ways already glimpsed in the copyright wars.[213] At the same time, a diffuse point of manufacture will exacerbate many of the same policy problems that these regulations are designed to address. A sense of crisis will likely manifest itself in numerous areas at roughly the same time: consumer safety, environmental controls, arms controls, export and import controls, and so on.

B. *The Futility of Device-Based Digital Rights Management*

Early attempts at policing are likely to follow the same patterns as those made by the Motion Picture Association of America (MPAA) and Recording Industry Association of America (RIAA) in the early days of file sharing at the turn of the 21st century.[214] In particular, we are likely to see attempts to impose software or hardware restrictions on the capability of replicator users to print certain types of designs. In the copyright wars, these sorts of restrictions have been known as "digital rights management" (DRM).[215] DRM might operate to ensure that the consumer's me-

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[212] Caboose, *Open Lighter*, THINGIVERSE, http://www.thingiverse.com/thing:190597 (last visited Sept. 5, 2014).
[213] *See* Dan L. Burk, *Legal and Technical Standards in Digital Rights Management Technology*, 74 FORDHAM L. REV. 537, 538–39 (2005).
[214] *See generally* Andrew V. Moshirnia, *Giant Pink Scorpions: Fighting Piracy with Novel Digital Rights Management Technology*, 23 DEPAUL J. ART, TECH. & INTELL. PROP. L. 1 (2012).
[215] *See* Burk, *supra* note 213, at 538–39 ("While the proliferation of digital technology raises the cost of policing and enforcing legal exclusion, the same technology may also offer the producers of intangible goods an alternative method of exclusion. Because digital technology is capable of virtually modeling structural reality, it can be programmed to mimic the characteristics of tangible property. Producers of intellectual property may therefore resort to a form of self-help by re-embedding intangible goods in digital rights management systems, or 'DRM,' that simulate the natural appropriability resistance of physical goods. Such technological controls prohibit or constrain the copying and

dia were usable only for a fixed period of time,[216] or they might operate as "copy protection" in an attempt to prevent users from sharing their media with their friends or on the Internet.[217] DRM

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distribution that digital formats invite. By essentially transforming public goods back into private goods, owners of intellectual property may introduce into the design of digital media the more congenial constraints of more traditional media. Indeed, the constraints imposed by DRM may, in some cases, be designed to exceed those of traditional media.").

[216]   These include Cartrivision, a failed videocassette rent-by-mail format from the early 1970s that only the factory could rewind for a second viewing, *see* Charlie Sorrel, *1972 VCR Offered 'Analog Rights Management,'* WIRED (July 1, 2008, 3:25 AM), http://www.wired.com/2008/07/1972-vcr-offere/, DivX, a failed rival to DVDs in the late nineties that would phone in to and ask permission from a central server before playing a video, thus ensuring that the purchaser could only watch the purchased video for a fixed period, *see* Timothy K. Armstrong, *Digital Rights Management and the Process of Fair Use*, 20 HARV. J.L. & TECH. 49, 76 (2006), and EZ-D, a failed Disney rental disc that would physically self-destruct—no kidding!—48 hours after the user opened its airtight packaging, Eric A. Taub, *DVD's Meant for Buying but Not for Keeping*, N.Y. TIMES (July 21, 2003), http://www.nytimes.com/2003/07/21/technology/21FLEX.html. Each of these was an attempt to avoid the copy-prone model of traditional video stores such as Blockbuster, which attempted its own DRM-enabled fixed-period download service before folding completely in 2013. *See* Greg Sandoval, *Blockbuster Acquires Movielink*, CNET NEWS (Aug. 8, 2007, 6:50 PM), http://news.cnet.com/Blockbuster-acquires-Movielink/2100-1026_3-6201609.html; Todd Leopold, *Your Late Fees Are Waived; Blockbuster Closes*, CNN (Nov. 6, 2013, 9:47 PM), http://www.cnn.com/2013/11/06/tech/gaming-gadgets/blockbuster-video-stores-impact/.

[217]   These include the Audio Home Recording Act-mandated Serial Copy Management System, an encoding technique to degrade the fidelity of homemade Digital Audio Tape recordings, *see* 17 U.S.C. § 1002(a)(1)–(2) (2012) ("No person shall import, manufacture, or distribute any digital audio recording device . . . that does not conform to the Serial Copy Management System [or] a system that has the same functional characteristics."), various technologies that prevented late-90s audio CDs from being ripped until teenagers figured out you could get around it if you made a ring around the edge of the disk with a Sharpie, *see* John Leyden, *Marker Pens, Sticky Tape Crack Music CD Protection*, THE REGISTER (May 14, 2002), http://www.theregister.co.uk/2002/05/14/marker_pens_sticky_tape_crack/, iTunes' "FairPlay" restriction (later removed in 2009) that its proprietary-format .aac music files could only be copied onto five devices and no more, *see* *Apple iPod iTunes Antitrust Litig.*, C05-00037 JW HRL, 2011 WL 976942, at *1 (N.D. Cal. Mar. 21, 2011), the Wal-Mart music store's DivX-like requirement, *see supra* note 213, that the listener seek reauthorization from a Wal-Mart server every time a song is ported to a new operating system or device, a restriction that rendered many such files unplayable forever when Wal-Mart ceased supporting them, *see* Bruce Houghton, *Walmart Shutting Down DRM Download Servers*, HYPEBOT.COM (June 1, 2009), http://www.hypebot.com/hypebot/2009/06/walmart-shutting-down-drm-download-servers.html (last visited Aug. 5, 2014), and the video game *Assassin's Creed 2*, which would constantly ping an official server for permission to keep running and would shut down in the middle of a game without giving the player a chance to save if ever the Internet

techniques today are often used to force users to download security updates or to prevent owners from installing disapproved software on their smart phones or other devices.[218]

A state DRM strategy[219] for regulating replication could take a few forms. A fully centralized, highly aggressive approach would mean that regulating authorities would flag conforming files as "approved," and then replicators would be authorized only to print approved files. This approach would more or less conform to the one taken by Apple with its devices: new software is available through the officially sanctioned "App Store," and the device's owner lacks administrative privileges to install software through any other means.[220] A slightly less aggressive approach would resemble that taken by antivirus and filtering software: a central service daily distributes lists of "blocked" sources. Presumably, replicator users under this scheme would also lack administrative privileges and be forced to download the daily update in order to keep using the device. A still less-aggressive approach would involve firmware that scanned for certain *types* of shapes, such as guns, and refused to print them. One firm's 3D printers already follow this approach.[221]

Such tactics have a mixed record. The copyright wars have shown that DRM measures are almost always cracked by sophisticated users soon after they hit the market, and that unsophisticated

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connection went down for a couple of minutes or if, as eventually occurred, the server crashed, *see* Christina Mulligan, *A Numerus Clausus Principle for Intellectual Property*, 80 TENN. L. REV. 235, 261–62 (2013).

[218] *See* Michael K. Cheng, *IPhone Jailbreaking Under the DMCA: Towards A Functionalist Approach in Anti-Circumvention*, 25 BERKELEY TECH. L.J. 215, 215–16, 226 (2010).

[219] Even though the term "digital rights management" conventionally refers to the management of a property relationship between two private parties, I see no reason why the term should not be used to describe similar tactics in the context of a police relationship between private actors and the state.

[220] *See* Cheng, *supra* note 218.

[221] *See* Adi Robertson, *Plastic Piracy: DRM Won't Cripple 3D Printing*, THE VERGE (Sept. 17, 2013, 4:30 PM), http://www.theverge.com/2013/9/17/4741264/plastic-piracy-drm-wont-cripple-3D-printing ("Danish company Create it Real thinks it's found a solution. Earlier this year, it announced a kind of firewall for firearms, which would check each file in a 3D printer's queue against a database of printable components. If an exact match was found, it wouldn't print.").

users learn almost as quickly to Google, download, and apply the crack that the sophisticated users have developed.[222]

DRM also creates security vulnerabilities by reserving access for an official external administrator. Attackers can exploit this back channel if they find the keys to administrator access. In one particularly awful instance, Sony BMG in the early 2000s packaged millions of its CDs with "rootkit" software that established a hidden and remotely manageable file folder on users' computers.[223] BMG used the rootkit to monitor customers' listening habits.[224]

Users who run up against DRM limitations tend to take offense at the idea that they have been "locked out" of their own stuff.[225] The Electronic Frontier Foundation, a perennial and outspoken opponent of DRM, has adopted the slogan, "you bought it, you

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[222]   *See* James Grimmelmann, *Regulation by Software*, 114 YALE L.J. 1719, 1755–56 (2005) ("The list of famous failures of DRM systems is long. The system used to control the video content on DVDs was broken by a Norwegian teenager with a program simple enough to have been translated into song form. The DRM system used to tie Adobe eBooks to a particular computer fell almost as easily. Many DRM systems used to keep streaming Internet audio and video files from being recorded have been cracked, as was every DRM technology employed in a famous challenge issued by the Secure Digital Music Initiative. It is not clear that any DRM system has withstood a serious attempt to crack it. In practice, these exploits have a common structure. Someone analyzes the DRM software. She then writes another program that takes advantage of a bug or design decision of the DRM system to defeat it, yielding a use of the content that the programmer of the system wished to prevent. Because not everyone is expert in reverse engineering, these programs can lead to mass defeat of DRM systems only if distributed to others. The original cracker, therefore, writes a program that can be used by others to defeat the DRM software.").

[223]   *See* Deirdre K. Mulligan & Aaron K. Perzanowski, *The Magnificence of the Disaster: Reconstructing the Sony BMG Rootkit Incident*, 22 BERKELEY TECH. L.J. 1157, 1158–64 (2007).

[224]   *See id.*

[225]   *See* Philip A. Wells, *Shrinking the Internet*, 5 N.Y.U. J.L. & LIBERTY 531, 565–67 (2010) (negatively comparing aggressive copyright enforcement online to New York City's "broken windows" policing policies of the 1990s, and arguing that both have bred "contempt" for the policing authorities); *see also* Joseph P. Fishman, *Copyright Infringement and the Separated Powers of Moral Entrepreneurship*, 51 AM. CRIM. L. REV. 359, 362–65 (2014) ("It has by now become a relatively uncontroversial proposition that private lawsuits against individual file-sharers have been a self-defeating exercise for plaintiffs . . . Imposing sanctions that are perceived to be unjust may mobilize opposition and foment backlash, further strengthening the norm that tolerated noncompliance in the first place. A prohibition that deviates far from a normative consensus risks alienating not only the subjects of that prohibition, but also those who have discretion over how to enforce it.").

own it."[226] *Make* magazine's "Maker's Bill of Rights" is more to the point: "If you can't open it, you don't own it."[227] This view of ownership, which would oppose DRM on property-rights grounds, is more polemical than doctrinal; as any first-year law student knows, "ownership" is a bundle of rights that is fully conceptually severable into whatever portfolio of access two contracting parties might bargain for.[228] But even standardized contracts of adhesion can change under pressure from popular expectations about the meaning of ownership. After years of criticism and poor results, many of the major media merchants have backed off of the most obnoxious DRM controls[229] and accepted some loss of control over the distribution of copyrighted materials as a fact of life.

C. *The Limited Potential of Voluntary Measures*

If traditional policing and DRM-based policing are ruled out as impracticable and direct policing of CAD files is ruled out as constitutionally suspect, then voluntary compliance is all that remains. To encourage voluntary compliance, the state might circulate advisory blacklists and "seals of approval" and invite users to follow its lead. A closely managed Thingiverse of safe and effective designs could easily become a path of least resistance for casual replicator users, and that counts for a lot: against everyone's expectations, the iTunes music market proved in the 2000s that people will often pay money for music if doing so is even slightly more convenient than downloading it for free. But voluntary measures have limits. They would not reach users who were determined to replicate noncompliant designs, and isolated instances of noncompliance in

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[226]   Corynne McSherry, *You Bought It, You Own It! Time to Reclaim the Right to Use/Tinker/Repair/Make/Sell/Lend Your Stuff*, ELECTRONIC FRONTIER FOUNDATION (Jan. 16, 2014, 10:28 AM), https://www.eff.org/deeplinks/2014/01/you-bought-it-you-own-it-time-reclaim-right-usetinkerrepairmakeselllend-your-stuff.

[227]   Mister Jalopy, *Maker's Bill of Rights*, MAKE, http://cdn.makezine.com/make/MAKERS_RIGHTS.pdf (last visited Sept. 6, 2014).

[228]   *See, e.g.*, Fresh Pond Shopping Ctr., Inc. v. Callahan, 464 U.S. 875, 878 (1983) ("In previous cases we have recognized that property ownership carries with it a bundle of rights . . . .").

[229]   *See* John Y. Kim, *The Great Kaleidescape: New Hope in the Digital Rights Debate*, 27 TEMP. J. SCI. TECH. & ENVTL. L. 339, 340, 343 (2008) (discussing the music industry's abandonment of DRM technologies).

areas such as product safety could still impose significant external harms on others.[230]

D. *Resorting to Code-Based Policing*

If DRM avenues produce the same mixed results that they have in the copyright wars, and assuming that voluntary measures are not always good enough, then the only viable approaches available to regulators will have to involve the regulation of code itself rather than of the manufacturing process. Imagine a law that imposed a fine for manufacturing a non-code-compliant lighter on your home replicator but not for downloading the lighter's CAD.[231] Set aside, in the first place, the likely objection that the end-user is probably the wrong target for such a law. It is hard to imagine how such a law could be enforced with any consistency unless your home replicator itself was either hobbled by DRM or subject to constant surveillance by an outside administrator. Without those technological controls, illicit lighters might still occasionally be discovered by chance at garage sales and so on, and prosecutors could seek enormous penalties to compensate for the low detection rate, thereby enhancing the deterrent effect; but if the point of regulating manufacturing rather than code is to avoid conflicts with personal liberties, then we have at this desperate point completely defeated the purpose of the exercise.

It should be clear at this point that there is no realistic way to regulate the production of goods on home replicators without at some point penalizing or restraining the distribution of CAD files themselves on the Internet.

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[230]   *See* Rory K. Little, *Guns Don't Kill People, 3D Printing Does? Why the Technology is a Distraction From Effective Gun Controls*, 65 HASTINGS L.J. 1505, 1512–13 (2014) ("Of course, none of these [proposed ideas for gun relations] will prevent the possibility of 'secret gun factories.' Imagine an organized criminal gang inclined toward violence, setting up a factory of 3D printers . . . and producing 'homemade' guns without regard to any legal requirements or restrictions.").

[231]   Or, imagine Philadelphia's ordinance to outlaw the 3D printing of guns, *supra* note 24.

III.   WAYS FORWARD

As I have explained above, the regulation of replicative manufacturing will have to involve the regulation of CAD files.[232] Given the high material stakes and the minimal expressive stakes, the First Amendment should not place the general constitutionality of these regulations in doubt. The courts' primary agenda in the replicator cases will therefore be to ensure that the presence of CAD in a fact pattern does not in itself trigger First Amendment protection. But there are good and bad paths to that endpoint.

The bad paths mostly make the common mistake of measuring the First Amendment's scope ontologically. Under these approaches, the question would become whether computer code, as a thing in itself, is First Amendment subject matter.[233] This is the wrong question to ask. CAD files can be used in the service of speech but they do not comprise speech in themselves.[234]

It will be said in objection, of course, that CAD files fall into some category such as "communication" or "data" or "information," and that "information," for example, "is speech." But I find it doubtful that all *actual spoken speech* "is speech" in the constitutional sense, much less "information," a term so capacious that it could describe almost any phenomenon in the universe. The First Amendment is a social formula, not a language game, and when we resort to a constitutional boundary drawn relative to terms such as "communication" or "language," "we have got on to slippery ice."[235] A stare of disbelief is, in my view, the only effective reply to a person who truly believes their laptop is engaged in free speech as it scans for a device driver.

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[232]   *See supra* Part II.

[233]   *See supra* Part II.B.5.

[234]   *See supra* Part II.B.1.

[235]   LUDWIG WITTGENSTEIN, PHILOSOPHICAL INVESTIGATIONS § 107 (G.E.M. Anscombe trans., 3d ed. 1953) ("The more narrowly we examine actual language, the sharper becomes the conflict between it and our requirement. (For the crystalline purity of logic was, of course, not a result of investigation: it was a requirement.) The conflict becomes intolerable; the requirement is now in danger of becoming empty.—We have got on to slippery ice where there is no friction and so in a certain sense the conditions are ideal, but also, just because of that, we are unable to walk. We want to walk: so we need friction. Back to the rough ground!").

Granting that CAD is not *in itself* speech, then, there will still be cases in which the suppression of CAD—or sound trucks, or money, or sleeping in the park—will burden speech. But there will be other cases in which the suppression of CAD raises no speech issue at all.[236] A truly categorical approach to the CAD question, then, would either *Lochner*ize an entire growing sector of the economy because of code's basicresemblance to text, or otherwise deprivilege a scattered class of speakers who might use CAD to illustrate their point. I do not expect the Supreme Court to make either of these hamhanded mistakes.

Yet I am not entirely optimistic that courts will consistently take the good path, which is to treat the presence of CAD in a fact pattern as a red herring that in itself neither adds nor subtracts expressive value. As Professor Wagner put it at the turn of the century in an effective critique of the categorical approach to software and speech, "the best law of software is no law of software."[237] The concern is what kind of claims might arise in that vacuum, where various interest groups can be expected to press First Amendment opportunities from time to time in the absence of any clear discouragement from the Court. And it is hard to imagine what clear discouragement would look like, short of the blunt, stupid "CAD is not speech" approach that courts managed to avoid in the last round of First Amendment litigation surrounding software.[238] The Supreme Court, after all, has never developed any broader theory of coverage, and probably never can.[239]

Should the court manage a truly neutral approach to the CAD question, we are sure to see at least some case law that legitimately extends First Amendment coverage, and at times protection, to deserving parties who are engaged in some genuine form of expression involving CAD. (To the extent that software generally presents the same issues as CAD specifically, the cryptography

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[236]   *See supra* Part II.B.4.
[237]   R. Polk Wagner, *The Medium is the Mistake: The Law of Software for the First Amendment*, 51 STAN. L. REV. 387, 408 (1999).
[238]   *See supra* Part II.B.5.
[239]   *See supra* Part II.B.5.

cases of the late nineties already serve this purpose.)[240] Absent a strong general definition of expression, these isolated cases will accumulate into a bank of precedent for parties who would press broad, aggressive First Amendment theories—"the Supreme Court has previously held in *A v. B* that CAD files are 'speech' for First Amendment purposes"—in the manufacturing context. Such claims are likely to persist even if the courts take care to avoid encouraging them.

For example, the Second Circuit largely managed to avoid a categorical analysis when it confronted the software question at the turn of the century. In *Universal City Studios, Inc. v. Corley*, it extended First Amendment coverage (but not protection) to the source code for DeCSS, a decryption program designed to circumvent DRM software affixed to DVDs.[241] The defendant owned *2600: The Hacker Quarterly*, and had posted the source code to the magazine's website.[242] Eight movie studios had sued under DMCA anti-circumvention provisions.[243]

The court took a measured approach to the coverage issue, acknowledging three ways in which software might communicate: "to the user of the program (not necessarily protected) . . . to the computer (never protected),"[244] and finally, "a third manner in which a programmer might communicate through code: to another programmer."[245] (This third manner was presumably "protected.")[246]

Then, in dicta, the court noted mildly that "[e]ven dry information, devoid of advocacy, political relevance, or artistic expression, *has been* accorded First Amendment protection."[247] Years later, in separate litigation, counsel for IMS Health, a data-mining firm looking to extend First Amendment protection to its singularly

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[240]   *See* Junger v. Daley, 209 F.3d 481, 485 (6th Cir. 2000) ("Because computer source code is an expressive means for the exchange of information and ideas about computer programming, we hold that it is protected by the First Amendment.").

[241]   273 F.3d 429, 445–46 (2d Cir. 2001).

[242]   *Id.* at 439.

[243]   *Id.* at 429, 440.

[244]   *Id.* at 449 (citation omitted).

[245]   *See id.*

[246]   *Id.*

[247]   *Id.* at 446 (emphasis added).

"dry" informational product,[248] seized on this language, which the Second Circuit expanded into a circle of protection for "dry" information in general: "The First Amendment protects '[e]ven dry information, devoid of advocacy, political relevance, or artistic expression.' *Universal City Studios, Inc. v. Corley*, 273 F.3d 429, 446 (2d Cir. 2001). . . . *Universal City Studios*, 273 F.3d at 446–49 (computer program is speech)."[249]

The court went on to strike down on First Amendment grounds a Vermont law against the sale of pharmacy prescriber data or its disclosure for marketing purposes.[250] The Supreme Court, as discussed *supra*, later affirmed this opinion, and in doing so extended exotic *Lochner*-esque[251] immunities to a huge range of expressionless data commodities.

I should not overstate my point here, as *IMS Health* would surely have gone the same way with or without *Corley*. Nevertheless, the point stands. Substantive language from *Corley*, an opinion that goes out of its way to avoid a categorical approach to software,

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[248]   *See* Sorrell v. IMS Health Inc., 131 S. Ct. 2653 (2011).

[249]   IMS Health Inc. v. Sorrell, 630 F.3d 263, 271–72 (2d Cir. 2010) (demonstrating the circular usage of the *Corley* cases' language), *aff'd*, 131 S. Ct. 2653 (2011); *cf. id.* at 287–88 (Livingston, J., dissenting) ("To be clear, the dissemination of dry information *can* qualify for First Amendment protection. . . . But here, data mining appellants do not contend on appeal that section 17 precludes them from distributing data to foster scientific or medical research. To the contrary, to the extent Vermont's law applies to them at all, it merely prevents them from licensing their data for a single use—the marketing of prescription drugs. Nor do data mining appellants contend the statute prohibits them from fostering public opinion or debate—to the contrary, as noted above, data mining appellants actually *prohibit* their customers from disclosing the data they license to *anyone* else, much less the general public. As such, I have some difficulty comparing the data they sell to 'discourse' or the 'exchange of ideas.'").

[250]   IMS Health Inc. v. Sorrell, 630 F.3d 263, 280–82 (2010), *aff'd*, Sorrell v. IMS Health, Inc., 131 S. Ct. 2653 (2011).

[251]   This fighting word is Justice Breyer's. *See* Sorrell v. IMS Health, Inc., 131 S. Ct. 2653, 2679–85 (2011) (Breyer, J., dissenting) ("Moreover, given the sheer quantity of regulatory initiatives that touch upon commercial messages, the Court's vision of its reviewing task threatens to return us to a happily bygone era when judges scrutinized legislation for its interference with economic liberty. History shows that the power was much abused and resulted in the constitutionalization of economic theories preferred by individual jurists . . . At best the Court opens a Pandora's Box of First Amendment challenges to many ordinary regulatory practices that may only incidentally affect a commercial message. At worst, it reawakens *Lochner*'s pre-New Deal threat of substituting judicial for democratic decision-making where ordinary economic regulation is at issue.") (internal citations omitted).

managed to become the centerpiece of the coverage discussion at both the district and the circuit levels in *IMS Health*, and finally migrated into a Supreme Court precedent that envisions an almost singularly categorical approach to the First Amendment status not just of software, but of "dry information" generally. *Corley*'s cautious theoretical concession to a publisher engaged in actual expression became by any measure a cashable resource for a nonexpressive business interest advancing something much broader.

These stories are bound to repeat themselves many more times as our technology continues on the slope toward zero-marginal-cost manufacturing and as the market for things becomes a market for information. The growing "informational" aspect of commerce will present seemingly boundless opportunities for First Amendment challengers. But it must be remembered that the whole universe, at a high enough level of generalization, is "information." Berkeley grasped this point centuries ago when he postulated that every object in the universe was an idea in the mind of God.[252] Carroll's Red Queen[253] and *The Matrix*'s central mainframe[254] are in possession of similar "informational" goods. These are powerful and beautiful insights. But they are worse than worthless to the project of a coherent legal system.

Pragmatism will ultimately exert a brake on First Amendment protections in the replicator economy. I have taken it as a given that the courts will allow most of the regulatory state to live on (with, perhaps, the occasional indulgence to certain commercial interests), even if that means regulating the distribution of certain CAD files on the Internet. But it matters how the courts get there. As I have argued throughout this Article, the best way forward is to ignore coverage arguments addressed categorically to CAD. For CAD is not speech. CAD is not not speech. CAD is not the question.

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[252] GEORGE BERKELEY, THREE DIALOGUES BETWEEN HYLAS AND PHILONOUS 43 (Jonathan Bennett ed., Early Modern Texts 2007) (1713), *available at* http://www.earlymoderntexts.com/pdfs/berkeley1713.pdf.

[253] The "Red Queen" is a character of Lewis Carroll's. *See* LEWIS CARROLL, THROUGH THE LOOKING-GLASS, AND WHAT ALICE FOUND THERE (Univ. Cal. Press 1983) (1871).

[254] THE MATRIX (Warner Bros. Pictures 1999).