

A THEORY OF JOINT AUTHORSHIP FOR FREE AND OPEN SOURCE SOFTWARE PROJECTS

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It is commonly believed that every contributor to a free and open source software project owns copyright in their incremental contribution to the project, and owns it solely. It is also commonly believed that one must avoid a legal conclusion that the project code is jointly authored—and therefore jointly owned—even though the legal concept of joint authorship is strongly consistent with the social construct of free software. This view is based on a belief that the application of the existing copyright law of joint authorship will undermine the intended operation of the free software license and thus fail to support the goals of the free software movement.

This Article takes the position that, under U.S. law, joint authorship is a legal framework for copyright ownership in a free and open source software project that presents no greater risk than those risks inherent in the concept of sequential ownership and may even be superior, providing some benefits that are not available under the current commonly accepted theory of ownership.

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INTRODUCTION

It seems to be a commonly held belief that every contributor to a free and open source software¹ project (or their employer) owns the copyright in their incremental contribution to a project, and owns it solely. Upon examination, however, this belief leads to some challenging questions under U.S. copyright law. For example, what is a “work,” the fundamental increment of copyright—can it be only a few changes interspersed throughout a file? If there is no express license grant from the contributor for the inbound code, how can a user nevertheless be assured that every contributor has granted a license in their solely owned copyright? How much code must one person

1. The author will use “free software,” “open source software,” and “free and open source software” interchangeably.

have contributed to have standing to bring a claim for license non-compliance?

It also seems to be commonly believed that one must avoid a theory that the project code is jointly authored and therefore jointly owned. While the legal concept of joint authorship is strongly consistent with the social construct of free software, nevertheless there is a belief that the application of the existing copyright law of joint authorship will undermine the intended operation of the free software license and thus fail to support the goals of the free software movement.

U.S. law is evolving in a way that calls into question the settled assumptions about copyright ownership in free software. Projects may have to confront the possibility that a court might conclude that the code is not owned by the collective, but instead by a single individual, making free software vulnerable to the whims of one individual or corporation. The purpose of this Article is to examine joint authorship as an alternative.

Part I of this Article outlines some relevant concepts of U.S. copyright law. Part II then examines the currently held view that copyright in a free software project is owned by a series of sole owners and discusses the weaknesses of that theory in its application. Part III turns to an alternative theory of joint authorship and proposes that, contrary to common belief, joint authorship may provide a solid legal framework for copyright ownership in free and open source software. It further explains how joint ownership eliminates some of the problems that arise with the current theory, or at least presents no greater challenges than those that exist with the theory of sequential works.

The author does not suggest that there is only one paradigm for ownership of copyright in free software projects. The question of ownership is fact-intensive, and minor changes in fact may drive an entirely different outcome in every case. But no theory should be dismissed without critically examining its weaknesses and strengths.

I. BASIC PRINCIPLES OF COPYRIGHT AUTHORSHIP IN THE UNITED STATES

There are only two types of authorship recognized in U.S. copyright law: sole authorship and joint authorship.² Copyright

2. 17 U.S.C. § 201(a) (2012) (“Initial Ownership.—Copyright in a work protected under this title vests initially in the author or authors of the work. The authors of a joint work are co-owners of copyright in the work.”); 17 U.S.C. § 101 (2012) (defining “joint work” as “a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole”). A “work made for hire” is a statutory shift in who will be designated as the author when the work is created by an employee in the scope of the person’s employment or, in certain circumstances, where the

subsists in a “work” of authorship.³ Five types of works are mentioned in the Copyright Act, three expressly defined and two terms used but not defined.

First is the fundamental increment of a copyright, a “work,” which the Copyright Act does not expressly define.⁴ This author will not try to do so in this Article—it is a vexing question, particularly in software.⁵ This Article will instead assume for purposes of discussion that a “work” is the smallest increment of authorship in which a copyright can be enforced,⁶ whatever that might be. In this paper, the term “initial work” will be used for the first work created by the first author.

work was created by an independent contractor. *See* 17 U.S.C. § 101 (2012) (defining “work made for hire”). In a work made for hire, the employer or hiring party is deemed the author rather than the natural person. 17 U.S.C. § 201(b) (2012) (“In the case of a work made for hire, the employer or other person for whom the work was prepared is considered the author for purposes of this title . . .”). That entity has the status of original author, whether sole or joint. *See infra* text accompanying notes 21–25 discussing the second category of authorship of a work made for hire, the one outside of the employer/employee relationship.

3. 17 U.S.C. § 102(a) (2012) (“Copyright protection subsists, in accordance with this title, in original works . . .”).

4. 17 U.S.C. § 101 (2012) (definitional section of the Copyright Act, failing to define “work”). Section 102 of the Copyright Act provides some parameters for a “work,” i.e., it must be “original,” it must include “authorship” (both concepts well defined in case law), and it must be fixed in any tangible medium of expression, but the section gives us no insight on the size or boundaries of this unit.

5. *See generally* Justin Hughes, *Size Matters (or Should) In Copyright Law*, 74 *FORDHAM L. REV.* 575 (2005) (discussing the concept of “work” in copyright law).

6. 17 U.S.C. § 106 (2012) (describing exclusive rights of an author with respect to “works,” e.g., “to reproduce the copyrighted work . . .”).

The next three categories of works—“derivative work,”⁷ “compilation,” and “collective work”—are expressly defined.⁸ A derivative work is:

[A] work based upon one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which a work may be recast, transformed, or adapted. A work consisting of editorial revisions, annotations, elaborations, or other modifications which, as a whole, represent an original work of authorship, is a “derivative work.”⁹

A derivative work incorporates a portion of an earlier copyrighted work in some way.¹⁰ Although the phrase “derivative work” means the combination of the pre-existing work and the

7. This Article discusses “derivative works” as defined by the Copyright Act. This definition may be different from the meaning of “derivative work” as the term is used in the GNU GENERAL PUBLIC LICENSE VERSION 2 (June 1992), <https://www.gnu.org/licenses/old-licenses/gpl-2.0.en.html> [<https://perma.cc/5NC7-GCBS>] [hereinafter GPLv2] or when used colloquially in describing a modified version of open source software. See, e.g., HEATHER MEEKER, OPEN (SOURCE) FOR BUSINESS: A PRACTICAL GUIDE TO OPEN SOURCE SOFTWARE LICENSING 101 (2015) (describing the use of “derivative work” in the GPLv2 to mean “infringing work”); VAN LINDBERG, INTELLECTUAL PROPERTY AND OPEN SOURCE: A PRACTICAL GUIDE TO PROTECTING CODE 22–29 (2008) (describing how the author of the GPLv2, the Free Software Foundation, does not use “derivative work” in a way that is consistent with the Copyright Act); LAWRENCE ROSEN, OPEN SOURCE LICENSING 114–15 (2004) [hereinafter ROSEN] (explaining that the term “derivative work” in the GPLv2 can be construed to also encompass a collective work); V.K. Unni, *Fifty Years of Open Source Movement: An Analysis Through the Prism of Copyright Law*, 40 S. ILL. U.L.J. 271, 280 (2016) (using “derivative” colloquially to mean a modification). For further discussion on the meaning of “derivative work” in the context of the GPLv2, see Eben Moglen & Mishi Choudhary, *Software Freedom Law Center Guide to GPL Compliance: 2nd Edition*, SOFTWARE FREEDOM LAW CTR. (Oct. 31, 2014), [_2d_ed.html](#); Theresa Gue, *Triggering Infection: Distribution and Derivative Works Under the GNU General Public License*, 2012 U. ILL. J.L. TECH. & POL’Y 95 (2012); Michael F. Morgan, *The Cathedral and the Bizarre: An Examination of the “Viral” Aspects of the GPL*, 27 J. MARSHALL J. COMPUTER & INFO. L. 349 (2010); Lothar Determan, *Dangerous Liaisons—Software Combinations as Derivative Works? Distribution, Installation, and Execution of Linked Programs Under Copyright Law, Commercial Licenses, and the GPL*, 21 BERKELEY TECH. L. J. 1421 (2006); Mikko Välimäki, *GNU General Public License and the Distribution of Derivative Works*, 2005 (1) J. INFO. L & TECH. (2005), http://www2.warwick.ac.uk/fac/soc/law/elj/jilt/2005_1/valimaki/ [<https://perma.cc/4Z63-ZZGP>].

8. The Copyright Act also defines “joint work.” 17 U.S.C. § 101 (2012). However, a “joint work” is not another type of work, but rather any of the other types of works—initial, derivative, collective or compilation—“prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole.” “This definition ... is improperly designated. It is in fact a definition of joint authorship.” MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 6.01 (Matthew Bender, Rev. Ed.) [hereinafter *Nimmer*]. This Article will refer to this description as the definition of “joint authorship.”

9. 17 U.S.C. § 101 (2012).

10. H. R. REP. NO. 94-1476, at 62 (1976) (“Thus, to constitute a violation of section 106(2) [the exclusive right of the author to prepare derivative works], the infringing work must incorporate a portion of the copyrighted work in some form; for example, a detailed commentary on a work or a programmatic musical composition inspired by a novel would not normally constitute infringements under this clause.”).

modifications,¹¹ the new author's rights do not extend to any of the pre-existing copyrighted work; the new author's copyright extends only to what is different from the pre-existing work and must itself have sufficient originality to be copyrightable.¹²

A "compilation" is a collection of pre-existing works or data, with the copyright accruing in the selection, coordination, and arrangement of the constituent elements separate and apart from any copyright in the elements themselves.¹³ A "collective work" is a subset of the compilation, where the underlying elements are themselves separately and independently copyrightable,¹⁴ such as periodicals, anthologies, symposia, and collections of the discrete writings of the same authors.¹⁵ To synthesize the concepts of derivative work and compilation, and its subset the collective work:

Between them the terms "compilations" and "derivative works" which are defined in section 101, comprehend every copyrightable work that employs preexisting material or data of any kind. There is necessarily some overlapping between the two, but they basically represent different concepts. A "compilation" results from a process of selecting, bringing together, organizing, and arranging previously existing material of all kinds, regardless of whether the individual items in the material have been or ever could have been subject to copyright. A "derivative work," on the other hand, requires a process of recasting, transforming, or adapting "one or more preexisting works"; the "preexisting work" must come within the general

11. See, e.g., *Stewart v. Abend*, 495 U.S. 207, 223 (1990) (referring to "the aspects of a derivative work added by the derivative author" as distinct from the portion of it that was the pre-existing work); *Weissmann v. Freeman*, 868 F.2d 1313, 1322 (2d Cir. 1989) (referring to an entire work as a "derivative work" and identifying the parts of it that were new additions and modifications).

12. 17 U.S.C. § 103(b) (2012) ("The copyright in a compilation or derivative work extends only to the material contributed by the author of such work, as distinguished from the preexisting material employed in the work, and does not imply any exclusive right in the preexisting material. The copyright in such work is independent of, and does not affect or enlarge the scope, duration, ownership, or subsistence of, any copyright protection in the preexisting material."); COMPENDIUM OF U.S. COPYRIGHT OFFICE PRACTICES § 1509.1(C) (2) (3rd ed. 2014) [hereinafter *Compendium*] ("A registration for a derivative computer program covers the new material or revised material that the author contributed to that work, but it does not cover any of the unclaimable material that may appear in the program.").

13. 17 U.S.C. § 101 (2012) ("A 'compilation' is a work formed by the collection and assembling of preexisting materials or of data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship. The term 'compilation' includes collective works."); *Feist Publ'ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 341 (1991) ("A compilation is not copyrightable *per se*, but is copyrightable only if its facts have been 'selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship.'").

14. 17 U.S.C. § 101 (2012) ("A 'collective work' is a work, such as a periodical issue, anthology, or encyclopedia, in which a number of contributions, constituting separate and independent works in themselves, are assembled into a collective whole."). To distinguish the two, an example of a compilation that is not a collective work is a collection of facts, like a phone book.

15. H. R. REP. NO. 94-1476, at 122 (1976).

subject matter of copyright set forth in section 102, regardless of whether it is or was ever copyrighted.¹⁶

The last type of work that the Copyright Act refers to, not defined in section 101, is a “revision.” The Copyright Act uses the word in the definition of “derivative work,” suggesting that some quantum of “editorial revisions” can change a pre-existing work substantially enough that it will create a new derivative work.¹⁷ Therefore, by negative implication, there can be a pre-existing work that has been modified with “editorial revisions” but that is without a separate copyright because the changes do not rise to the level of an “original work of authorship” that creates a derivative work.

Combining all of these concepts of types of authorship and types of works, below are some examples, increasing in complexity, of what one might find in a software distribution. The reader need not

16. H. R. REP. NO. 94-1476, at 57 (1976).

17. 17 U.S.C. § 101 (2012) (“A work consisting of *editorial revisions*, annotations, elaborations, or other modifications which, as a whole, represent an original work of authorship, is a ‘derivative work’,” emphasis added); cf. Shapiro, Bernstein & Co. v. Jerry Vogel Music Co., 73 F. Supp. 165, 167 (S.D.N.Y. 1947) (holding under the Copyright Act of 1909 that changing a musical work from common time to march time, adding a chorus, making minor changes to the accompaniment and changing the title did not create a new work; these would therefore presumably be revisions).

The Copyright Act also uses the word “revision” in Section 201(c), titled “Ownership of Copyright”:

Copyright in each separate contribution to a collective work is distinct from copyright in the collective work as a whole ... the owner of copyright in the collective work is presumed to have acquired only the privilege of reproducing and distributing the contribution as part of that particular collective work, any *revision* of that collective work, and any later collective work in the same series.

17 U.S.C. § 201(c) (2012) (emphasis added). In this context, whether a work is a “revision” depends on its visual loyalty to the original rendition. See *Faulkner v. Nat’l Geographic Soc’y*, 294 F. Supp. 2d 523, 540 (S.D.N.Y. 2003) (“In determining whether the freelancer’s work is part of a new collection as distinguished from a revision, the focus is on the manner in which it is presented to, and perceptible by, the user.”), *aff’d* *Faulkner v. Nat’l Geographic Enters.*, 409 F.3d 26 (2d Cir. 2005), relying on *N.Y. Times Co. v. Tasini*, 533 U.S. 483, 499 (2001). In *N.Y. Times Co.*, the Supreme Court had to decide whether electronic databases containing many years’ worth of electronic copies of the New York Times, Newsday, and other periodicals originally published in print form were “revisions” of the original newspapers, holding they were not. *N.Y. Times Co.*, 533 U.S. at 488. This meaning of “revision” is therefore not helpful outside the scope of § 201(c). See *1-800 Contacts, Inc. v. WhenU.com*, 309 F. Supp. 2d 467, 484 n.37 (S.D.N.Y. 2003) (“Although the *Tasini* Court turned to the perceptions of the computer user to determine whether articles had been reproduced and distributed “as part of” a “revision” of collective works for purposes of § 201(c), *Tasini* does not require this Court to ‘view Plaintiff’s website as would a PC user surfing the web in order to determine whether Defendant modified Plaintiff’s copyrighted works’ in preparing a derivative work in violation of 17 U.S.C. § 106(2).”).

understand all the permutations, the purpose is only to illustrate how complicated the question can get in only a few steps.

- An initial work that is authored by a sole or multiple authors;
- Revisions to an initial work made by a sole or multiple authors that change the initial work but that are not significant enough that a derivative work is created (and thus without any new copyright);
- A derivative work authored by a sole or multiple authors that is based on an initial work by a sole or multiple authors;
- A collective work or compilation authored by a sole or multiple authors that includes initial works and derivative works by sole or multiple authors;
- Revisions to the selection, coordination, and arrangement of a collective work made by a sole or multiple authors but that are not significant enough that a derivative work of the collective work is created (and thus without any new copyright);
- A derivative work authored by a sole or multiple authors that is based on a collective work authored by a sole or multiple authors, that is, the new authors have made changes to the selection, coordination and arrangement of the original collective work that are sufficiently original so that the new collective work has its own copyright.

These combinations are not at all far-fetched in the world of software copyright; all of them may exist at the same time in a software distribution.¹⁸

18. Omar Johnny, Marc Miller & Mark Webbink, *Copyright in Open Source Software—Understanding the Boundaries*, 2 INT’L FREE & OPEN SOURCE L. R. 13, 14–16 (2010) (describing software development scenarios); ROSEN, *supra* note 7, at 44 (describing how a software distribution may include many parts by many authors). For non-software examples, *see, e.g.*, *Greene v. Ablon*, 794 F.3d 133, 153 (1st Cir. 2015) (finding that the plaintiff was the author of the initial work and a joint author of the derivative work that was based on the initial work); *Brownstein v. Lindsay*, 742 F.3d 55, 59 (3d Cir. 2014) (discussing where one person was the author of a rules set, another was the author of the computer code, and the two were joint authors in the combination of the two parts). For a very confusing collection of various rights in a variety of media, *see Davis v. E.I. DuPont de Nemours & Co.*, 240 F. Supp. 612 (S.D.N.Y. 1965) (describing the ownership and various licenses for an underlying novel, two different stage adaptations, a screenplay, and a television production).

This paper assumes for the sake of argument that questions like who the author is and whether a given contribution is copyrightable can be answered. But those questions are themselves incredibly complicated. First, the person whose name is associated with the contribution in the version control system may not be its true author, either because the code originated with someone else or because the code was written in the course of the contributor’s employment and thus the employer is the copyright owner. Second, while revision control systems keep track of changes, they don’t necessarily show the information that might be relevant to determining copyrightability. Daniel German of the University of Victoria and the Linux Foundation are studying the contributions to the Linux kernel on a very granular level—fascinating work, but that ultimately may not help inform concepts like creativity and originality. *See Jake Edge, Token-Based Authorship Information From*

II. THE OWNERSHIP CONUNDRUM OF FREE AND OPEN SOURCE SOFTWARE

Free and open source software is unlike almost¹⁹ any other kind of copyrightable work because there can be a monumental number of authors all contributing to the same body of code.²⁰ The question becomes how to understand the authorship of a work when a number of different people have modified it over time.

A. *Work Made for Hire*

The drafters of the Copyright Act of 1976 were aware that some types of works, like films and encyclopedias, had many contributors and so provided that copyright authorship for these certain types of works could be unified in one entity.²¹ In this situation, individual contributors would not have any copyright interest in the collaboratively created work as long as they had signed a document agreeing their contribution would be as a work made for hire.²² This transfer of authorship is only available for nine types of works, specifically a contribution to a collective work, as a part of a motion picture or other audiovisual work, as a translation, as a supplementary work, as a compilation, as an instructional text, as a test, as answer material for a test, or as an atlas.²³

In theory, the work made for hire definition for collaborative works could apply to some free software projects. Some software distributions, like an operating system, might fall into the statutory category of “compilation,” specifically the subcategory of collective work, with the constituent elements “contributions to a collective work.” However, for the software collective work and all its components to be considered a work made for hire with a single

Git, LWN.NET (Aug. 31, 2016), <https://lwn.net/Articles/698425/> [<https://perma.cc/NJ7Q-XZY9>]; *Contributors to the Linux Kernel*, CREGIT-LINUX, <https://cregit.linuxsources.org/> (last visited June 18, 2017) [<https://perma.cc/43MK-35ZW>].

19. Movies also have a significant number of contributors. See *infra* notes 65–93 and accompanying text for how cases on ownership of the copyright in movies may apply to free software projects.

20. JONATHAN CORBET & GREG KROAH-HARTMAN, *LINUX KERNEL DEVELOPMENT: HOW FAST IT IS GOING, WHO IS DOING IT, WHAT THEY ARE DOING AND WHO IS SPONSORING THE WORK* 9 (Linux Foundation ed., 25th ed. 2016) [hereinafter CORBET & KROAH-HARTMAN] (stating that the Linux kernel had over 13,500 contributors from more than 1,300 companies).

21. Jessica D. Litman, *Copyright, Compromise and Legislative History*, 72 CORNELL L. REV. 857, 890–91 (1987) (noting that the types of commissioned works that could be works made for hire were those typically created by multiple authors).

22. 17 U.S.C. § 101(2) (2012). Definition (1) under “work made for hire” is a separate type, which is “a work prepared by an employee within the scope of his or her employment,” a situation outside of the discussion in this section. Note that significant problems can arise where the person using the contributions of independent authors neglects to get the signed writing. See, e.g., 16 Casa Duse, LLC v. Merkin, 791 F.3d 247 (2d Cir. 2015) (director claiming separate authorship in directorial work); *Garcia v. Google, Inc.*, 786 F.3d 733 (9th Cir. 2015) (actress claiming separate copyright ownership in performance).

23. 17 U.S.C. § 101 (2012).

author, the constituent pieces of code making up the collective work would have to be specially ordered or commissioned for use in the collective work and there would also have to be a writing signed by the contributors of the software agreeing it was a work made for hire.²⁴ In free software, however, rarely is there someone who solicits and orchestrates contributions to the larger collective work; instead the compiling author assembles pre-existing underlying works. Nor do the agreements that some software projects have contributors sign contemplate that the contribution will be part of a work made for hire.²⁵ It is therefore unlikely that the multiple contributors to free software projects have created a work made for hire.

B. *The Theory That Authorship Is a Sequence of Derivative Works*

Assume that there is a simple piece of software, a single file, created by a sole author. The sole author elects to make the software available under an open source license in a public code repository like GitHub.²⁶ Also assume that the original author plans to accept changes suggested by others but will not be asking for a formal contributor license agreement or an assignment of the contributor's copyright.²⁷ Another person copies the original source code as allowed by the license, makes changes throughout the file as allowed by the license, and submits a pull request²⁸ suggesting that the original author modify

24. *Id.*

25. *See, e.g.,* HARMONY INDIVIDUAL CONTRIBUTOR LICENSE AGREEMENT, <http://harmonyagreements.org/docs/ha-cla-i-v1.pdf> (last visited Apr. 1, 2017) (granting a license to the contribution and stating "You retain ownership of the Copyright in Your Contribution and have the same rights to use or license the Contribution which You would have had without entering into the Agreement") [<https://perma.cc/RF2B-FYNZ>]; APACHE INDIVIDUAL CONTRIBUTOR LICENSE AGREEMENT V2.0, <https://www.apache.org/licenses/icla.pdf> (last visited Apr. 1, 2017) (having the contributor grant a license to the project for their contribution) [<https://perma.cc/9Y58-6M28>]; ORACLE CONTRIBUTOR AGREEMENT, <http://www.oracle.com/technetwork/oca-405177.pdf> (last visited Apr. 1, 2017) (creating a joint ownership between Oracle and the contributor) [<https://perma.cc/5QJW-6P82>]; OWNCLOUD CONTRIBUTOR AGREEMENT, <https://owncloud.org/wp-content/uploads/2018/01/ownCloud-copyright-assignment-common-1.pdf> (last visited Apr. 1, 2017) (stating in the "Grant of License" that "You hereby transfer to own Cloud your entire right, title, and interest (including all your rights under copyright) in the changes and enhancements to the Contribution.") [<https://perma.cc/82NY-77N4>].

26. GitHub is a web-based version control repository and hosting service generally used for management of source code. *See* Klint Finley, *What Exactly is GitHub Anyway?* TECHCRUNCH (July 14, 2012), <http://techcrunch.com/2012/07/14/what-exactly-is-github-anyway/> [<https://perma.cc/Z5FH-RVCL>].

27. *See, e.g.,* *Why Your Project Doesn't Need a Contributor Licensing Agreement*, SOFTWARE FREEDOM CONSERVANCY (June 9, 2014), <https://sfconservancy.org/blog/2014/jun/09/do-not-need-cla/> (opining that open source software projects do not need to have contributors grant formal licenses to their contributions) [<https://perma.cc/N3F7-425Y>].

28. A "pull request" is a notification to a source code repository maintainer that there are changes that can be added to the main repository. *See* Mark Johnson, *What is a Pull Request?*, OSS WATCH (Nov. 8, 2013), <http://oss-watch.ac.uk/resources/pullrequest> [<https://perma.cc/T39A-JUMT>]; *About Pull Requests*, GITHUB HELP, <https://help.github.com/articles/about-pull-requests/> (last visited Feb. 18, 2018) [<https://perma.cc/59VN-U4HM>].

the initial work by making the same changes to it. The original author does.

The traditional view is that each person who contributed copyrightable content to the file is the sole copyright owner of their contribution.²⁹ Now recall the types of second generation works that copyright law recognizes—the revision, the derivative work, and the subset of a compilation, the collective work³⁰—and consider how this contribution affects the initial work. The file with the new changes is no longer the initial work because it has been modified. It may be a revision, although that would not create any new copyright.³¹ It is not a collective work because, under our hypothetical that this is a single file, the contributions are not “separate and independent works,”³² they have been blended together and are inseparable from the initial work. The only possibility left is that it is a “derivative work” of the initial work—meaning there are now two works, the initial work and the newer derivative work. Definitionally, the term “derivative work” is not just the new portion, but is the combination of it with the initial work.³³ However, the contributor’s copyright ownership interest is not for the derivative work as a whole; rather it “is independent of, and does not affect or enlarge the scope, duration, ownership, or subsistence of, any copyright protection in the pre-existing material.”³⁴

Now consider the next contribution by another author. The result will be the same, an initial work, a subsequent derivative work created by making the first change, and now a second derivative work created by making the second change. Now consider how it looks when there are 13,500 authors and 8 to 9 changes made per hour.³⁵

29. See, e.g., VAN LINDBERG, *INTELLECTUAL PROPERTY AND OPEN SOURCE* 155 (2008) (“In a typical open source project, each contributor maintains copyright to the code he contributes to the project”); Rowan Wilson, *Open Source Development – An Introduction to Ownership and Licensing Issues*, OSS WATCH (May 9, 2013), <http://oss-watch.ac.uk/resources/iprguide> (“It is conceivable for every contributor to own the copyright to their contribution”) [<https://perma.cc/76YS-TYHL>]; *Frequently Asked Questions*, OPEN SOURCE INITIATIVE, <https://opensource.org/faq> (last visited Mar. 7, 2017) (“In a Contributor License Agreement (CLA), the original contributor retains copyright ownership of their contributions, but grants the project a broad set of rights”) [<https://perma.cc/H3AC-MT6P>]; Ben Adida, *About OpenACS: Licensing*, OPENACS, <http://openacs.org/about/licensing/open-source-licensing> (last visited Mar. 6, 2017) (“In general, copyright is a serious obstacle to creating works in a collaborative fashion, because each author owns the copyright and thus controls the distribution policies on their individual pieces.”) [<https://perma.cc/D7ZP-YXAS>].

30. See *supra* notes 4–17 and accompanying text.

31. See *supra* note 17 and accompanying text.

32. See *supra* notes 14–15 and accompanying text.

33. See *supra* note 11 and accompanying text.

34. 17 U.S.C. § 103(a) (2012).

35. CORBET & KROAH-HARTMAN, *supra* note 20, at 9 (calculating changes per hour in the Linux kernel). Consider also the complexity that the revisions may be more branch-like than linear.

1. The Limitations and Risks of the Serial Derivative Work Theory

A theory that an open source software project is a sequence of derivative works presents a number of challenges. Most significantly, in projects where contributor license or assignment agreements are not required, many people are adding their solely owned content but they may not have stated expressly anywhere what license they are granting for their copyrightable contributions.³⁶ Other challenges are that license enforcement could be difficult, if not impossible,³⁷ because the fractured ownership may mean that no one has a good copyright infringement claim to use as leverage.³⁸ The concept that there can be so many derivative works of one file may be difficult for a court to swallow.³⁹ In the worst case, a court will reject the theory and decide that there is only one author for the work no matter how many people contributed.⁴⁰

a. The Licensing Gap

The fact that there are different copyright owners creates some risk for the users. While we can be fairly sure that the original author was granting a license to the software,⁴¹ the grant by a subsequent contributor may be uncertain. If the initial work was licensed under a copyleft license, the contribution will necessarily be under the same license,⁴² but there are no equivalent assurances for other types of free

36. See *infra* notes 41–54 and accompanying text.

37. Some may consider this a feature, not a bug.

38. See *infra* notes 55–62 and accompanying text. The few cases of enforcement of the copyright in a GPL-licensed work were not significantly litigated. *BusyBox: GPL Lawsuits*, WIKIPEDIA, https://en.wikipedia.org/wiki/BusyBox#GPL_lawsuits (last visited July 22, 2017) [<https://perma.cc/W9HD-UUKU>].

39. See *infra* notes 63–64 and accompanying text.

40. See *infra* notes 65–95 and accompanying text.

41. In order to “open source” software, the author adds license information to the source code. It may be a separate file within a hierarchical repository, annotated within the file itself, or both. See APACHE SOFTWARE FOUNDATION, <http://www.apache.org/dev/apply-license.html#new> (last visited Apr. 21, 2017) (“To apply the ALv2 to a new software distribution, include one copy of the license text by copying the file: <http://www.apache.org/licenses/LICENSE-2.0.txt> into a file called LICENSE in the top directory of your distribution”) [<https://perma.cc/22W8-6LQ3>]; APACHE LICENSE VERSION 2.0 (Jan. 2004), <https://www.apache.org/licenses/LICENSE-2.0.html> (providing a short form reference to the license to be used in file headers) (last visited Mar. 3, 2018) [<https://perma.cc/3VM3-KXLB>]; *How to Use GNU Licenses for Your Own Software*, FREE SOFTWARE FOUNDATION (Apr. 12, 2014), <https://www.gnu.org/licenses/gpl-howto.html> (describing adding a reference to the source code itself as well as in a file called “COPYING”) [<https://perma.cc/R4LL-R693>].

42. See GPLv2, *supra* note 7, at ¶ 2(b) (stating that modifications must be under the same license); MOZILLA PUBLIC LICENSE VERSION 2.0, § 3.1 (Jan. 2012), <https://www.mozilla.org/en-US/MPL/2.0/> [<https://perma.cc/SA6N-ZCLB>] [hereinafter MPLv2].

and open source software licenses. Some use this uncertainty to advocate that a project should have a contributor license agreement.⁴³

In the absence of a contributor license agreement, the commonly accepted understanding is called “inbound = outbound,” which is the concept that contributions back to the software corpus are licensed under the outbound project license.⁴⁴ It is not entirely clear how this is legally operative, but two approaches might apply: the contributor has

43. See, e.g., Ross Gardler & Rowan Wilson, *Contributor License Agreements*, OSS WATCH, <http://oss-watch.ac.uk/resources/cla> (last updated Aug. 2, 2012) (“A Contributor Licence Agreement (CLA) is strongly recommended when accepting third party contributions to an open development project, such as an open source software project. In order to redistribute contributions, it is necessary to ensure that the project has the necessary rights to do so.”) [<https://perma.cc/99TN-VSX8>]; Julien Ponge, *In Defense of Contributor License Agreements* (Aug. 27, 2013), <https://julien.ponge.org/blog/in-defense-of-contributor-license-agreements/> (stating that without a contributor license agreement there is a question about what license governs the contribution) [<https://perma.cc/UJ83-4C6Z>]; *Frequently Asked Questions*, UBUNTU, <https://www.ubuntu.com/legal/contributors/licence-agreement-faq> (last visited Apr. 17, 2017) (“Why do you ask contributors to send in the agreement? We need to make sure that we—and the users of our software—are legally entitled to distribute your contributed code, anywhere in the world”) [<https://perma.cc/YXV3-TFKV>]; *What is a CLA and Why Do I Care?*, CLAHUB, https://www.clahub.com/pages/why_cla (last visited Apr. 17, 2017) (stating that the CLA confirms the author’s right to make the contribution, confirms the author’s willingness to have it used, and ensures that the grant cannot be withdrawn) [<https://perma.cc/XC25-YLC3>]; *About the Django Contributor License Agreement*, DJANGO SOFTWARE FOUNDATION, <https://www.djangoproject.com/foundation/cla/faq/> (last visited Apr. 17, 2017) [<https://perma.cc/4UPV-A4QR>]. Another justification is that it allows the project to relicense. ROSEN, *supra* note 7, at 46 (noting that projects may ask for a contributor license so that they have the freedom to change license terms); *What Is Contributoragreements.org?*, CONTRIBUTOR AGREEMENTS, <http://contributoragreements.org/faq.html> (last visited Apr. 17, 2017) (“They also become relevant in case a project with a large community of different contributors wants to have more flexibility in terms of the respective outbound licensing model, such as license change, and more possibilities in terms of enforcement”) [<https://perma.cc/9ANJ-RX8N>]. The freedom to relicense may include the ability to use the code in proprietary distributions. See, e.g., *Open Source Completely Underestimates Contributor License Agreements*, JAVA, SQL AND JOOQ (Mar. 31, 2014), <https://blog.jooq.org/2014/03/31/open-source-completely-underestimates-contributor-license-agreements/> (“At Data Geekery, we want to stay in full control of both source code maintenance, but also copyright . . . This allows us to continue publishing our jOOQ code under the terms of the ASL 2.0 and our more restrictive commercial license.”) [<https://perma.cc/PMW2-TQGZ>].

44. Richard Fontana, *The Trouble with Harmony: Part 1*, OPENSOURCE.COM (July 7, 2011), <https://opensource.com/law/11/7/trouble-harmony-part-1> [<https://perma.cc/QN69-YF9K>]; *GitHub Terms of Service*, GITHUB, <https://help.github.com/articles/github-terms-of-service/> (last visited Mar. 9, 2017) (“Whenever you make a contribution to a repository containing notice of a license, you license your contribution under the same terms, and you agree that you have the right to license your contribution under those terms . . . Isn’t this just how it works already? Yep. This is widely accepted as the norm in the open-source community; it’s commonly referred to by the shorthand ‘inbound = outbound’. We’re just making it explicit.”) [<https://perma.cc/L8ER-8DHQ>].

granted an express license, i.e., the project license, through conduct,⁴⁵ or the contributor's conduct has implied a license.⁴⁶

The challenge of proving there is an express agreement is the uncertainty that comes from relying on conduct as the manifestation of assent,⁴⁷ particularly where the theory is that the conduct is the offer of a license rather than its acceptance. An offer is "the manifestation of willingness to enter into a bargain, so made as to justify another person in understanding that his assent to that bargain is invited and will conclude it."⁴⁸ A licensee relying on the grant therefore will have to prove that the act of making the contribution meant that the contributor was aware of the license and its terms, aware that the project would incorporate the change and make it available to all, and that the act manifested the contributor's willingness that an unknown user at some unknown point in the future would be able to accept the offer. It isn't a frivolous theory, but it leaves a great deal of room for denial on the part of the contributor.

The implied license theory, either with a grant of the same scope as the project license or a different one, is also not a comfortable fit with the existing implied license doctrine in U.S. copyright law.⁴⁹ This is a typical recitation of the legal standard, originating in a case captioned *Effects Assocs. v. Cohen*:⁵⁰

an implied nonexclusive license has been granted when (1) a person (the licensee) requests the creation of a work, (2) the

45. RESTATEMENT OF THE LAW 2D, CONTRACTS § 19(1) (1981) ("The manifestation of assent may be made wholly or partly by written or spoken words or by other acts or by failure to act."); *Russack-Baker v. Billings P. Learned Mission*, No. 566008, 2004 Conn. Super. LEXIS 330, at *14–15 (Super. Ct. Feb. 5, 2004) (stating that receipt of an employee manual might be an implied agreement that the procedures in the agreement would be followed or else an express contract: "Contracts may be express or implied. These terms, however, do not denote different kinds of contracts, but have reference to the evidence by which the agreement between the parties is shown. If the agreement is shown by the direct words of the parties, spoken or written, the contract is said to be an express one. But if such agreement can only be shown by the acts and conduct of the parties, interpreted in the light of the subject matter and of the surrounding circumstances, then the contract is an implied one . . . Whether this contract is styled express or implied involves no difference in legal effect, but lies merely in the mode of manifesting assent.").

46. *Latimer v. Roaring Toyz, Inc.*, 601 F.3d 1224, 1235 (11th Cir. 2010) (distinguishing an express license from an implied license); *Johnson v. Jones*, 149 F.3d 494, 500 (6th Cir. 1998); *Graham v. James*, 144 F.3d 229, 235 (2d Cir. 1998); *Luar Music Corp. v. Universal Music Grp., Inc.*, 861 F. Supp. 2d 30, 37 (D.P.R. 2012) ("a non-exclusive license may be granted (1) orally, (2) in writing, or (3) impliedly through conduct where the copyright owner manifests the intent to grant a nonexclusive license.").

47. RESTATEMENT OF THE LAW 2D, CONTRACTS § 19(2) (1981) ("The conduct of a party is not effective as a manifestation of his assent unless he intends to engage in the conduct and knows or has reason to know that the other party may infer from his conduct that he assents.")

48. *Id.* § 24.

49. An implied license can exist where there is also writing, if the use is not described in the writing. *See, e.g., I.A.E., Inc. v. Shaver*, 74 F.3d 768, 776 (7th Cir. 1996) (deciding scope of implied license when there was also a letter agreement).

50. 908 F.2d 555 (9th Cir. 1990), *cert. denied*, 498 U.S. 1103 (1991).

creator (the licensor) makes that particular work and delivers it to the licensee who requested it, and (3) the licensor intends that the licensee-requestor copy and distribute his work.⁵¹

In the case of open source software, the first element may be problematic. It is generally understood to mean whether the work was commissioned,⁵² an unlikely scenario in free software. And even if the contribution was not independently motivated but instead someone asked for it, it might be only the requestor who has an implied license to the contribution, not everyone who uses it.⁵³

While some courts rely solely on the *Effects Assocs.* test for determining whether there is an implied copyright license, others take a broader view of how one can imply a license. A license may be implied from conduct “from which [the] other [party] may properly

51. *I.A.E., Inc.*, 74 F.3d at 776, citing *Effects Assocs.*, 908 F.2d at 558–59. Understanding the facts in *Effects Assocs.* helps explain how this doctrine developed. Effects Associates created some special effects footage to be used in a film called “The Stuff” but Cohen, the executive producer/director, didn’t like the footage and would only pay half of the agreed-upon amount. Effects Associates sued for copyright infringement and the court, analogizing to a fact pattern in an earlier case, *Oddo v. Ries*, 743 F.2d 630 (9th Cir. 1984), concluded that Effects Associates had impliedly licensed the footage to Cohen: “The district court agreed with Cohen, and we agree with the district court: *Oddo* controls here. Like the plaintiff in *Oddo*, Effects created a work at defendant’s request and handed it over, intending that defendant copy and distribute it. To hold that Effects did not at the same time convey a license to use the footage in ‘The Stuff’ would mean that plaintiff’s contribution to the film was ‘of minimal value,’ a conclusion that can’t be squared with the fact that Cohen paid Effects almost \$56,000 for this footage. Accordingly, we conclude that Effects impliedly granted nonexclusive licenses to Cohen and his production company to incorporate the special effects footage into ‘The Stuff’ and to New World Entertainment to distribute the film.” *Effects Assocs.*, 908 F.2d at 558–59. This fact pattern has effectively turned into the legal standard for an implied copyright license. See *SmithKline Beecham Consumer Healthcare, L.P. v. Watson Pharms., Inc.*, 211 F.3d 21, 25 (2d Cir. 2000) (“courts have found implied licenses only in ‘narrow’ circumstances where one party ‘created a work at [the other’s] request and handed it over, intending that [the other] copy and distribute it,’” quoting *Effects Assocs.*, 908 F.2d at 558); *Nelson-Salabes, Inc. v. Morningside Dev.*, 284 F.3d 505, 514 (4th Cir. 2002) (“Although this Court has not heretofore specifically addressed the question of what circumstances might create an implied nonexclusive license, several of our sister circuits have examined the issue. In so doing, they have utilized versions of the three-part test created by the Ninth Circuit in its decision in *Effects Associates, Inc. v. Cohen*, 908 F.2d 555 (9th Cir. 1990)”; *Muhammad-Ali v. Final Call, Inc.*, 832 F.3d 755, 762 (7th Cir. 2016) (applying *Effects Assocs.* test where copy of a portrait was reprinted in a newspaper); *Jacob Maxwell, Inc. v. Veeck*, 110 F.3d 749, 753 (11th Cir. 1997) (applying *Effects Assocs.* test to playing a song at a baseball game). Nimmer, though, explains the flaw in this interpretation of *Effects Assocs.*: “Although those three factors, when they exist, may lead to the conclusion that there is a valid implied license, the other tests discussed in this section reveal how questionable it is for other courts to transmute those three factors into the only applicable test—and to hold that there can be no implied license when one of those factors is absent. In other words, the confluence of those three factors may be a sufficient condition to prove an implied license—but should not be taken as a necessary condition.” *Nimmer, supra* note 8, at § 10.03.

52. *Muhammad-Ali*, 832 F.3d at 762 (referring to the first factor as whether the work was commissioned by the accused infringer); *Yates v. Adams*, No. 15-cv-04912-JD, 2017 U.S. Dist. LEXIS 29156, at *2 (N.D. Cal. Mar. 1, 2017) (stating that independent contractor was “hired” to create the work); *Gerffert Co. v. William J. Hirten Co., LLC*, 815 F.Supp. 2d 521, 526 (D.R.I. 2011) (referring to whether the work was commissioned).

53. See, e.g., *Muhammad-Ali*, 832 F.3d at 762 (no implied license defense where a portrait was commissioned by the sitter, not the newspaper in which it was reprinted).

infer that the owner consents to his use. Consent to use the copyrighted work need not be manifested verbally and may be inferred based on silence where the copyright holder knows of the use and encourages it.”⁵⁴

This standard is a better fit for the inbound = outbound implied license theory. A developer has proactively offered code to a free software project with the knowledge that the contribution may be used to modify the original code base. This is a strong basis from which one can infer that those later using the modified code base have a license from the contributor to use the contribution on terms no narrower than those of the project license.

Despite its poor fit with the most common legal standard for an implied license, *Effects Assocs.*, inbound = outbound is nevertheless a strong theory. And, if the sequential derivative work concept is the correct one, it is absolutely necessary for the business model to work. But given the pervasiveness of the *Effects Assocs.* standard in copyright jurisprudence, it may prove challenging to convince a court that there are ways in which one can conclude that a license was granted in the absence of a traditional contract.

b. The Infringement Claim Will Be Poor

In the U.S., one must register the copyright in a work before one can file a copyright infringement lawsuit⁵⁵ and only the author or the author’s assignee may register the copyright.⁵⁶ Recall that under the sequence of derivative works theory, every change creates a new work. An author’s rights at any point in time will extend only as far as that author’s contribution, that is, the copyright in the delta between what

54. *Field v. Google Inc.*, 412 F. Supp. 2d 1106, 1116 (D. Nev. 2006) (brackets in original; holding that not using a “no archive” metatag on a website gave an implied license to Google to crawl the website); *see also* *Estate of Hevia v. Portrio Corp.*, 602 F.3d 34, 41 (1st Cir. 2010); *Hohn G. Danielson, Inc. v. Winchester-Conant Props., Inc.*, 322 F.3d 26, 40 (1st Cir. 2003); *Crestwood Membranes, Inc. v. Constant Servs.*, No. 3:15-CV-537, 2017 U.S. Dist. LEXIS 18621, at *22 (M.D. Pa. Feb. 8, 2017) (question of fact on implied licensing where the copyright owner was aware its designs were being printed by a third party); *Kennedy v. Gish, Sherwood & Friends, Inc.*, 143 F. Supp. 3d 898, 909 (E.D. Mo. 2015) (plaintiff’s knowledge that defendant had used low-resolution images in the past to create mock-ups for an advertising campaign, and that doing so was an accepted industry practice, meant that there was an implied license); *ExperExchange, Inc. v. Doculex, Inc.*, No. C-08-03875 JCS, 2009 U.S. Dist. LEXIS 112411, at *66-67 (N.D. Cal. Nov. 16, 2009) (implied license where (1) defendants provided royalty reports to plaintiff that listed the infringing products and the plaintiff did not notify the defendants that their number exceeded the scope of the license agreement; (2) the plaintiff continued to accept the royalty payments for those products; (3) the plaintiff repeatedly renewed the license agreement; and (4) an executive of the plaintiff encouraged the defendants to incorporate the plaintiff’s software into more of their products).

55. 17 U.S.C. § 411(a) (2012).

56. *Compendium*, *supra* note 12, at § 402 (stating that only the author or an owner of some or all of the exclusive rights may file a copyright application); *cf.* *Morris v. Business Concepts, Inc.*, 259 F.3d 65, 68 (holding that registration of the magazine as a whole as a collective work by an exclusive licensee of the included articles did not operate to register the copyright of the author of an individual article), *modified on reh’g*, 283 F.3d 502 (2d Cir. 2002).

the work was before the contribution and what it was after the contribution.⁵⁷

Thus, the copyright infringement claim will be for only a single author's contributions, which may be piecemeal throughout a file. Even if a number of authors join in one lawsuit, each one's infringement claim will be assessed individually, not by aggregating all the contributions and then comparing them to the accused work.⁵⁸

But let us assume for purposes of argument that the infringement claim is easily proved. Let's also assume that the copyright owner was successful in showing that its particular subset of code was original and creative enough to be entitled to copyright. Still, the remedies awarded will be limited to those afforded that particular author's contribution, not the work as a whole. If, for example, the work is a method in OpenJDK,⁵⁹ any injunctive remedy will be limited to ceasing the infringement of that single method, not ceasing use of the entire work.

Ideally, one will also have registered the copyright before the infringement begins, so that the awards of statutory damages and attorneys' fees are available.⁶⁰ However, characterizing the software as a series of derivative works makes registration before the infringement occurs a virtual impossibility. In the sequential derivative works theory, the code is constantly changing and a new work is created each time. Assume Author A wrote a routine, which was revised by Author B. Author B registers the copyright.⁶¹ Author C then revises the routine

57. *Compendium*, *supra* note 12, at § 621.1 (stating that a registration for a work of authorship in a derivative work extends only to the new material that the author contributed to the work).

58. *See, e.g.*, *Grant Heilman Photography, Inc. v. McGraw-Hill Cos.*, No. 12-2061, 2016 U.S. Dist. LEXIS 20438, at *2-3 (E.D. Pa. Feb. 19, 2016) (considering the use of a number of photographs by multiple authors in a number of textbooks as more than 2000 separate claims).

59. OpenJDK is an open source implementation of the Java SE platform, whose structure was clearly explained by Judge Alsup in *Oracle Am., Inc. v. Google Inc.*, No. C 10-03561 WHA, 2016 U.S. Dist. LEXIS 74931, at *16 (N.D. Cal. June 8, 2016).

60. 17 U.S.C. § 412 (2012).

61. The *registration* will be for the totality of the contributions by all authors. *Compendium*, *supra* note 12, at § 507.1 ("Thus, derivative works contain two distinct forms of authorship: The authorship in the preexisting work(s) that has been recast, transformed, or adapted within the derivative work, and the new authorship involved in recasting, transforming, or adapting the preexisting works"). This is not, though, congruent with what the author's *copyright* is. According to the Copyright Office, the registration for the derivative work only covers the new material that the author contributed, not any of the pre-existing work embodied in the work sought to be registered. *Id.* § 507.2. This is yet different from whether the copyright registration satisfies the precondition of having a registration before bringing a lawsuit. Courts have held that a registration for a derivative work can, under certain circumstances, satisfy the registration requirement in 17 U.S.C. § 411 for a claim of infringement of the pre-existing work that the derivative work incorporates. *Xoom, Inc. v. Imageline, Inc.*, 323 F.3d 279, 284 (4th Cir. 2003); *Christopher Phelps & Assocs., LLC v. Galloway*, 492 F.3d 532, 539 (4th Cir. 2007) ("While Phelps & Associates only registered the Bridgeford Residence design, that registration satisfied the prerequisite for suit under 17 U.S.C. § 411 for the entire design, even though some of it was created earlier in the form of the Bell and Brown Residence design.").

and infringer D copies the version after Author C's change. Author B has the infringement claim because that is the registered version, but the infringement claim may be poor, because Author C's modification may have changed Author B's copyright in a substantial enough way that the code Infringer D has copied is no longer similar to what Author B registered. The only sure way to ensure that there is a good infringement claim is to learn at what point in time the infringer copied the work and registered that version, meaning the registration will always be after the infringement occurs.⁶²

c. The Court's Suspension of Disbelief

Suppose one of the copyright claimants for a derivative work wishes to enforce the license against someone out of compliance with the license terms. The court would need to accept that, within a single file:

- Each addition or subtraction from a different contributor creates a new work;
- The original author created the work, then a second one made some changes and created a derivative work, then the first author returned, or perhaps a third author joined, and made some further changes that resulted in a derivative work of the second author's derivative work, and then one of the three authors, or a fourth author, makes some more changes that create a third derivative work, and so on;
- These sequence of changes means that hundreds or thousands of works are created in a month, even though the project packages a new binary version only occasionally;⁶³
- The user is getting hundreds of individual licenses from hundreds of individual contributors;
- As a sole owner, every contributor had the latitude to use a different license for their portion of the derivative work,⁶⁴ as

62. However, the timing of the registration, and resulting loss of availability of statutory damages and attorneys' fees, may not have too much negative impact on the plaintiff's claim if the main purpose of the lawsuit is, as is generally the goal of open source license enforcement, to force compliance with the terms of the license rather than obtain monetary relief. See Free Software Foundation, Inc., Software Freedom Conservancy, Inc., et al., *The Principles of Community-Oriented GPL Enforcement*, (Sep. 30, 2015), <https://fsf.org/licensing/enforcement-principles> [<https://perma.cc/W4NG-VDEY>], also available at <https://sfconservancy.org/copyleft-compliance/principles.html> (stating "Our primary goal in GPL enforcement is to bring about GPL compliance" and that "pursuing damages to the full extent allowed by copyright law is usually unnecessary, and can in some cases work against the purpose of copyleft") [<https://perma.cc/WX4S-EZT9>].

63. For example, in the Linux kernel, while there are 8-9 changes per hour, there are new releases only about every 9 to 10 weeks. CORBET & KROAH-HARTMAN, *supra* note 20, at 9.

64. *But see supra* note 42.

long as the contributor's license is no more onerous than the outbound license.

And, after accepting all of that, the one author's contribution may be only a small portion of the entire work.

Copyright law has never seen a case where there are so many authors with incremental, but independent, rights in one work, and it may prove a difficult concept for a court to accept. And if the court does not, the consequences as discussed below could unsettle all the expectations of the free and open source software community.

d. The Possibility That All But One Author Will be Left With Nothing

Consider a court confronted with a work that claims to be derivative of many, many other authors' works. The court rejects the theory that this is a very lengthy sequence of derivative works. What is left? Someone is the copyright owner, but who?

The court may turn to recent case law where contributors to a larger work tried to claim copyright in their incremental contribution. First, in *Garcia v. Google*⁶⁵ the plaintiff, Garcia, had a small acting role in what she thought was an action-adventure film.⁶⁶ Instead the film was dubbed, depicting the Prophet Mohammed as a murderer, pedophile and homosexual.⁶⁷ After it was translated into Arabic there were violent protests in the Middle East and an Egyptian cleric issued a fatwa against anyone associated with the film.⁶⁸ Garcia received multiple death threats.⁶⁹ She sued Google for copyright infringement in order to get the film removed from YouTube.⁷⁰ Garcia claimed that her brief acting performance was a work subject to independent copyright⁷¹ that she owned solely.⁷²

In addition to suggesting that an acting performance is not copyrightable,⁷³ the court rejected the possibility that a fragment of a larger audiovisual work was independently copyrightable. It had long

65. 786 F.3d 733 (9th Cir. 2015).

66. *Id.* at 737.

67. *Id.*

68. *Id.* at 737–38.

69. *Id.*

70. *Id.*

71. *Id.* at 736.

72. Claiming joint ownership of the copyright in the entire film would not have achieved Garcia's goal, which was to have the film removed from YouTube. As explained *infra* in note 113, joint authorship would have defeated a successful takedown.

73. *Garcia*, 786 F.3d at 741–42. The court mentions the Copyright Office's rejection of Garcia's copyright application. The Copyright Office's explanation of the reasons for the refusal is available at Exhibit to Appellees' Motion for Judicial Notice, Docket Entry 55, *Garcia v. Google*, 786 F.3d 733 (9th Cir. 2015) (No. 12-57302), <http://www.archive.org/download/gov.uscourts.ca9.12-57302/gov.uscourts.ca9.12-57302.55.0.pdf> [<https://perma.cc/2U9S-KXVE>].

been a Copyright Office position that a motion picture is a “single, integrated” work,⁷⁴ which the *Garcia* court agreed with:

Defining a “work” based upon some minimal level of creativity or originality would be too broad and indeterminate to be useful.... Garcia’s theory of copyright law would result in a legal morass ... splintering a movie into many different “works” Simply put, as Google claimed, it “makes Swiss cheese of copyrights.”⁷⁵

In reaching its conclusion that Garcia had no copyright interest in the work, *Garcia v. Google* referred back to an earlier authorship case, *Aalmuhammed v. Lee*.⁷⁶ Jefri Aalmuhammed made significant contributions to the Spike Lee film *Malcolm X*, including writing a Hajj scene for the movie, and claimed to be a joint author. The court rejected the possibility on a theory that, even though Aalmuhammed’s contributions were copyrightable, he wasn’t an “author” of the work: “We hold that authorship is required under the statutory definition of a joint work, and that authorship is not the same thing as making a valuable and copyrightable contribution.”⁷⁷ Rather, the author of the work was whoever was the “master mind,” the one ““originating, making, producing, as the inventive or master mind, the thing which is to be protected”; ‘the man who really represents, creates, or gives effect to the idea, fancy, or imagination.’”⁷⁸ So while a contributor may have made a contribution that was sufficiently original and creative to be copyrightable, that individual’s copyright interest does not survive.⁷⁹

74. See *Compendium*, *supra* note 12, at § 808.3(D) (“A motion picture, including its production, direction, cinematography, performances, and editing, is a single, integrated work. Generally, a motion picture must be registered as a whole, with the possible exception of the screenplay and musical score. The individual elements that comprise a motion picture cannot be registered apart from the work as a whole. For example, one actor’s performance in a television show may not be registered apart from the rest of the motion picture.”); see also Exhibit to Appellees’ Motion for Judicial Notice, Docket Entry 55 at 4, *Garcia v. Google*, 786 F.3d 733 (9th Cir. 2015) (No. 12-57302), <http://www.archive.org/download/gov.uscourts.ca9.12-57302/gov.uscourts.ca9.12-57302.55.0.pdf> (referring to position as “longstanding”) [<https://perma.cc/2U9S-KXVE>].

75. *Garcia*, 786 F.3d at 742 (ellipses and brackets in original omitted).

76. 202 F.3d 1227 (9th Cir. 2000).

77. *Id.* at 1232; see also *Caffey v. Cook*, 409 F. Supp. 2d 484, 501 (S.D.N.Y. 2006) (acknowledging that musical performers had made copyrightable contributions to the stage show but finding that the producer was the sole author).

78. *Aalmuhammed*, 202 F.3d at 1233, quoting *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 61 (1884).

79. *16 Casa Duse, LLC v. Merkin*, 791 F.3d 247, 257 (2d Cir. 2015) (concluding that non-freestanding contributions to works of authorship are not themselves works of authorship); *Blizzard Entertainment, Inc. v. Lilith Games (Shanghai) Co.*, NO. 3:15-cv-04084-CRB, 2017 U.S. Dist. LEXIS 74639, at *7 (N.D. Cal. May 16, 2017) (quoted *infra* at note 93 and accompanying text); *Farkas v. Rich Coast Corp.*, No. 1:14-CV-272, 2017 U.S. Dist. LEXIS 88267, at *21-22 (M.D. Pa. June 7, 2017) (adopting *16 Casa Duse*). This case is distinguished from the situation where there is a free-standing work that is incorporated into a film, which

While Aalmuhammed only wanted to share authorship, the principle that a contribution could be significant and copyrightable (unlike Garcia's contribution, which was minor), but nevertheless not result in authorship, was the result in *16 Casa Duse v. Merkin*.⁸⁰ Here, everyone but the director signed a work made for hire agreement with the producer.⁸¹ The director later claimed sole ownership of the copyright in his directorial work separate and apart from the finished film, which the court rejected:

May a contributor to a creative work whose contributions are inseparable from, and integrated into, the work maintain a copyright interest in his or her contributions alone? We conclude that, at least on the facts of the present case, he or she may not.⁸²

Instead:

In cases in which none of the multiple-author scenarios specifically identified by the Copyright Act applies, but multiple individuals lay claim to the copyright in a single work, the dispositive inquiry is which of the putative authors is the "dominant author."⁸³

To decide who the "dominant author" is (or what *Burrows-Giles*⁸⁴ refers to as the "master mind"), the court will consider (1) decision-making authority—the parties' relative control over what changes are made and what is included in a work; (2) the way in which the parties bill or credit themselves; and (3) written agreements with third parties.⁸⁵

While one might be inclined to dismiss these cases as limited to the unique world of the movie industry, the same reasoning has been applied in a video game case, one having an "open source" aspect at that. In 2002 Blizzard Entertainment released *Warcraft III: Reign of*

is separately copyrightable. *TCA TV Corp. v. McCollum*, 839 F.3d 168, 192 (2d Cir. 2016) (holding that the Abbott and Costello "Who's On First" routine, which existed for years before it was incorporated into a film, was separately copyrightable from the later film); *Effects Assocs. v. Cohen*, 908 F.2d 555 (9th Cir. 1990) (assuming that special effects footage was independently copyrightable).

80. 791 F.3d 247 (2d Cir. 2015).

81. *Id.* at 260. See *supra* notes 21–23 and accompanying text describing "work made for hire" in this scenario.

82. *Id.*; see also *Farkas v. Rich Coast Corp.*, No. 1:14-CV-272, 2017 U.S. Dist. LEXIS 88267, at *21–22 (M.D. Pa. June 7, 2017) ("[W]hile Farkas invites us to compartmentalize this artistic process, and suggests that the writing, acting, filming and editing of a single movie are all separately copyrightable acts, the better weight of authority rejects this notion.").

83. *Id.* (emphasis added).

84. *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 61 (1884).

85. *16 Casa Duse*, 791 F.3d at 260, citing *Aalmuhammed v. Lee*, 202 F.3d 1227 (9th Cir. 2000).

Chaos,⁸⁶ a software gaming platform that allowed players to create new settings, characters, storylines and rules, known as “mods.”⁸⁷ One successful mod was “Defense of the Ancients” (DoTA).⁸⁸ Its developmental history was complicated and some of it lost to time, but it included forks of cracked versions, later forks after the original author “open sourced” it, many different contributors, two parallel versions (DoTA and DoTA Allstars), several different lead developers at different points in time, some of the work done while the lead developers were employed by game companies and some not, and the ultimate acquisition of three different lead developers’ rights by plaintiffs Blizzard Entertainment and Valve Corp.⁸⁹—in other words, a typical open source development project.

The defendants challenged the plaintiffs’ copyright ownership. The court begins:

With literally hundreds of versions of DotA and DotA Allstars floating around in the ether, the Court confronts quite the copyright conundrum. To sort through things, it must first determine just what, exactly, is the work(s) at issue here. Second, it must determine who is the relevant author(s). Third and finally, the Court will consider just what result(s) flows from the answers to those questions.⁹⁰

The court held that the various versions of DotA and DotA Allstars were “unitary” works, not collective works,⁹¹ and relied on *Aalmuhammed* for the proposition that the author of a mod was the person who was the “mastermind,” disregarding any copyright interest that any other contributors might have had in the mods:

The record contains ample evidence that Eul, Guinsoo, and Icefrog were the masterminds behind their respective versions of DotA and DotA Allstars. uCool concedes as much with respect to Eul, admitting that he “created the [mod], the characters, their abilities and themes, the rules, and named the game.” Guinsoo and Icefrog are no different, legally speaking. They, like Spike Lee, took suggestions from others—some elaborate, some less so—and decided which ones made the cut. So just as Spike Lee was the author of the work at issue in *Aalmuhammed*, a reasonable jury could (and perhaps must)

86. *Warcraft III: Reign of Chaos*, BLIZZARD ENTMT, <http://us.blizzard.com/en-us/games/war3/> (last visited Mar. 28, 2018) [<https://perma.cc/AZ6N-G22Q>].

87. *Blizzard Entm’t, Inc. v. Lilith Games (Shanghai) Co.*, No. 3:15-cv-04084-CRB, 2017 U.S. Dist. LEXIS 74639, at *7 (N.D. Cal. May 16, 2017).

88. *Id.* at *8–9.

89. *Id.* at *9–16.

90. *Id.* at *18.

91. *Id.* at *19–21; see *supra* notes 13–16 and accompanying text for the definition of a “collective” work.

conclude that Eul, Guinsoo, and Icefrog are the authors of the various works at issue here.⁹²

The court goes further, holding that the contributions not created by the lead developers were nevertheless owned by them (and thereafter by the plaintiffs by assignment):

Consider a twist on Aalmuhammed:

Spike Lee assigns his copyright in *Malcolm X* to, let's say, Warner Brothers. Disney comes along and makes a cartoon version of the movie called *Malcolm ABC*. Warner Brothers sues, claiming *Malcolm ABC* infringes its copyright in *Malcolm X*. Disney responds that Aalmuhammed, not Spike Lee, wrote the scene chronicling the protagonist's Hajj pilgrimage, which appears in both *Malcolm X* and *Malcolm ABC*. And under *Aalmuhammed and Effects Associates, Inc. v. Cohen* Aalmuhammed owned a copyright in that scene. Warner Brothers, the argument goes, does not own the Hajj scene, and so cannot recover for Disney's copying of that piece of *Malcolm X* (nor for its copying of any scene, character, or other cinematic element dreamed up by anyone not named Spike Lee).

Winning argument?

No, and it was a loser even before *Garcia v. Google* suggested that Aalmuhammed's script of the Hajj scene was not independently copyrightable after all. The whole point of Aalmuhammed's contributions was to integrate them into *Malcolm X*, and so they must be understood as parts of the movie to protect copyright in the movie. Copyright in movies, comic books, and video games would be worthless otherwise.

Our imagined case is this case in every way that matters, at least when it comes to heroes (and other game elements) dreamed up by third parties and then given to Guinsoo or Icefrog to integrate into *DotA Allstars*. Valve and Blizzard are alleging infringement of their games, so heroes must be understood as part of those games. Nothing changes for even the most hyper-detailed hero designs: Aalmuhammed's Hajj-scene contribution was hyper-detailed—he wrote the script.⁹³

Consider the outcome if this standard was applied to a free and open source software project. A court could find that one person, and

92. *Blizzard Entm't, Inc., No. 3:15-cv-04084-CRB* at *22–23 (brackets added) (internal citations omitted).

93. *Id.* at *24–26.

one person only, owns the copyright in the project, a complete upheaval of the settled expectations in the open source software realm. Many view the number of authors in a free software project as a strength: it keeps the software free⁹⁴ and adds to the vibrancy of the community around the software project.⁹⁵ Instead, there will be no brakes on the anointed single owner's power to do whatever the owner pleases with the software, whether granting proprietary licenses or selling the code to the highest bidder.

To summarize, in the case of a work with multiple authors, there are three options:

- An author of a *derivative work* owns copyright in only the material contributed by the author of such work. If this claim is accepted, at best the author can enforce the license in the author's own slice.
- The court rejects the sequential derivative works theory and holds instead that there is a *dominant author* who owns all the copyright. In this case, the continuation of the project as an open source one will be at the whim of the identified author, because as sole author that person or company can change the license, at least going forward, at any time.
- The work is one of *joint authorship*. This Article takes the position that identifying the work as a joint work by joint authors can be a viable option.

94. Richard Stallman, *When a Company Asks for Your Copyright*, FREE SOFTWARE FOUNDATION (Sep. 29, 2010, 4:14 PM), <https://www.fsf.org/blogs/rms/assigning-copyright> (discouraging contributors from assigning their copyright to a project because it allows the owner to sell proprietary licenses) [<https://perma.cc/2F96-KMQ9>]; see also *GNOME Foundation Guidelines on Copyright Assignment*, GNOME FOUNDATION, <https://wiki.gnome.org/FoundationBoard/Resources/CopyrightAssignment/Guidelines> (last updated Dec. 4, 2013) (describing the pitfalls of assigning copyright to one owner) [<https://perma.cc/SCW7-38F9>].

95. Michael Meeks, *Some Thoughts on Copyright Assignment*, STUFF MICHAEL MEEKS IS DOING, <https://people.gnome.org/~michael/blog/copyright-assignment.html> (last visited Apr. 1, 2017) ("I am not aware of a single project that mandates copyright assignment to a corporation that has a diverse, and thriving developer community. If there was even one, the business model of "communitising" a code-base, then firing all your developers, sitting back, and collecting an effort-free rent might become attractive. In contrast I am aware of many diverse and thriving communities that have eclectic ownership, and also some less thriving ones that are dominated by single entities.") [<https://perma.cc/4SQD-GPK8>]; see also *Samba Copyright Policy*, SAMBA, <https://www.samba.org/samba/devel/copyright-policy.html> (last visited Apr. 1, 2017) ("Samba is a project with distributed copyright ownership, which means we prefer the copyright on parts of Samba to be held by individuals rather than corporations if possible. There are historical legal reasons for this, but one of the best ways to explain it is that it's much easier to work with individuals who have ownership than corporate legal departments if we ever need to make reasonable compromises with people using and working with Samba.") [<https://perma.cc/92QW-6DJ6>].

C. *The Theory of Joint Authorship*

For there to be joint authorship, the authorship contributed by the two or more participants is either “inseparable” or “interdependent.”⁹⁶ “Inseparable” means that the works cannot be separately identified, for example, the collaboration of two playwrights on one play.⁹⁷ “Interdependent” means that, while the contributions may be separately identifiable, they are written pursuant to an express or implied agreement that the product will be regarded as an indivisible whole, such as the words and music of a song.⁹⁸ An example of the first in software is the single file with revisions by different authors, and an example of the second is a collection of files that creates one functioning software program.

For a work of joint authorship, all authors have to intend that their contributions be merged into a single whole.⁹⁹ The meaning of “intent” is whether they intend to be co-authors, not what their understanding is of the consequences of the legal relationship.¹⁰⁰ For example, a ghostwriter may not get credit for authorship of a book, but that does not mean that the ghostwriter was not a joint author.¹⁰¹ But, the joint authors do not have to work in physical proximity,¹⁰² they do not have to all contribute at the same time,¹⁰³ they do not have to know who the

96. 17 U.S.C. § 101 (2012).

97. *Childress v. Taylor*, 945 F.2d 500, 505 (2d Cir. 1991) (“Parts of a unitary whole are ‘inseparable’ when they have little or no independent meaning standing alone. That would often be true of a work of written text, such as the play that is the subject of the pending litigation.”).

98. *Id.* (“By contrast, parts of a unitary whole are “interdependent” when they have some meaning standing alone but achieve their primary significance because of their combined effect, as in the case of the words and music of a song.”).

99. *Id.* at 505–06, followed by *Greene v. Ablon*, 794 F.3d 133, 151 (1st Cir. 2015); *16 Casa Duse, LLC v. Merkin*, 791 F.3d 247, 256 (2d Cir. 2015); *Thomson v. Larson*, 147 F.3d 195, 201 (2d Cir. 1998); *Erickson v. Trinity Theatre, Inc.*, 13 F.3d 1061, 1068 (7th Cir. 1994).

100. *Janky v. Lake Cty. Convention & Visitors Bureau*, 576 F.3d 356, 362 (7th Cir. 2009) (“With respect to the first element, we explained that the intent prong does not have to do with the collaborators’ intent to recognize each other as coauthors for purposes of copyright law; the focus is on the parties’ intent to work together in the creation of a single product, not on the legal consequences of that collaboration.”).

101. *Brod v. Gen. Publ’g Grp., Inc.*, 32 F. App’x 231, 235 (9th Cir. 2002) (finding that the author’s contributions to the photographer’s photographs made them joint authors, even though the photographer was the only one credited).

102. *Edward B. Marks Music Corp. v. Jerry Vogel Music Co.*, 42 F. Supp. 859, 864 (S.D.N.Y. 1942), *aff’d*, 140 F.2d 266 (2d Cir. 1944) (“The ‘collaboration that produced the harmony of the two, the words and the music, made the song a musical composition, which was the result of a joint effort. Physical propinquity of the authors and consultations while this was being done, were not essential.”).

103. *Shapiro, Bernstein & Co. v. Jerry Vogel Music Co.*, 161 F.2d 406, 409 (2d Cir. 1947) (music combined with new lyrics that replaced original lyrics was work of joint authorship); *Edward B. Marks Music Corp.*, 42 F. Supp. at 864 (music lead sheets written first and lyrics written later). There is some authority that the intent to create a joint work must exist at the time of creation. *Nimmer*, *supra* note 8, at § 6.03 (“The preconcerted common design, or, in the words of the Copyright Act, ‘the intention that their contributions be merged,’ must exist at the moment in time when the work is created, not at some later date,” citing H.R. REP. NO. 94-1476 at 122 (1976)). There is also some suggestion in the case law that one can decide after the work’s original creation that additional contributions are desired, and thus it can become

future contributors will be,¹⁰⁴ and they do not have to contribute in equal share.¹⁰⁵

In the case of free software, proof of the intent¹⁰⁶ to create a joint work is not a problem; it is almost the sine qua non of the open source software project. The word “collaboration” is used so often to describe open source code development that it is almost a trope.¹⁰⁷ The licenses

a joint work at that point in time. *Shapiro, Bernstein & Co. v. Jerry Vogel Music Co.*, 221 F.2d 569 (2d Cir. 1955), *modified on reh'g*, 223 F.2d 252 (2d Cir. 1955). Nevertheless, it likely does not matter for purposes of software under an open source license. Open source software is created when a copyright author (or authors) decides to put software under a written license. If a software author creates a work and decides later in time to “open source” the software and adds a license, in the worst case the first modification accepted by another author will create a derivative work of the initial work, and that derivative work is then the one that becomes the work of joint authorship. *See, e.g., Janky*, 576 F.3d at 359–60 (plaintiff was author of initial work, but later changes made in collaboration with another band member to about 10% of the lyrics created a joint work); *Nimmer*, *supra* note 8, at § 6.05 (stating that where intent only occurs after the work has been written, the merger of the inseparable or interdependent parts creates a jointly authored derivative work).

Nimmer states that the reason intent must be formed before any contributions is because “where the common design for a joint work was not agreed upon by the several contributors until after one of the contributions was already created, what justification is there for inferring that the parties intend a joint authorship?” *Nimmer*, *supra* note 8, at § 6.02. In the case of open source software, which only exists because an author added an express license allowing for modification of the work and thereafter accepted a contribution, the “inference” that the parties intended a joint authorship seems abundantly clear. There is also no risk that the original author can withdraw their permission to use the initial work as the basis for the derivative work, since the original author licensed the initial work in perpetuity under the open source license.

104. *Edward B. Marks Music Corp. v. Jerry Vogel Music Co.*, 140 F.2d 266, 267 (2d Cir. 1944) (holding a work was a joint work where a lyricist, Marks, sold his lyrics to a music publisher and the music publisher hired a songwriter, Loraine; “Marks and Loraine never met until years later, and had not therefore worked in conjunction, except that Marks intended the words to be set to music which someone else should compose, and that Loraine understood that he was composing music for those particular words,” stating “it makes no difference whether the authors work in concert, or even whether they know each other; it is enough that they mean their contributions to be complementary in the sense that they are to be embodied in a single work to be performed as such.”), *quoted by Siegel v. Time Warner Inc.*, 496 F. Supp. 2d 1111, 1145 (C.D. Cal. 2007). *See also Edward B. Marks Music Corp. v. Jerry Vogel Music Co.*, 47 F. Supp. 490, 491 (S.D.N.Y. 1942) (“Two men producing a musical composition jointly are nonetheless coauthors and owners though they labor at different times, without conference or consultation, and though they may remain strangers to each other.”).

105. *Greene v. Ablon*, 794 F.3d 133, 151 (1st Cir. 2015); *Baker v. Robert I. Lappin Charitable Found.*, 415 F. Supp. 2d 473, 487 (S.D.N.Y. 2006) (“Although Baker apparently did the vast majority of the work, equality in quantity of contribution is not required, and a reasonable jury could only find that Lappin and Coltin were ‘true collaborators in the creative process.’”). Whether a contributor’s contribution must rise to the level of copyrightable in order to be considered a joint author is beyond the scope of this article. *See Nimmer*, *supra* note 8, at § 6.07 (explaining the circuit split on the issue).

106. Note that both the inbound = outbound implied license theory and joint authorship involve determining the contributor’s intent. Therefore, the legal conclusion may simply be a question of how the same set of facts is framed.

107. *See, e.g., Community and Collaboration*, OPEN SOURCE INITIATIVE, <https://open-source.org/community> (last visited Mar. 12, 2017) (touting benefits of collaboration when creating open source software) [<https://perma.cc/W8LE-FLVA>]; *The Open Source Way, Connected Curiosity*, RED HAT, <https://www.redhat.com/en/open-source> (last visited Mar. 12, 2017) (“At Red Hat, when we talk about ‘open source,’ we’re talking about a proven way of collaborating to create technology. The freedom to see the code, to learn from it, to ask questions and offer improvements: This is the open source way.”) [<https://>

themselves sometimes reflect a joint development ethos. For example, the Mozilla Public License version 2.0 defines “Contributor” as “each individual or legal entity that creates, contributes to the creation of, or owns Covered Software,”¹⁰⁸ suggesting that many authors are contributing to the same work. The terminology used in open source software, “contributing upstream,”¹⁰⁹ “inbound” and “outbound,” suggests a common pool of code shared by all. Nevertheless, it is perceived as a legal status to be avoided.¹¹⁰

In any given case there may not be intent to be joint authors. To decide if there is intent, courts will consider:

- (1) whether the putative author controls the work and is “the inventive or master mind who creates, or gives effect to the idea”; (2) whether the “putative coauthors make objective manifestations of a shared intent to be coauthors”; and (3) whether “the audience appeal of the work turns on both contributions and the share of each in its success cannot be appraised.”¹¹¹

As an example, projects with contributor license agreements, which describe a licensing relationship among authors, weigh against the alternative possibility that the work is one of joint authorship.

1. The Perceived Risks of a Joint Ownership Theory

There are two reasons given for avoiding a theory of joint authorship in a free software project: (1) that a party that does not want

perma.cc/4FPZ-BZM2]; *What is Open Source*, OPENSOURCE.COM, <https://opensource.com/resources/what-open-source> (last visited Mar. 12, 2017) (“By design, open source software licenses promote collaboration and sharing because they permit other people to make modifications to source code and incorporate those changes into their own projects.”) [<https://perma.cc/GV32-8XWD>]; Thomas Goetz, *Open Source Everywhere*, WIRED (Nov. 1, 2003, 12:00 PM), <https://www.wired.com/2003/11/opensource/> (“It’s called that because the collaboration is open to all and the source code is freely shared. Open source harnesses the distributive powers of the Internet, parcels the work out to thousands, and uses their piecemeal to build a better whole.”) [<https://perma.cc/9G24-B34R>].

108. MPLV2, *supra* note 42, at § 1.1. Compare this to the GNU General Public License version 3, which does not blur the relationship, making a distinction between a “Program” and a “work based on the Program.” GNU GENERAL PUBLIC LICENSE VERSION 3.0 (2007), <https://www.gnu.org/licenses/gpl-3.0.en.html> [<https://perma.cc/62TQ-DZCE>].

109. See, e.g., Brian Warner, *Contribute Upstream to Manage Technical Debt*, SAMSUNG OPEN SOURCE GROUP (Feb. 17, 2016), <https://blogs.s-osg.org/contribute-upstream-to-manage-technical-debt/> [<https://perma.cc/ZL2Q-EJHJ>]; Ryota Mibu et al., *How to Work Upstream with OpenStack*, OPENSTACK, <https://www.openstack.org/videos/video/how-to-work-upstream-with-openstack> (last visited Jan. 29, 2018) [<https://perma.cc/5W5N-GBWQ>].

110. “Joint ownership is a lurking issue in open source development.... [O]pen source projects are collaborative efforts. The messaging and rhetoric regarding open source development often emphasizes open source’s collaborative nature, and this is ripe fodder for an argument that open source projects are actually joint works.” HEATHER MEEKER, OPEN SOURCE FOR BUSINESS 211–12 (Paula Fleming & Doug McNair eds., 2015).

111. *Brod v. Gen. Publ’g Grp., Inc.*, 32 F. App’x 231, 234–35 (9th Cir. 2002) (quoting *Aalmuhammed v. Lee*, 202 F.3d 1227, 1234 (9th Cir. 2000)).

to comply with the terms of an open source license will be able to obtain a more favorable license from one of the co-owners, and (2) that all copyright owners would have to be joined in any lawsuit, in practical effect meaning there could never be a lawsuit.¹¹² This article takes the position that neither of these fears is real.

a. Obtaining an Alternative License

It is a common generalization that a joint author may exploit a joint work without the consent of the other joint owners.¹¹³ However, this is only true in the absence of an agreement to the contrary—joint owners may alter any of the default rules of joint ownership with an agreement.¹¹⁴ Indeed, joint owners may agree by contract that none of them shall independently license a work,¹¹⁵ and a licensee with knowledge of the agreement takes its license subject to that agreement.¹¹⁶

112. MEEKER, *supra* note 110, at 211–12. *See also* Eban Moglen, *Why the FSF Gets Copyright Assignments From Contributors*, GNU OPERATING SYSTEM, <https://www.gnu.org/licenses/why-assign.en.html> (last visited Jan. 29, 2018) (“If there are multiple authors of a copyrighted work, successful enforcement depends on having the cooperation of all authors.”) [<https://perma.cc/QJ8C-BCU7>].

113. *Nimmer*, *supra* note 8, at § 6.10[A][1][a] (“One joint owner cannot be liable for copyright infringement to another joint owner, given the baseline proposition that one cannot infringe his own copyright. It follows that a joint owner may exploit the work himself, without obtaining the consent of the other joint owners.”), citing *Oddo v. Ries*, 743 F.2d 630 (9th Cir. 1984); *see also* *Martin v. Cuny*, 887 F. Supp. 1390, 1394 (D. Colo. 1995); *Weinstein v. University of Ill.*, 811 F.2d 1091, 1095 (7th Cir. 1987).

114. *See, e.g., Nimmer*, *supra* note 8, at § 6.02 (stating “For example, although the words and music of a song are separately identifiable, the lyricist and composer, in jointly undertaking the task of creating a song, *in the absence of express agreement to the contrary*, may be presumed to have intended that each shall own an undivided interest in the combined product of their respective efforts,” emphasis added); *Sweet Music, Inc. v. Melrose Music Corp.*, 189 F. Supp. 655, 658 (S.D. Cal. 1960) (holding that, even though the widow of a joint owner was not bound by the terms of the publishing agreement because her husband’s death extinguished it, the other joint owner was); *see, e.g., Cal. Civ. Code* § 981 (*Deering* 2016) (state law on joint ownership of copyright defining the terms of the relationship “unless otherwise agreed”).

115. *Corbello v. DeVito*, 832 F. Supp. 2d 1231, 1244 (D. Nev. 2011) (“it is now the law in this Circuit[,] [j]oint owners may agree by contract that none of them shall independently license a work”), citing 1 MELVILLE B. NIMMER & DAVID NIMMER, *NIMMER ON COPYRIGHT* § 6.10[C] (Matthew Bender & Co., Inc. 2011); *Maurel v. Smith*, 271 F. 211, 215 (2d Cir. 1921) (enforcing an agreement between one joint author and the theatrical managers: the agreement defined how the author was to be credited, stated that the joint author was not granting any publishing rights, and stated that the theatrical managers agreed that there would be no changes, interpolations, additions, or eliminations without the author’s consent in writing); *Meredith v. Smith*, 145 F.2d 620 (9th Cir. 1944) (“It is not questioned that Fricke as co-owner of the copyright would have had the right to give permission to Smith to publish the book. The contention is that Fricke had given up that right by the contract and that Smith, having notice thereof, could receive from Fricke no valid permit to use the copyright. [¶] Upon the trial the District Court found that there was an agreement between appellant and Fricke that neither of the copyright owners would give a permit to a third person to use the copyright without the permission of the other, but that it had terminated prior to the alleged infringing publication of the book by Smith.”).

116. *Maurel*, 271 F. at 215 (holding that licensees of the jointly authored work were bound by the terms of an agreement of one of the authors); *Nimmer*, *supra* note 8, at § 6.10[C].

This Article proposes that in the case of free software projects there is, in fact, a writing that precludes any joint author from licensing the software on different, more favorable terms to anyone—the license agreement itself. No writing is required for there to be joint authorship,¹¹⁷ but the open source software license agreement is an expression of the parties' understanding about the mutual obligations the authors have to each other.

In other words, the license agreement does double duty. For non-contributors, it is simply a copyright license. For contributors, the joint authors, it is the description of the terms on which they have agreed the work could be distributed. The result is the same for both groups of users: there are some conditions on the use, distribution and modification of the software and non-compliance is breach of that agreement.¹¹⁸ It is simply that the parties' legal relationship to the document differs, a license in one case and a joint authorship agreement in the other. As an example, a non-contributor that purports to license the software in a way contrary to the project license, for example by excusing the duty to provide source code,¹¹⁹ will have breached the condition of the license and therefore no longer has a license defense to a claim of copyright infringement.¹²⁰ Where instead it was a joint author who failed to provide the source code, the joint author will have breached its contractual obligation to the other joint authors.¹²¹

Assume there is evidence supporting the notion that the intent of the contributors was to create a joint work.¹²² Certainly the contributors must also believe that everyone, contributor or not, has to use the code on the same terms, for if one of them could grant a different license it would defeat the fundamental purpose underlying

117. *Thomson v. Larson*, 147 F.3d 195, 200 (2d Cir. 1998) (evaluating whether there was a co-authorship where there was no writing); cf. *Papa's-June Music, Inc. v. McLean*, 921 F. Supp. 1154, 1158 (S.D.N.Y. 1996) (holding that there needs to be a writing to alter the ordinary pro rata share of authorship).

118. The result of the breach of a copyright license is generally copyright infringement; however, that will not be the case with a breach of the author's agreement. See *supra* note 113 for the proposition that co-authors are not liable to each other for copyright infringement.

119. See, e.g., GPLv2, *supra* note 7, at ¶ 3; GPLv2, *supra* note 42, at § 3.2.

120. See Eben Moglen, *Enforcing the GNU GPL*, GNU OPERATING SYSTEM (Sept. 10, 2001), <https://www.gnu.org/philosophy/enforcing-gpl.html> (describing the GPLv2 as a copyright grant with conditions, where failure to meet the conditions is a copyright infringement) [<https://perma.cc/E8E9-KGHL>].

121. The obligation to provide source code is a deliberate example. While the legal claims against contributors and non-contributors may be different—copyright infringement versus breach of contract—in some cases the claim against the non-contributor might also be only for breach of contract. *MDY Indus., LLC v. Blizzard Entm't, Inc.*, 629 F.3d 928, 941 (9th Cir. 2010) (holding that, for the breach of a contract to constitute copyright infringement, there must be a nexus between the condition and the licensor's exclusive rights in copyright). Copyright law only provides an author with the right to exclude others from making reproductions, not an affirmative duty to provide anything. A court may not agree that the obligation to provide source code is a condition of the copyright license but instead decide it is a contractual covenant, the failure of which leads only to a breach of contract claim.

122. See *supra* notes 99–101 and accompanying text.

the choice of a free and open source license and their election to contribute. What they must expect is that the software would be used by everyone on equal footing, and the free software license is the expression of exactly what those terms are.

Like the inbound = outbound license theory,¹²³ the legal conclusion drawn depends on ascribing meaning to conduct because there is no formal execution. And similar to inbound = outbound, the argument is that the contributor voluntarily, with knowledge of the agreement, provided code with the desire and understanding that it would be added to the larger work.¹²⁴ The inbound = outbound theory relies on the grant of a license by conduct, with the scope of the grant from a written document. The joint authorship theory implies something similar, assent based on conduct to be bound to a common agreement describing the terms on which the copyright may be exercised.¹²⁵ But where there is joint authorship, the downstream licensee has only to prove that contributors intended that their contribution be added to the work,¹²⁶ while for inbound = outbound the downstream licensee will have to prove the more complicated proposition that the act of making the contribution was an offer of license to someone other than to whom the contribution was given.¹²⁷ Further simplifying matters, if the project is only one work, then a licensee only has to be concerned with one license grant,¹²⁸ to the work as a whole, not hundreds or thousands of grants.

Some additional principles will further discourage a joint owner from offering such a license. First is the liability that a breaching joint author will have to the other authors. At a minimum the breaching joint author will have to share any monies received in exchange for the improper grant.¹²⁹ Since the breaching co-author may have to share the largesse, there will be less financial incentive to make the extra grant. Further, because the grant of the alternative license will also have

123. See *supra* note 44 and accompanying text.

124. See *supra* notes 47–48 and accompanying text.

125. While an assignment must be in writing, 17 U.S.C. § 204(a) (2012), here there is no transfer of any rights. Instead, the free software license is in the role of a document that describes the metes and bounds of a joint owner's right to make grants to others.

126. See *supra* notes 99–100 and accompanying text.

127. See *supra* notes 47–48 and accompanying text.

128. Note that even the initial grant is by conduct, adding the license to the source code, not by executing an agreement. Figuring out what license actually applies to any open source software is often challenging. See, e.g., *What is Open Compliance?*, LINUX FOUNDATION, (last visited Mar. 3, 2018) (listing standards and tools for open source license compliance). For an example of a case where the licensing itself is perplexing, see *History and License*, PYTHON SOFTWARE FOUNDATION, <https://docs.python.org/3/license.html> (last visited June 30, 2017) [<https://perma.cc/7UTB-4WK7>].

129. *Brownstein v. Lindsay*, 742 F.3d 55, 68 (3d Cir. 2014) (“the licensing author must account to his co-author for his fair share of profits from any non-exclusive license”); *Goodman v. Lee*, 78 F.3d 1007, 1012 (5th Cir. 1996) (determining availability of accounting as a matter of state law); *Oddo v. Ries*, 743 F.2d 630, 633 (9th Cir. 1984) (“A co-owner of a copyright must account to other co-owners for any profits he earns from licensing or use of the copyright”).

subverted the purpose and goals of the original license agreement, even if the breaching joint author was not paid for the license, the granting joint author may nevertheless be liable to the co-authors for harm caused by the use of the copyright.¹³⁰

The recipient of the license grant from the unfaithful joint author may not get off without penalty either. To the extent the licensee solicited the special terms, the licensee may itself be liable in tort for intentional interference with contract.¹³¹ Even if the licensee did not solicit the special license, but was aware that the project had an open source license with conditions on how the software could be used, the improper license will be invalid¹³² and the licensee liable to the other co-authors for restitution.¹³³ And even where the licensee may have been unaware it had an improper license, the software license may be void due to the licensor's absence of authority to make the grant,¹³⁴

130. *Szekely v. Eagle Lion Films*, 242 F.2d 266, 268 (2d Cir. 1957) (stating that the market for the plaintiff's screenplay had been destroyed by the distribution of the film, for which the plaintiff deserved compensation); *Shapiro, Bernstein & Co. v. Jerry Vogel Music Co.*, 73 F. Supp. 165, 168 (S.D.N.Y. 1947) ("It has been said that copyright, being an incorporeal right, cannot be destroyed. But its broad use by an active publisher can so far exhaust the popularity of a song, or any other musical composition, as to destroy its value after that use has ended. And the destruction of value of a copyright is, in effect, a destruction of the copyright."); *Crosney v. Edward Small Prods.*, 52 F. Supp. 559, 561 (S.D.N.Y. 1942) ("Defendant as a cotenant has so used the res, i. e. the motion picture rights of the play, that the value of the use of such rights by the plaintiff has been destroyed. It presents a clear case for an accounting."); *But see Herbert v. Fields*, 152 N.Y.S. 487, 490 (1915) (acknowledging the concept that co-tenants could destroy an article but expressing skepticism that the concept could be applied outside of physical goods) *cf. Greene v. Ablon*, 794 F.3d 133, 156 (1st Cir. 2015) (holding that the duty of accounting is only for lost profits, not lost value).

131. These elements of the tort are: (1) an economic relationship between the plaintiff and some third party, with the probability of future economic benefit to the plaintiff; (2) the defendant's knowledge of the relationship; (3) intentional acts on the part of the defendant designed to disrupt the relationship; (4) actual disruption of the relationship; and (5) economic harm to the plaintiff proximately caused by the acts of the defendant. *Korea Supply Co. v. Lockheed Martin Corp.*, 63 P.3d 937, 950 (Cal. 2003).

132. *Maurel v. Smith*, 271 F. 211, 215 (2d Cir. 1921) (holding that a work could only be used under the conditions described in an agreement between a joint author and the publishers).

133. RESTATEMENT OF THE LAW 3D, RESTITUTION AND UNJUST ENRICHMENT § 17 ("A transfer by an agent, trustee, or other fiduciary outside the scope of the transferor's authority, or otherwise in breach of the transferor's duty to the principal or beneficiary, is subject to rescission and restitution. *The transferee is liable in restitution to the principal or beneficiary as necessary to avoid unjust enrichment.*" *Emphasis added.*); *see Cambridge Literary Props., Ltd. v. W. Goebel Porzellanfabrik G.m.b.H. & Co. Kg.*, 510 F.3d 77, 102 (1st Cir. 2007) (Cyr, J. dissenting) (characterizing the relationship between copyright co-owners as fiduciary); *Johnson v. Berry*, 171 F. Supp. 2d 985, 991 (E.D. Mo. 2001) (citing cases both ways and describing the proposition as unsettled); *but see Willis v. Scorpio Music (Black Scorpio) S.A.*, No. 15cv1078 BTM(RBB), 2016 U.S. Dist. LEXIS 6179, at *10 (S.D. Cal. Jan. 19, 2016) (rejecting theory, citing two district court opinions for the proposition that "courts have rejected the proposition that a duty to account to a co-owner is tantamount to owing a fiduciary duty").

134. "[A] grantor may not convey greater rights than it owns." *Gilliam v. ABC*, 538 F.2d 14, 21 (2d Cir. 1976); *Photographic Illustrators Corp. v. Orgill, Inc.*, 118 F. Supp. 3d 398, 403 (D. Mass. 2015). In *Gilliam*, the British Broadcasting Corporation granted the American Broadcasting Company a license to edit Monty Python's Flying Circus episodes, but the Monty Python's screenwriters' agreement highly controlled the editing the group would allow. ABC was enjoined from broadcasting the edited episodes:

preventing the licensee from further distribution of the software out of compliance with the open source license.¹³⁵ And if the licensee was not aware of the nature of the software it received, and is only a user of the software, the open source license will often still allow the user to continue to use the software,¹³⁶ meaning there is no harm to the innocent recipient of the improper license.

Thus, the likelihood that a co-owner would be able to successfully grant a different license, or would be willing to take the legal risk of doing so, is quite low.¹³⁷

b. Joinder of All Co-Owners

It is well-settled that a joint owner does not have to join the other co-owners in an action for infringement.¹³⁸ Joinder may be desirable where the validity of the copyright is challenged, because the outcome

If the broadcast of an edited version of the Monty Python program infringed the group's copyright in the script, ABC may obtain no solace from the fact that editing was permitted in the agreements between BBC and Time-Life or Time-Life and ABC. BBC was not entitled to make unilateral changes in the script and was not specifically empowered to alter the recordings once made; Monty Python, moreover, had reserved to itself any rights not granted to BBC. Since a grantor may not convey greater rights than it owns, BBC's permission to allow Time-Life, and hence ABC, to edit appears to have been a nullity.

Id. Although the issue generally arises in the context of a licensee grant to a sublicensee, there is no reason that the same principle would not hold true where it is a joint owner as licensor making the grant contrary to the terms of the agreement with the other co-owners. *Cf.* *Richards v. Platz*, 920 F. Supp. 2d 1316, 1345 (N.D. Ga. 2013) (two of four co-authors' ability to exploit the work was limited by the scope of the work in which they were co-owners).

135. Of course since open source licenses are available to all, the licensee could simply revert to the project's open source license. And, it would be a private matter between the wrongdoing joint author and its licensee whether their private contract with the impermissible license grant was, as a whole, voidable or simply reformed without the improper grant.

136. *See, e.g.*, GPLv2, *supra* note 7, at ¶ 4; GNU AFFERO PUBLIC LICENSE VERSION 3, ¶ 8 (Nov. 19, 2007), <https://www.gnu.org/licenses/agpl.html> [<https://perma.cc/GA25-FZQR>]; MPLV2, *supra* note 42, at § 5.3.

137. *See also* F. Jay Dougherty, *Not a Spike Lee Joint? Issues in the Authorship of Motion Pictures Under U.S. Copyright Law*, 49 UCLA L. REV. 225, 326 (suggesting that courts should re-examine the judge-made rules relating to the right to exploit a work and to a pro rata share in the proceeds).

138. *Davis v. Blige*, 505 F.3d 90, 99 (2d Cir. 2007) citing 17 U.S.C. § 501(b) (noting that a court "may require" an owner of a copyright to serve notice on a person who is shown "to have or claim an interest in the copyright" and "may require the joinder ... of any person having or claiming an interest in the copyright"); *Broad. Music, Inc. v. Evie's Tavern Ellenton, Inc.*, 772 F.3d 1254, 1258 n.2 (11th Cir. 2014) ("Previously, the Eleventh Circuit has not explicitly adopted the rule set forth by the Second Circuit in *Davis v. Blige*, 505 F.3d 90, 99 (2d Cir. 2007), that a copyright co-owner may maintain and recover in a copyright infringement action without joining other co-owners. We do so now."); *Edward B. Marks Music Corp. v. Jerry Vogel Music Co.*, 140 F.2d 266, 269 (2d Cir. 1944) ("It was early decided that the holder of the legal title to a copyright might sue without joining others who had an equitable interest in the copyright."); *Copyright.net Music Publ'g LLC v. MP3.com*, 256 F. Supp. 2d 214, 218 (S.D.N.Y. 2003) (holding that copyright infringement plaintiffs were not obligated to join alleged co-owners of compositions at issue). The author of this article could find no case where one author was seeking relief for infringement and a joint author was held to be a necessary party,

of the litigation may permanently affect the rights of the other co-owners, but is not needed where infringement alone is alleged.¹³⁹

There are, though, no cases involving so many authors. When confronted with the possibility of hundreds of co-authors, a court may be skeptical that a single author should or could represent the interests of all of them. The court may therefore consider joinder. Joinder is required, when: (1) relief cannot be accorded in the person's absence, or (2) "th[e] person claims an interest relating to the subject of the action and is so situated that the disposition in the person's absence may (i) as a practical matter impair or impede the person's ability to protect that interest or (ii) leave any of the persons already parties subject to a substantial risk of incurring double, multiple, or otherwise inconsistent obligations by reasons of the claimed interest."¹⁴⁰ If an indispensable party cannot be joined, then the suit might be dismissed.¹⁴¹

Joinder, or a dismissal for lack of joinder, is nevertheless unlikely because the lawsuit over open source software will generally be limited in scope. It may be that the suit involves only a question of law interpreting the unorthodox license language, in order to decide whether the licensee is in compliance. In that case, whether there is one owner as plaintiff and 49 absent ones, or 50 plaintiffs, the same legal conclusion will be reached.¹⁴² Or, the suit may involve understanding how the accused software is functionally related to copyleft-licensed software, but these facts will be the same no matter who or how many

139. *Shady Records, Inc. v. Source Enters.*, No. 03 Civ. 9944 (GEL), 2004 U.S. Dist. LEXIS 26143, at 53-54 (S.D.N.Y. Dec. 30, 2004) (denying joinder: "the Source Parties assert that the suit must be dismissed because Shady has failed to join all the co-owners of the Works. But the Source Parties misunderstand the law, which merely permits courts to require joinder of co-owners where desirable. Generally speaking, joinder will be desirable where the validity of the copyright is challenged such that the outcome of the litigation may permanently affect the rights of the co-owner, but not where infringement alone is alleged. This action does not call into question the underlying validity of Shady's copyright," citations omitted); *Gaines v. Fusari*, No. 11-4433 (WJM), 2012 U.S. Dist. LEXIS 102654, at *16 (D.N.J. July 24, 2012) (noting in dicta that a co-owner would likely be an indispensable party where a claim might affect her ownership share of a copyright); *Cogniplex, Inc. v. Hubbard Ross, L.L.C.*, Nos. 00 C 7463, 00 C 7933, 2001 U.S. Dist. LEXIS 11113, at *12 (N.D. Ill. Apr. 26, 2001) (holding that possible co-owners did not need to be joined to decide rights under a license); *Wales Indus. v. Hasbro Bradley, Inc.*, 612 F.Supp. 510, 517 (S.D.N.Y. 1985) ("The recently enacted Copyright Act vests discretion in the Court to 'require the joinder ... of any person having or claiming an interest in the copyright.' Absent special circumstances joinder should be required in cases challenging the validity of the copyright upon which rest the rights of the person to be joined and should not be required if the only issue is whether the defendant engaged in unlawful copying" and holding this was the special circumstance that required joinder).

140. FED. R. CIV. P. 19(a).

141. FED. R. CIV. P. 19(b) ("If a person who is required to be joined if feasible cannot be joined, the court must determine whether, in equity and good conscience, the action should proceed among the existing parties or should be dismissed," then providing factors to consider).

142. See *Parsons v. Bristol Dev. Co.*, 402 P.2d 839, 842 (1965) (stating that interpretation of a written instrument is a judicial function); *Bethlehem Steel Co. v. Turner Constr. Co.*, 2 N.Y.2d 456, 460 (1957) (stating that where the intention of the parties may be gathered from the four corners of the instrument, the interpretation of a contract is a question of law).

plaintiffs there are.¹⁴³ Whether the plaintiff made a copyrightable contribution and is therefore a joint author with standing to bring the suit may be challenged, but that challenge will be specific to that author; it is unlikely that a defendant could make a colorable validity attack on the entire project by claiming that it is not copyrightable at all. Even the possibility of a financial award does not require joinder since the duty of accounting doesn't involve the defendant: "[if] the money was not divided among co-owners of the compositions, then the proper suit would be between these co-owners, not the co-owners against defendant."¹⁴⁴ So while allowing one author to assert the rights of all joint authors may seem counterintuitive, there is no principled reason why it cannot be done.¹⁴⁵

The sequential derivative works theory has the opposite risk, an inability to have enough plaintiffs for a lawsuit. Where there are so many owners of incremental copyrights, it may be necessary to join a number of contributors as plaintiffs in order to state a colorable claim for infringement. If an infringer has copied the code comprehensively, but not literally,¹⁴⁶ it may mean that a significant number of plaintiffs have to be joined to make out the infringement claim.

The prospect that all joint authors will have to be joined is not a realistic one and thus, not a reason to avoid a claim that the free software project is the work of joint authors. The sequential derivative works theory is actually the one with a greater likelihood that more plaintiffs must be joined.

2. Joint Authorship May Have Advantages

As noted,¹⁴⁷ the concept that an open source software project is the work of copyright joint authors is so apt that its simple availability as a viable ownership theory commends it. However, it may also have some advantages over the serial derivative work ownership theory.

143. See *infra* note 154 and accompanying text noting disagreement over whether licenses should be enforced. However, the advisability of using legal process to enforce licenses does not change the reasoning a factfinder will use to reach its conclusion.

144. Copyright.net Music Publ'g LLC v. MP3.com, 256 F. Supp. 2d 214, 218 (S.D.N.Y. 2003).

145. See *infra* note 152 and accompanying text regarding procedural safeguards that will also protect the absent owners.

146. See *Nimmer, supra* note 8, at § 13.03[A] for explanation of "comprehensive nonliteral similarity" and "fragmented literal similarity." Another similar theory used specifically for software is copying of the "structure, sequence and organization" of the software, *Whelan Assocs. v. Jaslow Dental Lab., Inc.*, 797 F.2d 1222, 1248 (3d Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987) ("We hold that copyright protection of computer programs may extend beyond the programs' literal code to their structure, sequence, and organization"), approved in *Oracle Am., Inc. v. Google Inc.*, 872 F. Supp. 2d 974 (N.D. Cal. 2012), *rev'd and remanded by Oracle Am., Inc. v. Google Inc.*, 750 F.3d 1339 (Fed. Cir. 2014).

147. See *supra* notes 107-109 and accompanying text.

a. Joint Authorship Discourages FOSS Trolling

It is already the case that at least one contributor to a free software project is exploiting his ownership to extract money from companies that breach open source licenses.¹⁴⁸ This is viewed as highly harmful to the free software movement.¹⁴⁹ A theory that the work is one of joint authorship will put negative pressure on this practice.

Copyright co-owners have a duty of accounting to the other co-owners.¹⁵⁰ In the absence of an agreement, the revenue will be shared equally by all joint owners regardless of the amount of their contribution.¹⁵¹ This limits the appeal an author may see in pursuing a compliance suit for monetary gain: the more authors there are, the smaller the share that the renegade plaintiff will be able to keep.

There is also procedural discouragement. A court may require that a copyright plaintiff serve written notice of the action to any person that has an interest in the copyright.¹⁵² Given the large number of joint authors not involved in the suit, a court may be highly inclined to order the notice to ensure that the plaintiff is representative of the group interest. With current version control systems and established channels of communication for projects, it will be quite easy to identify other joint authors and provide them with notice. Joint authors who believe that the plaintiff's demands are harmful can intervene in the lawsuit and try to correct its course.¹⁵³

148. Richard Fontana, *Seven Notable Legal Developments in Open Source in 2016*, 8 INT'L FREE & OPEN SOURCE L.R. 59, 60–61 (2016) (describing Patrick McHardy case); Bradley M. Kuhn & Karen M. Sandler, *The Importance of Following Community-Oriented Principles in GPL Enforcement Work*, SOFTWARE FREEDOM CONSERVANCY (July 19, 2016), <https://sfcon.servancy.org/blog/2016/jul/19/patrick-mchardy-gpl-enforcement/> [<https://perma.cc/8NGM-4PCX>]; Mark Radcliffe, *Free and Open Source Software Litigation in 2016*, 3-4 (Dec. 21, 2016), <https://www.slideshare.net/markradcliffe/free-and-open-source-software-litigation-in-2016> [<https://perma.cc/U78M-U88D>].

149. Kuhn & Sandler, *supra* note 148.

150. *Corbello v. DeVito*, 777 F.3d 1058, 1062 (9th Cir. 2015) (duty to account for licensing income); *Brownstein v. Lindsay*, 742 F.3d 55, 68 (3d Cir. 2014); *Oddo v. Ries*, 743 F.2d 630, 633 (9th Cir. 1984), citing *Shapiro, Bernstein & Co. v. Jerry Vogel Music Co.*, 221 F.2d 569 (2d Cir. 1955), *modified on reh'g*, 223 F.2d 252 (2d Cir. 1955); *Jerry Vogel Music Co. v. Miller Music, Inc.*, 272 A.D. 571, 575 (App. Div. 1947), *aff'd*, 299 N.Y. 782 (1949) (duty to account for licensing income). The rule was the same under the previous Copyright Act. See H.R. REP. NO. 94-1476 at 121 (1976) (“There is also no need for a specific statutory provision concerning the rights and duties of the coowners of a work; court-made law on this point is left undisturbed. Under the bill, as under the present law, coowners of a copyright would be treated generally as tenants in common, with each coowner having an independent right to use of license the use of a work, subject to a duty of accounting to the other coowners for any profits.”).

151. *Sweet Music, Inc. v. Melrose Music Corp.*, 189 F. Supp. 655, 658 (S.D. Cal. 1960) (holding that, since the agreement was silent, the royalty share was divided equally even though the relative contributions to the joint work were 3/4 and 1/4).

152. 17 U.S.C. § 501(b) (2012).

153. *Id.* (stating “The court ... shall permit the intervention, of any person having or claiming an interest in the copyright,” emphasis added).

b. License Compliance Work Will Be Easier

Consider now a claim for injunctive relief. The suit for injunctive relief is only asking that the defendant abide by the same rules that every other user of the software must follow, rules that are defined in a document that everyone has agreed controls. While there are many who disagree with copyright litigation as a means for encouraging license compliance,¹⁵⁴ and many disagree over what the words of the licenses actually mean,¹⁵⁵ unlike with FOSS trolling, where currently the benefits accrue to the successful troll only, a suit for injunctive relief benefits the community as a whole by ensuring there is a level playing field.

The weakness of license compliance work based on the sequential derivative works theory is that the author can claim infringement of only the author's contribution. That contribution may be only a small portion of the work, allowing the defendant to more easily claim that the fragment is not sufficiently creative to be copyrightable. Where, instead, the infringement claim is of the entire work—which the joint author has the right to enforce—attacks on the validity of the copyright will be much easier to defeat.

c. No Author Can Hold-up the Project

On rare occasions, a contributor to an open source software project will try to revoke the license in the contribution.¹⁵⁶ Under the inbound = outbound theory, the contributor has granted an implied license; however, a license for which there has been no consideration is revocable.¹⁵⁷ Consider the effect of a contributor revoking the license

154. See Jonathan Corbet, *The Kernel Community Confronts GPL Enforcement*, LWN.NET (Aug. 31, 2016), <https://lwn.net/Articles/698452/> [<https://perma.cc/KDQ7-FSYY>].

155. Compare ROSEN, *supra* note 7, at 120 (“the legal analysis of what constitutes a derivative work simply doesn’t depend upon the style or mechanism of inter-program linking”) with *Frequently Asked Questions About the GNU Licenses*, GNU OPERATING SYSTEM, <https://www.gnu.org/licenses/gpl-faq.html#GPLStaticVsDynamic> (last updated Jan. 1, 2018) (“Linking a GPL covered work statically or dynamically with other modules is making a combined work based on the GPL covered work. Thus, the terms and conditions of the GNU General Public License cover the whole combination”) [<https://perma.cc/V529-6Q4Z>].

156. Cf. Rupert Godwins, *Another Test for the GPL*, ZDNET (Jan. 27, 2008), <http://www.zdnet.com/article/another-test-for-the-gpl/> (describing developer who was “withdrawing two packages from the GPL”) [<https://perma.cc/L8XY-T4KA>]; Kik, *Left-pad and NPM*, NPM (Mar. 23, 2016), <http://blog.npmjs.org/post/141577284765/kik-left-pad-and-npm> (describing where a developer unpublished a software package resulting in the failure of thousands of websites and its restoration over the objection of the developer) [<https://perma.cc/YA9C-KXWH>].

157. *Ortiz v. Guitian Music Bros.*, No. 07 Civ. 3897, 2009 U.S. Dist. LEXIS 65191, at *8 (S.D.N.Y. July 22, 2009) (“Indeed, absent consideration, nonexclusive licenses are revocable.”); *Johnson v. Jones*, 885 F. Supp. 1008, 1012 n.6 (E.D. Mich. 1995). However, justifiable and detrimental reliance on the grant can be a substitute for consideration and the agreement enforced on a promissory estoppel theory. *Signal Hill Aviation Co. v. Stroppe*, 96 Cal. App. 3d 627, 640, 158 Cal. Rptr. 178, 185 (1979); *Kaye v. Grossman*, 202 F.3d 611, 615 (2d Cir. 2000) (“A cause of action for promissory estoppel under New York law requires the plaintiff to prove three elements: 1) a clear and unambiguous promise; 2) reasonable and

in a heavily integrated contribution: it may be exceptionally difficult to disentangle. But joint authorship relies on the intent of the authors at the time the work was created,¹⁵⁸ which is a matter of the objective manifestation of their intent at the time of the contribution and thus not subject to post hoc turnabout.¹⁵⁹ A joint author will not be able to hold up a project by claiming that the contribution has to be removed after a later change of heart.

d. Copyright Registration Is More Likely to be Timely

Registering the copyright in the work before the infringement begins¹⁶⁰ is considerably easier. Rather than a sequence of small, incremental works, the “work” will be a portion of code that will more naturally be considered complete—a file, a collection of files that perform a function, a module. A series of subsequent modifications will probably often be revisions,¹⁶¹ not the creation of a new work. Packaging a new release would be an appropriate point in time for a new registration, but even without a new registration, a copyright claimant can still bring suit against the copyist of a newer release with the older registration.¹⁶²

Given what may be a large number of authors for a given work, registration will still be challenging. A copyright registration for a work of joint authorship must name all the authors.¹⁶³ However, with version control systems we can identify the contributors (albeit, who are not necessarily the authors¹⁶⁴) at least by nickname, and one may

foreseeable reliance on that promise; and 3) injury to the relying party as a result of the reliance.”).

158. *See supra* notes 99–100 and accompanying text.

159. *Aalmuhammed v. Lee*, 202 F.3d 1227, 1234 (9th Cir. 2000) (stating that determining whether there is joint ownership is based on part on the objective manifestations of a shared intent to be co-authors; “We say objective manifestations because, were the mutual intent to be determined by subjective intent, it could become an instrument of fraud.”)

160. *See supra* note 60 and accompanying text on value of early registration.

161. *See supra* note 17 and accompanying text discussing “revision.”

162. One can generally enforce the copyright in an underlying work against a copy of a derivative work. *Montgomery v. Noga*, 168 F.3d 1282, 1293 (11th Cir. 1999); *SimplexGrinnell, LP v. Integrated Sys. & Power, Inc.*, 642 F. Supp. 2d 206, 213 (S.D.N.Y. 2009); *but cf.* *Well-Made Toy Mfg. Corp. v. Goffa Int’l Corp.*, 354 F.3d 112, 117 (2d Cir. 2003) (copyright registration for 20” doll was not a registration of a 48” derivative work because of changes made in proportion for aesthetic reasons). Note that this theory will not be of much use in claiming infringement of sequential derivative works. It has not been tested where the claimant does not own the entire copyright in all versions of the work, that is, where the copyright claimant is asserting infringement of only portions created at different times. And the claim will still be limited to only that particular author’s copyrighted content.

163. *Compendium, supra* note 12, at § 613.5 (“If the work submitted for registration is a joint work the applicant should provide the name of each author who contributed copyrightable authorship to the work that the applicant intends to register.”).

164. *See supra* note 18 discussing difficulty of ascertaining authorship. Further, version control systems also do not keep track of whether a contributor’s change remains in the distribution—it may have been removed by a later modification.

use a pseudonym for an author's name.¹⁶⁵ No matter what the burden though, it will be less than all the same authors registering each of their contributions individually.¹⁶⁶

e. Contributor License Agreements are Less Important

One commonly held belief, at least by lawyers, is that having contributors sign agreements to license their contribution to a project is good practice.¹⁶⁷ Developers, though, see contributor license agreements as ranging from unfair¹⁶⁸ to merely an impairment on successful contribution,¹⁶⁹ so eliminating them aids in the project's faster growth.

With joint authorship, at least one of the reasons for a contributor license agreement goes away. One rationale given for the contributor license agreement is that it ensures that the contributor cannot revoke the license,¹⁷⁰ but as noted, joint authorship reduces this risk.¹⁷¹

165. *Compendium*, *supra* note 12, at § 613.9 ("If the work is a pseudonymous work, the applicant is not required to provide the author's full name in the application. Instead, the applicant may insert the author's pseudonym in the Name of Author field/space, provided that the applicant checks the box marked Pseudonymous.").

166. The photography industry found registration challenging because of the volume of images a photographer may create. As a result, in 1995, the Picture Agency Council of America, Inc. met with the Copyright Office and established special procedures for the group registration of photos. In the case of photos, the owner is allowed to name only three authors followed by a statement such as "and (number) others." *Alaska Stock, LLC v. Houghton Mifflin Harcourt Publ'g Co.*, 747 F.3d 673, 677 (9th Cir. 2014). Perhaps the software industry should seek a similar accommodation from the Copyright Office.

167. Bradley M. Kuhn, *Why Your Project Doesn't Need a Contributor Licensing Agreement*, SOFTWARE FREEDOM CONSERVANCY (June 9, 2014), <https://sfconservancy.org/blog/2014/jun/09/do-not-need-cla/> ("Lawyers are trained to zealously represent their clients, and as such they often seek to an outcome that maximizes leverage of clients' legal rights") [<https://perma.cc/U5BB-M696>]; Jonathan Corbet, *The Most Powerful Contributor Agreement*, LWN.NET (Apr. 2, 2014), <https://lwn.net/Articles/592503/> ("But, when company lawyers sit down to write a contributor agreement, they will naturally write that agreement to favor their employers; that is just part of what lawyers do.") [<https://perma.cc/ED3L-32Q9>].

168. Diane Mueller, *Why Foundations, Trade Associations and other Walled Gardens Cling to CLAs*, OPENSIFT (Mar. 17, 2014), <https://blog.openshift.com/keep-calm-and-merge-on-lowering-barriers-to-open-source-contributions-with-apache-v2/> ("It is not always clear why such CLAs are used. Some companies use CLAs with terms that are intentionally unfair or burdensome because there is actually a desire to discourage 'outside' participation based on merit. ... What most uses of CLAs have in common, however, is asymmetry and imposition of red tape for contributors. CLAs usually privilege one company or organization and create legal obstacles for those who seek to participate and contribute.") [<https://perma.cc/5XLZ-VQGN>].

169. Bryan Cantrill, *Broadening Node.js Contributions*, JOYENT (June 11, 2014), <https://www.joyent.com/blog/broadening-node-js-contributions> ("Even at their very best, CLAs and copyright assignments act as a drag on contributions as new corporate contributors are forced to seek out their legal department—which seems like asking people to go to the dentist before their pull request can be considered.") [<https://perma.cc/JM4V-Q9GC>].

170. Tony Guntharp, *CLAHub - CLA's Done Right*, FUSION94.ORG (Jan. 16, 2013), <http://fusion94.org/2013-01-16-clahub-clas-done-right/> (describing the CLA as ensuring that the contributor had the right to make the contribution and prevents the contributor from withdrawing permission) [<https://perma.cc/7B9K-XT45>].

171. *See supra* notes 156–159 and accompanying text.

3. What Joint Ownership Doesn't Change

A theory of joint ownership of free software projects changes very little in practice. The same people will be authors because in all cases one has to have made a copyrightable contribution.¹⁷² The difference is only in the size of the work authored—joint authors sharing an undivided interest in the whole, as opposed to each sequential owner owning a small individual piece, which we assume they have agreed others may use.

One of the perceived benefits of having a software distribution consisting of a number of solely owned copyrights is that everyone must consent to changing the license.¹⁷³ This remains true with a joint ownership model because it would still take all the authors to agree to change their joint ownership agreement, the license.¹⁷⁴

There is a distinction when it comes to reuse of the code. Under the theory that a contribution is solely owned, one thing a copyright owner can do with the contribution is make it available under a variety of licenses. For example, the author could contribute code to a copyleft project and then reuse the same code in a permissively licensed project. In the joint authorship theory, just as with the offer of a different license for nefarious purposes, a reuse even just for a different free software project would be a breach of the co-author's agreement.¹⁷⁵ However, query how often this actually arises in the context of an interdependent or inseparable work.

Many free software projects find it beneficial to have contributors sign an agreement that either licenses or assigns the authors' copyrights in their contributions to the project.¹⁷⁶ The very point of the

172. Under the theory of joint authorship, most courts hold that a person's contribution has to be copyrightable for the person to be considered a joint author. *Childress v. Taylor*, 945 F.2d 500, 507 (2d Cir. 1991); *Thomson v. Larson*, 147 F.3d 195, 200 (2d Cir. 1998); *Seshadri v. Kasraian*, 130 F.3d 798, 803 (7th Cir. 1997); *Erickson v. Trinity Theatre, Inc.*, 13 F.3d 1061, 1071 (7th Cir. 1994).

173. See *supra* note 95. This is also a bug, in that it prevents changing a flawed license or updating to a newer version of a license. See, e.g., Thomas Claburn, *Inside OpenSSL's Battle to Change Its License: Coders' Rights, Tech Giants, Patents and More*, THE REGISTER (Mar. 24, 2017), https://www.theregister.co.uk/2017/03/24/openssl_asks_contributors_to_agree_to_apache_license/ [<https://perma.cc/D7RG-G6BX>]; *Relicensing Dolphin: The Long Road to GPLv2+*, DOLPHIN EMULATOR (May 25, 2015), <https://dolphin-emu.org/blog/2015/05/25/relicensing-dolphin/> (describing the difficulty of changing from the GPLv2 license to the GPLv3 license) [<https://perma.cc/T39U-NTSN>].

174. *Anderson v. Educational Publishers, Inc.*, 133 F. Supp. 82, 88 (D. Minn. 1950) (publishing contract for jointly owned work, which could only be terminated by both authors, could not be terminated when one of the authors' heirs had not joined in the termination).

175. This may be a favorable turn of events, too, if it means that contributors will be more willing to contribute knowing that their contributions cannot be extracted and used elsewhere.

176. See, e.g., Eben Moglen, *Why the FSF Gets Copyright Assignments From Contributors*, GNU OPERATING SYSTEM (Apr. 12, 2014), <https://www.gnu.org/licenses/why-assign.en.html> [<https://perma.cc/U95J-DJHR>]; *Contributor License Agreement*, .NET FOUNDATION, <https://cla.dotnetfoundation.org/> (last visited Mar. 11, 2018) [<https://perma.cc/7Y3X-NSNG>]; *Licensing of Distributions*, APACHE SOFTWARE FOUNDATION, <http://www.apache.org/licenses/#clas> (last visited June 25, 2017) [<https://perma.cc/J97C-BFKL>]; *Canonical Contributor*

express agreement is to clarify what the relationship is between the other project authors and the contributor. Therefore, where there is a contributor license agreement, likely there will be no need to rely either on the inbound = outbound theory or joint authorship, since the express terms will control. For example, the Oracle Contributor Agreement is ambiguous about whether it creates a joint authorship relationship or instead just a joint ownership,¹⁷⁷ but it is entirely clear that Oracle may do whatever it pleases with the contribution, as may the contributor.¹⁷⁸

The theory of joint ownership, therefore, would have very little effect on the day-to-day operations of free software projects.

III. EXAMPLES OF THE COMPLEXITY OF FREE SOFTWARE OWNERSHIP

There is no single answer for who owns the copyright in free and open source software projects. All types of ownership and works—single or joint, initial, derivative or collective—may coexist or morph over time.

Consider for example software developed by a company that later decides to make it publicly available as an open source library. The company is the author of the initial work as a work made for hire. The company then requires a contributor license agreement for contributions made by non-employees. There is no intent here to create a joint work on the part of the company, so the iterations will be a series of derivative works, or if the “dominant author” theory¹⁷⁹ applies, the company is still the only copyright owner.

As another example, consider a fork.¹⁸⁰ The initial work may be a work of joint authorship, but some contributors become dissatisfied

License Agreement, UBUNTU, <https://www.ubuntu.com/legal/contributors> (last visited June 25, 2017) [<https://perma.cc/U2DH-JCTK>]; *OpenStack Project Individual Contributor License Agreement, OPENSTACK*, <https://review.openstack.org/static/cla.html> (last visited June 25, 2017) [<https://perma.cc/934G-DRLJ>].

177. “With respect to any worldwide copyrights, or copyright applications and registrations, in your contribution: you hereby assign to us joint ownership, and to the extent that such assignment is or becomes invalid, ineffective or unenforceable, you hereby grant to us a perpetual, irrevocable, non-exclusive, worldwide, no-charge, royalty-free, unrestricted license to exercise all rights under those copyrights.” ORACLE CONTRIBUTOR LICENSE AGREEMENT VERSION 1.2.1, § 2, <http://www.oracle.com/technetwork/oca-405177.pdf> (last visited Apr. 2, 2017) [<https://perma.cc/YY4R-FMCZ>].

178. “[Y]ou agree that each of us can do all things in relation to your contribution as if each of us were the sole owners, and if one of us makes a derivative work of your contribution, the one who makes the derivative work (or has it made) will be the sole owner of that derivative work.” *Id.* See also APACHE INDIVIDUAL CONTRIBUTOR LICENSE AGREEMENT V2.0, <https://www.apache.org/licenses/icla.pdf> (last visited Apr. 1, 2017) (“You hereby grant to the Foundation and to recipients of software distributed by the Foundation a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare derivative works of, publicly display, publicly perform, sublicense, and distribute Your Contributions and such derivative works”) [<https://perma.cc/2QAS-VNDB>].

179. See *supra* notes 80–93 and accompanying text.

180. “Fork” here is meant in its original sense, where there was a schism and individuals start independent development on existing code to create a distinct and separate piece

with the direction of the project and decide to split off and take it in a new direction. The newly created fork may be a derivative work of a joint work, and, as more authors join the new project, the fork will be a joint work that is a derivative work of the original project.¹⁸¹

In general terms, a distribution of an operating system combined with user-level applications, like Debian or Fedora, will be a collective work since it is a combination of a number of independently created software projects. Each software component would have its own copyright, sole or joint, and the author(s) of the distribution will have a copyright in the selection, coordination and arrangement of the combination of the constituent parts.

As shown, there is not a single answer. Every situation must be pulled apart and its specific facts examined.

CONCLUSION

Free and open source software was and remains revolutionary. However, there are very few legal decisions that address and interpret the meaning or impact of the licenses,¹⁸² much less reaching questions such as ownership, standing, competence to make the license, and whether the grant was effective. The free software community has yet to navigate these waters.

This paper is meant only to provoke further thought and discussion on copyright ownership of free software projects. Its author does not advocate that anything should or has to change, except to prepare for the inevitable challenge to the settled expectations of authorship that is reaching the free software community borders, and to be ready to put the best theory forward. A too-hasty or thoughtless change, of course, may cause more harm than good—the existing

of software. *Fork (Software Development)*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Fork_\(software_development\)](https://en.wikipedia.org/wiki/Fork_(software_development)) (last visited June 18, 2017) [<https://perma.cc/8JZK-QNPF>]. Examples are the fork of LibreOffice from OpenOffice.org, which itself had been forked from StarOffice, and Amazon's FireOS from Android. *List of Software Forks*, WIKIPEDIA, https://en.wikipedia.org/wiki/List_of_software_forks (last visited June 18, 2017) [<https://perma.cc/SVL8-NDDY>]. However, the word is taking on a new meaning as the result of distributed version control systems, where there are many local copies, also called “forks,” of the canonical repository, the “blessed” repository. See Daniel M. German et al., *Continuously Mining Distributed Version Control Systems: An Empirical Study of How Linux Uses Git*, 21 *EMPIRICAL SOFTWARE ENGINEERING* 260, 267 (2016), <https://link.springer.com/article/10.1007/s10664-014-9356-2> [<https://perma.cc/37JZ-ZGQM>].

181. See, e.g., *Weissmann v. Freeman*, 868 F.2d 1313 (2d Cir. 1989) (one of the joint authors created a derivative work of their joint work).

182. *Jacobsen v. Katzer*, 535 F.3d 1373, 1382 (Fed. Cir. 2008) (construing the scope of the Artistic License); *Wallace v. IBM*, 467 F.3d 1104, 1108 (7th Cir. 2006) (open source software licenses are not a violation of antitrust law); *Artifex Software v. Hancorn, Inc.*, No. 16-cv-06982-JSC, 2017 U.S. Dist. LEXIS 62815 (N.D. Cal. Apr. 25, 2017) (alleging failure to comply with GNU General Public License stated a claim for breach of contract); *Ximpleware Corp. v. Versata Software, Inc.*, No. C 13-05160 SI, 2014 U.S. Dist. LEXIS 16740, at *9 (N.D. Cal. Feb. 4, 2014) (denying a motion to dismiss asserting that providing code to independent contractors was not a breach of the GNU General Public License).

model works quite well under many countries' laws, so nothing should change without understanding how a nudge in one direction might have deleterious effect on the outcome, whether under a foreign legal regime or a ripple effect in the same legal system.

But it is time for free software advocates to critically evaluate the risks of the existing structures and assumptions and strategize how they will ensure the system survives. This paper suggests one way to embrace joint authorship with knowledge of its weaknesses. Or it might be too late for a change, the communal understanding is baked into the history and evolution of free software, so staying the course, as rocky as it may be, is the best way forward. There may be a third, or a fourth, option no one has yet proposed. Whatever the result, the conversation should start.

