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(doi: 10.53227/108469)

Rivista di Digital Politics (ISSN 2785-0072)

Fascicolo 2, maggio-agosto 2023

Ente di afferenza:

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FLOSS AND OPEN EDUCATIONAL RESOURCES AS A RESPONSE TO NEOLIBERALISM

This paper proposes that we think of the modern, technology-enabled open movement as a powerful response to the neoliberalism which exploded in the United States and United Kingdom during the Eighties and gained far wider hegemony in the following decades. This iteration of open may be seen as starting with the free software movement in the Us, whose approach to dealing with the classically liberal foundations of Us copyright law was an explicit model for other parts of the open movement such as the Creative commons (Cc), open education, and open educational resources. This version of the recent history of open is a little different from the one that is often told today. However, it has the benefit of making clearer the sequence of innovations from which the modern open movement arose, how that movement stands firmly in opposition to the negative impacts of neoliberalism, and how it opposes attacks on academic and other freedoms. Clarifying these oppositions also makes clear what is at stake when we fight for increased use and availability of Open educational resources (Oer), and gives us a lens through which to consider various proposals for supporting that increase. We finish with both individual and collective strategies for helping increase the availability of Oer.

KEYWORDS *Neoliberalism, Copyright, Free/libre/open-source, Software, Creative Commons, Open Educational Resources.*

1. Roots of «open»

The history of the modern open movement is best understood as the result of a negotiation between various visions of how to allocate resources. On the one side is an approach based on somewhat intangible normative ideas such as the common good, academic freedom, and other notions of freedom and human rights, often encoded in lofty statements of principle. On the other side is a more gritty, practical approach based on market-based feedback mechanisms which run from gentle beginnings in classical liberalism through to the rather more ruthless neoliberal version which holds sway today in the United States, United Kingdom, and, increasingly, in other parts of the industrialized (and post-industrial) world.

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For the insight it can give us on how to move forward, let us trace the broad strokes of this history. In fact, the way this history is often told today somewhat hides¹ the significant debt that open science, open education, and Creative commons (Cc) in general, with its roughly two billion (Stihler 2023) openly licensed works – works of art, research papers, educational resources, etc. – owes to the pioneering work around Free/libre/open-source software (Floss).

We structure this tale around «Copyright law» and locate it in the Us because the Us is both the leading champion of neoliberalism and the country where Floss started.

2. Copyright I: liberal beginnings

In the Us, intellectual property law stems from Article I, section 8, clause 8, of the Us Constitution², known as the «Copyright clause», which reads: «The Congress shall have power [...] to promote the progress of Science and useful Arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries».

This clause includes its own self-justification: the patent and copyright laws Congress creates, based on this constitutional authority, are intended to promote science and (useful?) arts. The idea was that a kind of monopoly power with limited duration over ideas, in patents, and writings, in copyright, would get those lazy bohemians off the couch to invent and to write, in the knowledge that they would be able to profit from their inventions and writings.

The implied argument here seems fairly simple:

- a greater production of, and new forms of, Science and useful Arts are a common good worthy of support;
- inventors and artists must be offered the promise of future profits in order for them to be motivated to create more, and new, Science and useful Arts;
- an appropriate way to create a reasonable profit motive is to offer creators a monopoly of limited duration for their inventions and artistic creations.

¹ See, e.g., the version of history told in the course materials for the Certificate course (Cc) (Creative commons 2021). Except where otherwise indicated, this work is by Jonathan A. Poritz and is released under a Creative Commons Attribution-ShareAlike 4.0 International license.

² See, <https://www.govinfo.gov/content/pkg/GPO-CONAN-1992/pdf/GPO-CONAN-1992-6.pdf#page=8>.

Hopefully no one will argue with 1), although on its own it would lead to the questions of «who» would support this common good and «how» the support will be structured. One obvious answer to those questions, by the way, would be for the government to pay for this (and other) common goods directly, with general funds raised by taxes.

Instead, point 2) proposes to support this good with the strategy of liberalism – not particularly surprising given that the Constitution was written in a moment when liberal politics were ascendant, and by political liberals³. Liberalism sees a way to produce the common good of Science and useful Arts by using a market funded by the consumers in which creators will be motivated by hope of profit to get up and do the creation.

One interesting thing about the classical period of liberalism, particularly when contrasted with the more extreme form of neoliberalism currently dominant in the Us and elsewhere, is that the authors of the Constitution felt that neither completely pure free markets nor too heavy government intervention were the best course. Perfectly free markets have so much uncertainty for potential innovators that they would hesitate to bring to market new Science and useful Arts in the fear that others would steal their ideas and then their profits. But too much government intervention could be swayed to the advantage of particular elites.

Instead, in point 3), they corrected the market by creating government-granted monopolies – patents and copyrights – while, at the same time, limiting their duration in order to avoid onerous, permanent economic fiefs. This mechanism is focused on boosting the «first-mover advantage» (Lieberman and Montgomery 1988) by reducing uncertainty, in certain market situations, about how an innovator will be able to profit after taking the risk of innovating.

3. Copyright II: The Mickey Mouse era

However, there are three obvious problems with the foundations of copyright law as described above, mostly related to points 2) and 3), and in the fundamental market-based approach. First of all, it is really an empirical question as to whether the best way to motivate creators is via the hope for future profits coming from limited-term monopoly control over their creations. Fortunately, some empirical research has been done by Jessica Silbey (2014), described in her book «The Eureka Myth». Interviewing artists, scientists, and engineers, Silbey found that they did not talk about the limited mono-

³ In the sense of «those who like John Locke, Adam Smith, and John Stuart Mill», not in the sense with which that word is used in politics today.

polies awaiting their creations, but instead spoke largely about two issues: one along the lines of needing «a room of one's own» (with time, space, and autonomy) and the other having to do with cultivating social relationships with their audiences, collaborators, and the eyes of posterity. Apparently the typical scientist or artist does not actually think much like a «homo œconomicus».

Second, even assuming that creators are inspired by the prospect of their future limited monopoly, it is not clear whether that monopoly is actually the way profit-maximizing creators would maximize their profits. For example, the author and activist Cory Doctorow has written about how giving away his books for free on his website at the same time they are sold in bookstores and on the Internet has helped him make even more money (Doctorow 2008). Doctorow's anecdotal experience is supported by a study (admittedly small) (Hilton and Wiley 2010), which also found free e-books leading to increased sales of print books. Both Doctorow and independently Amanda Palmer (2014), emphasize the role of an artist's relationship with their audiences to explain their non-traditional (non-market and non-copyright-based) approaches.

Third, it makes sense to be careful about whether the limited monopoly approach is a market correction of the right size. We have just seen that some successful current artists feel (and act as if) these monopolies are unnecessary (or detrimental when exercised) even if fairly short, but there are reasons to think carefully about the long end of their duration as well. So, disregarding Silbey, Doctorow, and Palmer, and falling back on the pure monopoly-reward motivation, note that it is purported to be effective because of the risk-reduction by guaranteed future profit that it offers. But first movers already have some significant advantages (although that can vary with the industry and product; see Lieberman and Montgomery (1988) for the surprisingly subtle story) so we do not want to give them so much additional power here that they establish *de facto* permanent monopoly control over their industries simply by virtue of having been the first to create a product there.

This last point is where the history of copyright in the last several decades seems to go completely off its (liberal) rails. Record labels and movie studios both made huge profits in the mid- and late-twentieth century in the United States and sought to protect the intellectual property that was the basis of those profits⁴ – using copyright law. Essentially, very successful first-movers wanted to make their limited monopolies last much longer, and to protect

⁴ This is already a bit weird, in a certain sense, since only a small portion of the huge profits they made was shared with the actual creators. Nevertheless, it was asserted that there was no point in arguing with what was actually happening on the ground, and cutting those profits to the middlemen would mean «nothing» would get to the artists. See Giblin and Doctorow (2022) for much more detail on this whole story.

them against new technological threats in the Internet Age, by pushing a pair of acts known as the «Sonny Bono» Copyright term extension act (Ctea) and the Digital millennium copyright act (Dmca), both in 1998.

Prior to these two acts, the specifics of copyrights in the Us, including what was covered and how, as well as the duration of a copyright, had been defined and then modified in a series of Copyright acts dating 1790, 1909, and 1976. The term of copyrights started out as 14 years, plus 14 more years if renewed, and by 1976 became the life of the author plus fifty years, or simply 75 years in the case where there was no identifiable author, that is, anonymous works, works produced under a pseudonym, and works created for a corporation or other collective entity.

Then in 1998, with the Ctea, the term of copyrights was extended to the life of the author plus 70 years and, for anonymous, pseudonymous, and corporate works, to the date of creation plus 120 years or date of publication plus 95 years, whichever comes first. Furthermore, these new lengths of copyrights applied «also to works already extant and already under copyright»: older works got a boost of monopoly profit-making lifetimes.

There is simply no way this extension of the lifetimes of copyrights on existing works fits the original justification in the «Copyright clause» of the Constitution. Increasing the prospects for future profits *cannot* be an incentive for the creation of «already existing works», they exist already and no amount of additional incentive today will create more works in the past. That's just the way time works. Instead, one is left with the impression that the Ctea existed solely to continue the income being derived from already existing works by already wealthy and powerful corporations who had been first movers quite some time before.

In particular, one consequence of the Ctea was to extend the life of the Walt Disney Company's copyright on the character «Mickey Mouse», which would have otherwise run out at the end of 2003: under the Ctea, Mickey remained a Disney employee for twenty additional years. As it was found that Disney gave contributions to several of the politicians in Congress involved in passing the Ctea (Ota 1998), it started to seem that Disney (although certainly with the help of the Recording industry association of american –Riaa – and the Motion picture association of america Mpaa) in some sense bought the copyright law it wanted. Some copyright activists have called the Ctea the «Mickey Mouse protection act» for this reason.

The other Copyright law of 1998, the Dmca, is not so much a violation of the fundamental logic of the «Copyright clause» as it is an extremely ambitious extension of powers which might, in some modest form, be necessary to protect basic copyright in the Internet age. The reason is that to the extent that

one believes in copyright that is anything like the original liberal version, the advent of the Internet as the primary distribution mechanism of most copyrighted materials presents an enormous technological problem.

This problem is somewhat masked by common parlance in the Internet age which draws a distinction between «streaming» and «downloading» digital data. In fact, this distinction is a bit of science fiction, as there is absolutely no difference, in terms of bits⁵ moving around on networks. What is different is that the software on the consumer end of a so-called streaming connection politely agrees to erase all of the bits the moment they are off the screen or out of the earbuds of the consumer.

As a consequence, digital data – music and movies, for example – in reality are distributed from vendors to consumers in a form which is very easy to steal, to copy and share in violation of the rights of the copyright holder. Of course, the same thing is true of any book, but with a physical book it was a somewhat tedious process to copy and distribute infringing versions of the copyright-protected material. Not so for digital files.

One response of the middlemen was to create complex technological systems in an attempt to protect the digital data and to prevent them from being copied. These systems are called Digital restrictions management (Drm)⁶ and none of them are actually secure against a determined adversary. This is because the data must actually be present and unwrapped from any Drm at some point, at the very least before going to the screen and earbuds on the consumer's machine. Therefore if the middleman follows a common Drm strategy of scrambling – formally: «encrypting» – the data as they are in transit over the network, there must nevertheless be an unscrambling – «decrypting» – program on the consumer's device, which means a wily (and criminal) programmer can tinker with this program, or other programs on that device, to steal these decrypted data.

Fearing (with some reason) the high-speed copying and illegal distribution of copyrighted materials on the Internet, the Riaa and the Mpaa pushed for legislation to make it illegal to circumvent Drm on copyrighted digital data, and got the Dmca. Section 1201 of this Act states: «no person shall circumvent a technological measure that effectively controls access to a work

⁵ Recall a «bit» is the smallest unit of information: a value which can be either 0 or 1. The term was invented by the great statistician John Tukey – who also coined the term «software» – as a shortened form for «binary digit», meaning a digit of a number written in base two.

⁶ Some say that Drm stands for Digital rights management. «Restrictions» is more accurate.

protected under this title» where «this title refers to Title 17 of the Us Code, which is the law on copyright».

Further, no person shall manufacture, import, offer to the public, provide, or otherwise traffic in any technology, product, service, device, component, or part thereof, that:

- is primarily designed or produced for the purpose of circumventing a technological measure that effectively controls access to a work protected under this title;
- has only limited commercially significant purpose or use other than to circumvent a technological measure that effectively controls access to a work protected under this title; or
- is marketed [...] for use in a technological measure that effectively controls access to a work protected under this title.

Later it is also helpfully specified that in this subsection, to «circumvent technological measure» means to descramble a scrambled work, to decrypt an encrypted work, or otherwise to avoid, bypass, remove, deactivate, or impair a technological measure».

The courts have interpreted these anti-circumvention provisions very broadly, as have corporations and entities like the Riaa whose threats of litigation can be very intimidating even if potential defendants believe they could prevail in the end. The phrase «offer to the public, provide, or otherwise traffic in» circumvention methods and devices, covers, it is alleged, even public academic discussion of security issues in Drm technologies and methods, even of some much more general aspects of computer security research. For specific examples of how this has played out in the real world (Electronic Frontier Foundation 2001; 2002; Borland 2003). But Section 1201 has had a generally chilling effect on academic free speech: implicit in Section 1201 is the idea that talking in public about flaw in a commercial Drm product is as dangerous as other forms of speech denied 1st Amendment protection, such as revealing national secrets or shouting «fire» in a crowded theater. We have seen examples of its effect on security research – even Us President George W. Bush’s Cybersecurity czar Richard Clarke said that the Dmca needs reform for this reason: «I think a lot of people didn’t realize that it would have this potential chilling effect on vulnerability research» (Bray 2002).

Another innovation in the Dmca is a safe harbor provision Section 512 that protects Internet media distribution services like YouTube against litigation for so long as they attempt to respect copyrights. One required action to earn this protection is the «notice and takedown» process, the results of which Internetusers see so frequently when unable to find some audio or video they want. There are also examples of Section 512 being misused, such

as politicians or corporations using bogus copyright infringement notices to force YouTube to take down critical videos and even to shut down the accounts originating that criticism after repeated such notices. The Electronic frontier foundation (Eff) maintains a page called «Takedown Hall of Shame»⁷ at listing the worst of such spurious takedowns.

4. From copyright to copyleft and Floss

There is a small technical point we mentioned when discussing Dm which turns out to have enormous consequences. We said that a programmer could tinker with the software on a machine and copy digital content, whether it is a download or claims to be a live streaming. This is relatively trivial without Dm and of varying difficulty – from easy to hard, but in practice never impossible – with Dm. That is, you can make a copy if your machine does what you tell it to do, runs the programs you want, and doesn't lie to you when you ask its operating system to tell you about hardware and software resources. Hal 9000 and Frankenstein's monster can make circumventing Dm impossible, but a universal Turing machine (Utm)⁸ that you own and can program as you like *cannot*. For this reason, Doctorow refers to the digital media middleman's attempt to rule the Internet with Dm as a «war on general-purpose computing» (Doctorow 2012a) and urges the public to «seiz[e] the means of computation» (Doctorow 2023).

The whole structure whereby middlemen make money by distributing digital media with Dm, which *cannot* be legally removed thanks to the Dmca, is based on locking down the Utms we own. Of course, one might object that the Dmca provides a legal block to circumvention already, but experience shows that digital media which are popular on a mass scale get so much attention that the Dm is quickly removed and the media are posted on file-sharing sites, despite the legal prohibition. At that point, the ethical standards felt by millions of users regarding downloading «just one more» song (or video, e-book, video game, etc.) mean the profit stream of the middlemen may be seriously compromised.

⁷ See, <https://eff.org/takedowns>.

⁸ Alan Turing, the British mathematician who invented computer science and single-handedly had an enormous effect on the outcome of World War II by directing the work of breaking German military codes, defined what is now called a Universal turing machine: very roughly, a device capable of performing any computation which can be clearly stated as an algorithm.

In short, there is a fierce financial motivation for hardware manufacturers to constrain what software can run on their machines, which we should think of as de-universalizing a Utm, and commercial software vendors who provide everything from operating systems to video playback software to prevent the user and owner of a computer from fully controlling it. The hardware approach has, fortunately, been fairly slow. In the personal computer market, it involves a bit of extra hardware in the device called a Trusted platform module, which supports something called «secure boot» (although «restricted boot» would be a more accurate term). On the software level, just about all commercial software participates in this project of controlling users. Operating systems like Windows and MacOS X, players like Adobe Acrobat, essentially every *app* on a smartphone (which would otherwise be a beautiful, portable Utm with built-in digital radio!) that shares audio, video, or ebooks, many hardware drivers running under any operating system: all are actually working for their corporate originators, not the consumer who runs them.

The good news, on the software front at least, is that there is an excellent alternative which keeps consumers in control of their own powerful Utms: «free software».

This term does not refer to the cost of the software. English lacks a distinction between «free meaning costs nothing» and «free meaning unrestricted» or «not under someone else's control», but many other languages do have this distinction: «gratis», «gratuit», and «kostenlos» mean «costs nothing» in Italian, French, and German, respectively, while «libero», «libre», and «frei» mean «unrestricted» in the same languages. The kind of freedom we mean when talking about software is the one that has to do with lack of restrictions, not lack of cost. «Free» as in «free speech», not as in «free beer», Richard M. Stallman *and colleagues* (2002) defined it, around the time he started the Free software foundation (Fsf) in the mid-Eighties.

Another term more frequently used today than «free software» is «open source software», but this is actually a mistake, as Stallman pointed out some time ago (Stallman *et al.* 2002). The idea of «open source» is that the users are able to look at the source code of the programs they run. «Source code» is the version of the program that a human wrote, in some language like Python or JavaScript and that can be read, understood, and modified by another human being. This is not true for the «executable», which is what the computer itself needs in order to execute the program but which looks like complete gibberish to humans. Commercial software is usually distributed in executable form only, which means that the user *cannot* read the code, *cannot*

learn from the techniques it uses, and *cannot* modify it or customize it to their own specialized uses⁹.

Therefore, having the source code of a program is a necessary condition for tinkering with that program – but it is not sufficient. There may be legal barriers, such as intellectual property law and license terms, to doing whatever some user wants to do with the program. After all, the source code of a book is the human-readable words on its pages and yet copyright law restricts what we can legally do with books (publish our own editions, write sequels, etc.) without the permission of the copyright holder, despite always having the source code.

To call a piece of software «open source» means to emphasize its technical readiness to be hacked, not its true availability for (legal!) tinkering, learning, and adaptation. To emphasize those freedoms, regardless of whether the source code is public or not, we should call it «free software» – although it would be silly for a programmer to give the public freedom to tinker with their software without making it easy by making the source code public as well, so in practice, all free software is open source.

A good approach to avoiding this (surprisingly vehement) terminological dispute is to use the combined term «free/libre/open source software», which at least has a nice acronym, Floss.

Richard Stallman, as a founding demiurge of the free software movement, codified his ideas in the following definition (Stallman *et al.* 2002):

A program is free software if the program's users have the four essential freedoms:

- the freedom to run the program as you wish, for any purpose (freedom 0);
- the freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this;
- the freedom to redistribute copies so you can help your neighbors (freedom 2);
- the freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Stallman then took the idea of free software one step further. You can look for freedom for yourself to tinker with some program, but if you take

⁹ Well, there are techniques including «patching an executable» and running it through a «decompiler», but they are extremely difficult and are mostly only used by determined crackers.

some great piece of free software, tinker, and then puts it out in the world in some nonfree form, then you are (hypocritically) not granting your downstream users the same freedom which was vital in your own work. So to make free software into a real common good, we should release our software not only as free, but with a sort of self-replicating legal attachment that requires any descendant works, modified or not, must also be free, and must as well carry this replication clause. He named this concept «copyleft», in order to make explicit the contrast with traditional copyright¹⁰. In consultation with legal experts, the idea of copyleft was encoded in a license, now in its third iteration, the Gnu public license (Gpl).

It is a very strange fact that the public doesn't seem to be aware not only that Floss exists, but also that it is immensely widespread, to the extent it is reasonable to say that the modern world runs on Floss: web servers and important security software, operating systems on phones, cloud servers, and embedded microcontrollers. Floss is as ubiquitous (but as poorly understood) as the transistor.

5. Floss and higher education

There seems to be something very familiar in the four essential freedoms that Stallman stated for free software, apart from the legal technicalities of copyright and the unfolding historical drama in the modern history of software. Just look at the *1940 Statement of Principles on Academic Freedom and Tenure*, in which the American association of university professors (Aaup) elaborated upon its definition of the term «academic freedom»:

Institutions of higher education are conducted for the common good and not to further the interest of either the individual teacher or the institution as a whole. The common good depends upon the free search for truth and its free exposition. Academic freedom is essential to these purposes and applies to both teaching and research. Freedom in research is fundamental to the advancement of truth. Academic freedom in its teaching aspect is fundamental for the protection of the rights of the teacher in teaching and of the student to freedom in learning. It carries with it duties correlative with rights (American Association of University Professors 1940, 13).

Later in the *1940 Statement*, the Aaup gives more precise details about the specific tenets of academic freedom, covering rights and responsibilities for research, classroom teaching, and extramural communications. The Aaup statement serves as a bulwark against forces within and without universities that

¹⁰ His detractors said copyleft licenses are «viral», as if they carry a disease.

control the actions of its scholars, limiting their freedom to take their research wherever it leads or to share their discoveries however they deem best in the classroom and to the wider world.

Nonfree software is antithetical to the ways the scholarly life is practiced. If some program were used in an institution of higher education and a scholar wanted to change its functionality for their research, to use it in an unexpected way for their teaching, or to share with other scholars and students, and this were disallowed because of some failure of the four fundamental software freedoms, that would also constitute a failure of academic freedom. This means that any piece of nonfree software used at a university is a failure of academic freedom simply waiting to happen, waiting for the first truly innovative teacher or researcher.

For example, if some authority figure at a university were to come to a classroom and start to prescribe which color chalk or markers to use for which parts of a lecture or how many minutes to spend on which kinds of classroom activity, or that only multiple-choice quizzes could be given, the faculty would laugh and confidently assert primacy over those kinds of decisions. Similarly, if an authority figure told a laboratory scientist that they could only use reagents from one particular company in their experiments, or if a social scientist were told they could only use books and journals published by one particular publishing firm with which their university had made an agreement, again these scholars would laugh and insist otherwise. Yet somehow, when university administrations and business offices make deals which are much more restrictive with software and Ict service vendors, faculty do not perceive it as a matter of academic freedom.

Actually, the idea of free software and copyleft echoes much older and more fundamental ideas – the application to the realm of software of the project of the scholarly life which threads through the Enlightenment, the Scientific Method, and even predates Plato's Academy. This is probably perfectly obvious to any faculty member, but let us follow that thread just a little.

Scientific papers today have a fairly tediously repetitive style. They all have a «title», «abstract», «introduction», «methods», «results», «discussion», and «references». Notice the «methods» preceding the «results»: no scientist would simply tell their results without explaining the method. The social contract of science is to tell everyone how you did what you did, because only then does it have any chance of being trusted and only then will others be able to build on it – and others building on (citing) your work is the currency of success in science.

Doctorow has a beautiful example (which he puts into the mouth of a character in a novel (Doctorow 2012b) and tells an interviewer in *The Guar-*

dian (Pauli 2009) of the difference between alchemy and chemistry being like the difference between nonfree and free software. Here is another: almost every mathematics student knows the name of Pythagoras and his eponymous theorem – when I asks my students to state their favorite theorem on the first day of a class, almost all say the Pythagorean theorem, probably because that is the only theorem «with a name» that they know. But in fact, this theorem did not originate with Pythagoras, as we know it was familiar to Egyptians and Babylonians well before Pythagoras. In fact, other than some vague idea that «All is number», most of the deep ideas of the Pythagoreans are lost. Probably this is due to the fact that Pythagoras structured his school almost like a religion (or even a cult), keeping their most important ideas as secrets known only to the inner circle. There is even a probably apocryphal story that the Pythagorean follower Hippasus was murdered for revealing to the public the closely guarded secret that $\sqrt{2}$ is irrational¹¹.

Contrast this with Euclid, who wrote up his «Elements», which contained all of the theorems he knew, proved as clearly, carefully, and completely as he was able, and distributed widely. The Elements is estimated to have gone through more editions than any other book in the West except the Christian Bible (Boyer and Merzbach 2011). Knowledge of the «Elements» was considered basic to an educated person in a number of times and places in the last two thousand years. Kepler, Galileo, Descartes, Newton, and Einstein are just a few of the many famous scientists who told specific stories of the importance of the «Elements» in their lives. Apparently, a crucial step for real, lasting importance as a mathematician is to publish all of the «proofs» of your theorems, their «source code», and to encourage others to use your ideas, to tinker with them, and to publish their new proofs in turn – in fact, without doing this you would not any time in the last two thousand years¹² be considered a mathematician at all.

Free software and copyleft are built the way academics do higher education, and to use nonfree software is to abrogate the defense of academic freedom and to invite its failure, sooner or later.

¹¹ Meaning that there do not exist any two whole numbers p and q such that $p/q=2$. A very amusing version of the story of Hippasus of Metapontum is told in (Morris 2011).

¹² With the exception of a strange, non-productive period in the early sixteenth century mostly in Northern Italy.

6. From Floss to Cc and Oer

Software has some unique properties that make it quite different from other textual forms of expression, such as the fact that a program is created and modified as source code, but is often distributed to users and then run by their computers as an executable. But as an original work of authorship¹³, it can still be copyrighted. Copyright licenses designed to share software with the public, such as the Gpl, often have provisions for how the source and executable may be treated which would not be needed for plain texts designed only for humans and not computers.

In 1998, David Wiley created a license he called the Open content license (Ocl) «to bring the ideals of open source software to the world of content». The Ocl was then improved, largely by Eric Raymond (1999) (a software engineer, author of the influential «The Cathedral and the Bazaar», and advocate for the use of the term «open-source» rather than «free») in 1999 and released as the Open publication license (Opl). Not to be outdone, Stallman released the Gnu Free documentation license which served a very similar goal.

This proliferation of copyright licenses for human-directed works of authorship could have continued as it did for software – there are now at least fifty such software licenses which have at least some broad usage – but fortunately Stanford Law professor Larry Lessig and Internet publisher/activist Eric Eldred created the Creative commons licenses, with v1.0 coming out in 2001 just as they were fighting an important case over the constitutionality of the Ctea (they lost; see Lessig 2004). The suite of Cc licenses and tools are so effective, clear, and easy to use that they are now applied to the overwhelming majority of open materials other than software.

One possible reason Cc licenses and tools have been so popular is that they offer creators a great deal of flexibility in choosing how much they want to share, along the spectrum from «all-rights-reserved copyright to public domain». In particular, some Cc licenses include the «NoDerivatives clause», which does not allow the public (without direct permission from the rightsholder) to share derivative works. Since this violates the academic freedom and flexibility required for scholarly progress, as described above, such licenses are disqualified from works which will be considered Open educational resources (Oer), while works with any other Cc license or public domain tool are considered Oer.

¹³ Often fixed in a tangible medium of expression such as a computer memory, which is a prerequisite for copyrightability in the Us but in relatively few other countries.

The «NonCommercial Cc license clause», on the other hand, is considered by Floss advocates to be too restrictive of the uses downstream users may make of a work, as it prohibits (again without direct permission) profit-seeking activities centered around the work or its derivatives.

Finally, the «ShareAlike Cc clause» is very reminiscent of the copyleft virality in the Gpl, and so is much beloved of Floss advocates.

All together, we are left with what we might call the «Augmented Cc license spectrum» (Fig. 1).

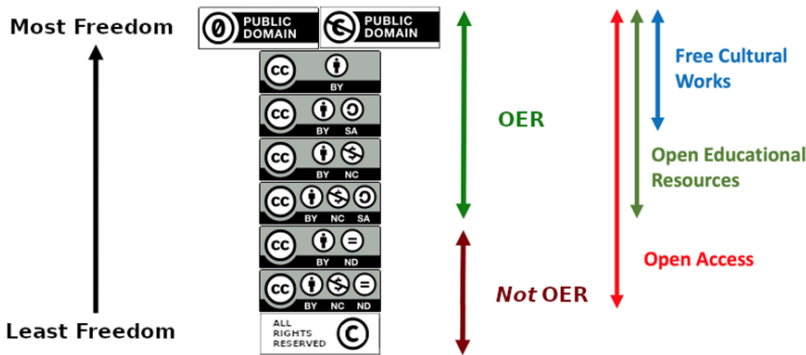


FIG. 1. The Augmented Cc license spectrum.

7. The neoliberal endpoint of education in the Us

As was exemplified in the «Copyright clause» of the Us Constitution, the Us has had a tendency to use market mechanisms – the offer of monopoly profits for a limited period of time – to drive socially beneficial outcomes – greater production of Science and useful Arts. What is extraordinary is how far this reasoning has been allowed to progress, to the point that measurements of investment/profit/loss are not only used to evaluate the progress towards a social goal, but also to measure the goal itself: where before we might have been happy if more original works of authorship were being created, now, in some strange process of the serpent eating its own tail, the economic benefit of those original works must be demonstrated to justify their creation (which was supposedly motivated by the promise to creators of economic benefit). This is beautifully described in horrifying detail by political scientist Wendy Brown’s brilliant «Undoing the Demos: Neoliberalism’s Stealth Revolution» (Brown 2015).

Creeping neoliberalism is particularly evident in the Us higher educational system. The loftiest goal of that system had long been a «liberal arts education» – another use of the word «liberal», this time referring to the «freedom» (similar to «libre» in Floss): a «liberal arts education» was intended for hundreds of years to describe an education which enables citizens to partake fully of the options available to free persons in a free society (Kimball 2010).

Whereas neoliberalism, which «converts non-economic domains, activities and subjects into economic ones, extending market metrics and practices to every dimension of human life» (paraphrasing Brown 2015), has no interest in the arts of liberty. Hence education in the Us has become a market transaction, where rational economic actors seek to accrue credentials which will have value in the marketplace. From the side of the providers of education, it no longer seems to make sense simply to give away these valuable credentials, where it might have made sense in a pre-neoliberal view to give away the training of the next generation of good citizens.

This reasoning is why in a neoliberal nation, public higher education has largely ceased to exist: in what sense is higher education «public» in the Us if the great majority of funding for the great majority of «public» universities in the country comes from student tuition and fees and not public monies? Similarly, it is natural in this mirror world that students should go deeply into debt when they make such a significant investment into themselves as seeing a higher education credential – hence the approximately \$1.7 trillion in total student higher education debt in the Us¹⁴.

Finally, in a market-driven educational worldview, it would only be natural that a small cartel of textbook publishers would pamper faculty – who make the choice of which textbook to require of their students – while disregarding any consequences for students – the ones paying for those required texts – or for the overall project of delivering a quality education. The pampering consists of sending faculty free texts, plus test banks, slide decks for class meetings, automated homework systems (for an additional fee to the students), and even silly gifts like coffee cups and t-shirts. Meanwhile, students in the Us are paying textbook costs that have been increasing at three times the rate of inflation (inflation = Consumer price index, Cpi, in this graph) (Fig. 2).

¹⁴ For some of these economic facts, see Poritz (2019) or, for updates, the Us Federal reserve, <https://www.federalreserve.gov/releases/g19/current/default.htm>.

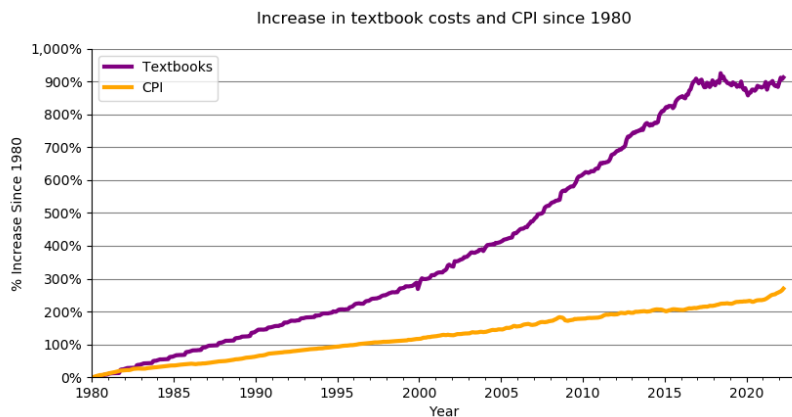


FIG. 2. Graph of textbook costs and inflation since 1980 in the Us.

Source: Poritz (2022).

8. Getting more Oer by individual and collective action

How the future of neoliberal policies, particularly towards education, will play out in the Us is unclear. But the pure profit-seeking seems to have hit some sort of stumbling block in the last few years, as indicated by the way the textbook price curve above hit a *plateau* around 2017. Probably this is due to greater awareness of Oer (Allen 2019), and greater adoption rates leading to well more than \$1 billion in total savings just in the Us (the total savings was in fact already more than \$1 billion in 2018) (Allen 2018).

Something that would help further break the back of this neoliberal financial landmine for students in the Us, and support the values of academic freedom and the scholarly life in other, less neoliberal countries, would be to encourage the creation of many more Oer for new subjects and with new pedagogies. This article closes by discussing strategies for increasing the size of this pool of available Oer.

On an individual level, scholars can simply adapt and create more Oer in their everyday pedagogical practice: that would be a big step. Enabling this, there are more and more tools and platforms – many of which, such as Pressbooks, H5P, WeBWorK, etc., are Floss! – as well as training programs in both the authoring and legal technicalities of Oer production. Ultimately, though, it is my hope that it will be effective merely to inform most scholars that they have become unwittingly complicit in the reduction of their own academic freedom and in an economic war against students.

There has indeed been a fair bit of recent scholarship on the basic level of awareness of individual faculty members of issues around Oer (Seaman and Seaman 2023) (in the Us only), of the perceived positive and negative aspects of Oer use as well as the incentives for faculty which are, in the eyes of faculty, effective or not (Marin *et al.* 2022) (compiling many case studies from nine countries).

It is often said today that most Oer are produced by overworked early career scholars for little or no compensation, and that we should not exploit their labor in this way but should instead pay them for their time.

I believe this perspective uncritically accepts the neoliberal worldview which is the root cause of so much of our problems in education today, and therefore should be rejected. I would therefore recommend that rather than finding one-time sources of funds to pay scholars for their Oer productivity, we need to change the culture around what it means to be a scholar and pedagogue in higher education which seeks to have a sustainable future that supports students. Oer production must be valued as high or higher, in getting jobs, promotions, and tenure, as other creative activity: we do need to put our thumb on the scales and say that a young scholar is contributing significantly to their discipline when they adapt or create an Oer with a new pedagogical approach for a basic subject or, perhaps at more research-oriented institutions, builds an entirely new Oer for an advanced topic for which no open resource yet exists.

Changing norms and practices like this will help to move the burden of Oer production from individual scholars to the collective action of our departments, institutions, and disciplinary associations.

Finally, I advocate for a more assertive approach whereby institutions of higher education – conducted for the common good as they are, recall from above – could require all pedagogical (and scholarly) materials produced by its employees to be Oer. The open movement has been extremely shy of seeming to force individuals into openness, but I believe that this is a natural policy to fight the dangers of neoliberalism, to advance the common good, and to have the greatest scholarly impact.

Institutions can require this commitment to open licensing and publication of prospective employees, in the same way that some grant organizations have made a similar requirement a condition of accepting funds¹⁵. Surely an employing educational institution's salary is as strong a financial incentive for open behavior as is a government grant given to a researcher. Additionally, just as researchers have the option not to seek such grants if they find the condition too onerous, so too a scholar who is more interested in profit-maximization

¹⁵ See Ostp issues guidance to make federally funded research freely available without delay, <https://www.whitehouse.gov/ostp/news-updates/2022/08/25/ostp-issues-guidance-to-make-federally-funded-research-freely-available-without-delay>.

has the right to seek employment in industry rather than in an educational institution where they will be required to serve the common good.

Here also, recent research has shown a rising tide of policies at institutional (and State and national) level is making this approach a lived reality for many in higher education: see for example Sparc's Oer state policy tracker for governmental policies in the Us States¹⁶ and Farrell *et al.* (2021) for the situation in Europe. Note also that since Unesco passed its Recommendation on open educational resources in 2019¹⁷, there has been an explosion of implementation efforts along the lines suggested here, as well as research in their extent and effectiveness, such as in the Oer degrees network of open orgs' collaborative project¹⁸.

The experiences described in this article have centered on responding to the damages of neoliberalism to the educational system in the Us, both widespread economic hardship and deep wounds to academic freedom and other common goods in the service of human flourishing. Perhaps other nations can avoid falling into the same traps, seeing the grim American model. But some communities face such severe economic hardship, with or without neoliberalism, that the cost-savings of Oer will be extremely beneficial. Regardless of the economic factors, the strategies of open education, open access, and Oer can help foster academic freedom and an educational system to support free people building free societies.

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¹⁶ See, <https://sparcopen.org/our-work/state-policy-tracking/>.

¹⁷ See, <https://www.unesco.org/en/legal-affairs/recommendation-open-educational-resources-oer>.

¹⁸ See, <https://policycommons.net/artifacts/2468078/oer-degrees-network-of-open-orgs-collaborative-project/3490021/>.

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