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## Open Access

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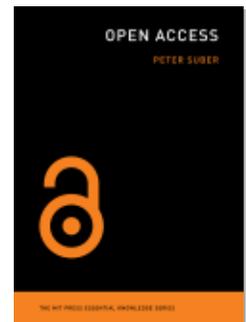
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## MOTIVATION

### 2.1 OA as Solving Problems<sup>1</sup>

There are lamentably many problems for which OA is part of the solution. Here are fifteen ways in which the current system of disseminating peer-reviewed research is deeply dysfunctional for researchers and their institutions, even if highly profitable for the largest conventional publishers. I've limited the list to those for which OA offers some hope of relief.

1. We are in the midst of a pricing crisis for scholarly journals. For four decades, subscription prices have risen significantly faster than inflation and significantly faster than library budgets. Subscription prices have risen about twice as fast as the price of healthcare, for most people the very index of skyrocketing, unsustainable prices. We're long past the era of damage control and into the era of damage.<sup>2</sup>

2. When most peer-reviewed research journals are toll access, a pricing crisis entails an access crisis. Before the rise of OA, all peer-reviewed journals were toll access, and even today about three-quarters of peer-reviewed journals are toll access.<sup>3</sup> When subscribers respond to skyrocketing prices by canceling subscriptions, access decreases. Cancellations mitigate one problem and aggravate another. A study by the Research Information Network in late 2009 found that 40 percent of surveyed researchers had trouble accessing journal literature at least once a week, and two-thirds at least once a month. About 60 percent said that access limitations hindered their research, and 18 percent said the hindrance was significant.<sup>4</sup>

3. Even the wealthiest academic libraries in the world suffer serious access gaps. When the Harvard Faculty of Arts and Sciences voted unanimously for a strong OA policy in February 2008, Professor Stuart Shieber explained that cumulative price increases had forced the Harvard library to undertake “serious cancellation efforts” for budgetary reasons.<sup>5</sup>

Access gaps are worse at other affluent institutions, and worse still in the developing world. In 2008, Harvard subscribed to 98,900 serials and Yale to 73,900. The best-funded research library in India, at the Indian Institute of Science, subscribed to 10,600. Several sub-Saharan African university libraries subscribed to zero, offering their

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patrons access to no conventional journals except those donated by publishers.<sup>6</sup>

4. The largest publishers minimize cancellations by bundling hundreds or thousands of high-demand and low-demand journals into “big deals,” which reduce the bargaining power of libraries and the cost-cutting options available to them. On the plus side, big deals give universities access to more titles than they had before and reduce the average cost per title. But when libraries try to cancel individual titles that are low in quality or low in local usage, publishers raise the price on the remaining titles. Bundling gives libraries little room to save money with carefully targeted cancellations, and after a point forces them to cancel all or none.

By design, big deals are too big to cancel without pain, giving publishers leverage to raise prices out of proportion to journal costs, size, usage, impact, and quality. Without bundling, libraries would have responded to the pricing crisis with a devastating number of cancellations. With bundling, publishers protect even second-rate journals from cancellation, protect their own profits, and shift the devastation to library budgets.<sup>7</sup>

While the damage grows, the largest journal publishers earn higher profit margins than the largest oil companies. In 2010, Elsevier’s journal division had a profit margin of 35.7 percent while ExxonMobil had only 28.1 percent.<sup>8</sup>

By soaking up library budgets, big deals harm journals from small nonprofit publishers excluded from the bundles. This exacerbates the problem for researchers because journals from these smaller publishers tend to be higher in quality and impact than the journals protected by the big deals (more in #11 below).

To top it off, most big deals include confidentiality clauses preventing universities from disclosing the prices they pay. The effect is to reduce bargaining and price competition even further. In 2009, three academics launched the Big Deal Contract Project to use state open-record laws to force disclosure of big-deal contracts with public universities. Elsevier went to court to block the release of its contract with Washington State University and lost.<sup>9</sup>

5. During the decades in which journal prices have been rising faster than inflation and faster than library budgets, libraries have cut into their book budgets to pay for journals. According to James McPherson, “In 1986 [academic] libraries spent 44 percent of their budgets on books and 56 percent on journals; by 1997 the imbalance had grown to 28 percent for books and 72 percent for journals.” Because academic libraries now buy fewer books, academic book publishers now accept fewer manuscripts. One result is that the journal crisis, concentrated in the sciences, has precipitated a monograph crisis, concentrated in the humanities.<sup>10</sup>

6. New restrictions on electronic journals add a permissions crisis on top of the pricing crisis. For publishers of online toll-access journals, there are business reasons to limit the freedom of users to copy and redistribute texts, even if that leaves users with fewer rights than they had with print journals. But these business reasons create pernicious consequences for libraries and their patrons.

Among the results: When libraries pay for subscriptions to digital journals, they don't buy or own their own digital copies but merely rent or license them for a period of time. If they cancel a subscription, they could lose access to past issues. They could violate the publishers' copyrights if they make or hold copies for long-term preservation without special permission or payment, shifting the task of preservation more and more to publishers who are not preservation experts and who tend to make preservation decisions with only future market potential in mind. Libraries can't migrate older content, such as journal backfiles, to new media and formats to keep them readable as technology changes, at least not without special permission or risk of liability. Some publishers don't allow libraries to share digital texts by interlibrary loan and instead require them to make printouts, scan the printouts, and lend the scans. Libraries must negotiate for prices and licensing terms, often under nondisclosure agreements, and retain and consult complex licensing agreements that differ from publisher to publisher and year to year. They

must police or negotiate access for walk-in patrons, online users off campus, and visiting faculty. They must limit access and usage by password, internet-protocol (IP) address, usage hours, institutional affiliation, physical location, and caps on simultaneous users. They must implement authentication systems and administer proxy servers. They must make fair-use judgment calls, erring on the side of seeking permission or forgoing use. They must explain to patrons that cookies and registration make anonymous inquiry impossible and that some uses allowed by law are not allowed by the technology.

I make this list library-centric rather than user-centric because the pricing crisis has nearly killed off individual subscriptions. Most subscribers to toll-access journals are libraries, and most authorized readers of toll-access journals are library patrons.<sup>11</sup>

In short, conventional publishers regard easy online sharing as a problem while researchers and libraries regard it as a solution. The internet is widening the gap between the interests of conventional publishers and the interests of researchers and research institutions.

Conventional publishers are adapting to the digital age in some respects. They're migrating most print journals to digital formats<sup>12</sup> and even dropping their print editions. They're incorporating hyperlinks, search engines, and alert services. A growing number are digitizing their backfiles and integrating texts with data. But the revolutionary

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power to share content without price or permission barriers, to solve the pricing and permission crises at a stroke and liberate research for the benefit of all, is the one innovation they fear most.

7. Conventional publishers acquire their key assets from academics without charge. Authors donate the texts of new articles and the rights to publish them. Editors and referees donate the peer-review judgments to improve and validate their quality.<sup>13</sup> But then conventional publishers charge for access to the resulting articles, with no exception for authors, editors, referees, or their institutions. Publishers argue that they add value to the submitted manuscripts, which is true. But other players in the game, such as authors, editors, and referees, add far more value than publishers. For funded research, the funding agency is another critical player. It too must pay for access to the resulting articles even when the cost of a research project is hundreds of thousands of times greater than the cost of publication. Among these five value-adders—authors, editors, referees, funders, and publishers—publishers add the least value and generally demand the ownership rights.

8. Conventional publishers use a business model that depends on access barriers and creates artificial scarcity. All publishers (conventional and OA) need revenue to cover their costs, but OA publishers use business models that dispense with access barriers and avoid artificial scarcity. Toll-access publishers contend that the OA business

models are inadequate. We can debate that, for example, in light of the evidence that more than 7,500 peer-reviewed OA journals are finding ways to pay their bills, the fact that a growing number of for-profit OA publishers are already showing profits, and the fact that most of the money needed to support OA journals is currently tied up supporting toll-access journals. (See chapter 7 on economics.)

But in the end it doesn't matter whether toll-access publishers are right or wrong to believe that their revenue requires access barriers. The deeper problem is that we donate time, labor, and public money to create new knowledge and then hand control over the results to businesses that believe, correctly or incorrectly, that their revenue and survival depend on limiting access to that knowledge. If toll-access publishers are right that they must erect access barriers to reimburse themselves, then the problem is that we allow them to be the only outlets for most peer-reviewed research. If they're wrong about the need for access barriers, then the problem is that we tolerate their access barriers, even for publicly funded research and gifts from authors who write for impact and not for money.

9. Conventional publishers often criticize OA initiatives for "interfering with the market," but scholarly publishing is permeated by state action, public subsidies, gift culture, and anticompetitive practices.<sup>14</sup> All scholarly journals (toll access and OA) benefit from public subsidies. Most scientific research is funded by public agencies us-

ing public money, conducted and written up by researchers working at public institutions and paid with public money, and then peer-reviewed by faculty at public institutions and paid with public money. Even when researchers and peer reviewers work at private universities, their institutions are subsidized by publicly funded tax exemptions and tax-deductible donations. Most toll-access journal subscriptions are purchased by public institutions and paid with taxpayer money.

Last and not least, publishers exercise their control over research articles through copyright, a temporary government-created monopoly.

10. Every scholarly journal is a natural mini-monopoly in the sense that no other journal publishes the same articles. There's nothing improper about this natural mini-monopoly. It's a side-effect of the desirable fact that journals don't duplicate one another. But it means that toll-access journals compete for authors much more than they compete for subscribers. If you need an article published in a certain journal, then you need access to that journal. This is one reason why free and expensive journals can coexist in the same field, even at the same level of quality. The free journals don't drive the expensive journals out of business or even drive down their prices. By weakening the competition for buyers, however, this natural monopoly weakens the market feedback that would otherwise punish declining quality, declining usage, and rising prices.

11. Laid on top of this natural monopoly are several layers of artificial monopoly. One kind of evidence is that large commercial publishers charge higher prices and raise their prices faster than small, nonprofit publishers. Yet, the scholarly consensus is that quality, impact, and prestige are generally higher at the nonprofit society journals.<sup>15</sup>

12. Large conventional publishers spend some of the money they extract from libraries on marketing and “content protection” measures that benefit publishers far more than users. Indeed, the content protection measures don’t benefit users at all and make the texts less useful.<sup>16</sup>

13. Conventional for-profit journals can increase their profit margins by decreasing their rejection rates. Reducing the rejection rate reduces the number of articles a journal must peer review for each article it publishes.<sup>17</sup>

14. Most faculty and researchers are aware of access gaps in their libraries but generally unaware of their causes and unaware that the problems are systemic and worsening. (A common response: My research is very specialized, so naturally my library won’t have everything I need.) On the other hand, librarians are acutely aware of library budget crises, high journal prices, hyperinflationary price increases, bundling constraints, publisher profit margins, and the disconnect between prices paid and journal costs, size, usage, impact, and quality. Researcher oblivion to the problems facing libraries adds several new problems to the mix. It means that the players who are most aware of

quality are generally unaware of prices, which Jan Velterop once called the “cat food” model of purchasing. It creates a classic moral hazard in which researchers are shielded from the costs of their preferences and have little incentive to adjust their preferences accordingly. It subtracts one more market signal that might otherwise check high prices and declining quality. And while researchers support OA roughly to the extent that they know about it, and have their own reasons to work for it, their general unawareness of the crisis for libraries adds one more difficulty to the job of recruiting busy and preoccupied researchers to the cause of fixing this broken system.<sup>18</sup>

The fact that there are enough problems to motivate different stakeholders is a kind of good news. If the system were broken for buyers (librarians) but not for users (researchers), or vice versa, that would delay any fix even longer. Or it would create a pernicious trade-off in which any fix would help one group at the expense of the other. But the system is broken for both buyers and users, which makes them natural allies.<sup>19</sup>

15. Finally, even in the absence of perverse journal pricing practices, the subscription or toll-access business model would not scale with the growth of research or the growth of published knowledge. If prices were low today and guaranteed to remain low forever, the total price for the total literature would still be heading toward exponential explosion. This is easiest to see at the mythical University

of Croesus, which can afford 100 percent of the literature today. In that respect, Croesus is far better off than any university in the real world. Let's suppose that journal prices and the Croesus library budget increase at the same rate forever. For simplicity, let's assume that rate is zero. They never grow at all, not even at the rate of inflation. Let's assume that the growth of knowledge means that the journal literature grows by 5 percent a year, a common industry estimate. Croesus can afford full coverage today, but in twenty years it would have to spend 2.7 times more than it spends today for full coverage, in sixty years 18.7 times more, and in a hundred years 131.5 times more. But since Croesus can't spend more than it has, in twenty years the coverage it could afford would drop from 100 percent to 37.7 percent, in sixty years to 5.4 percent, and in a hundred years to less than 1 percent.

We need a system of research dissemination that scales with the growth of research volume. The subscription or toll-access system scales negatively by shrinking the accessible percentage of research as research itself continues to grow.<sup>20</sup>

Money would solve the access crisis if we had enough of it, and if the amount at our disposal grew in proportion to the growing volume and growing prices of the literature. But we don't have nearly enough money, and the money we do have doesn't grow nearly fast enough to keep pace with the volume or prices of the literature.

Toll-access publishers don't benefit from access gaps and have their own reasons to want to close them. But they prefer the unscalable money solution, even if university budgets and national treasuries must be squeezed by law to find the funds. Crispin Davis, then-CEO of Elsevier, once argued that "the government needs to lay down guidelines on the proportion of university funds that should be set aside for the acquisition of books and journals, or even increase funding to ensure that universities can buy all the material they need."<sup>21</sup>

At some point we should trust the math more than special-interest lobbies. Among the many who have done the math, the University of California concluded that the subscription model for research journals is "incontrovertibly unsustainable."<sup>22</sup>

## 2.2 OA as Seizing Opportunities<sup>23</sup>

Even if we had no pressing problems to solve, we'd want to take full advantage of the unprecedented power of digital technology to share knowledge and accelerate research. But we have both problems and opportunities, and we should acknowledge that. Too much of the OA discussion is grim, utilitarian, and problem-oriented. We should complement it with discussion that is joyful, curious, and opportunity-oriented. Serious problems don't rule out

beautiful opportunities, and one of the most beautiful opportunities facing OA is that certain strategic actions will solve serious problems and seize beautiful opportunities at the same time.

Here's a brace of those beautiful opportunities. The internet emerged just as journal subscription prices were reaching unbearable levels. The internet widens distribution and reduces costs at the same time. Digital computers connected to a global network let us make perfect copies of arbitrary files and distribute them to a worldwide audience at zero marginal cost. For 350 years, scholars have willingly, even eagerly, published journal articles without payment, freeing them to consent to OA without losing revenue. Unrestricted access to digital files supports forms of discovery and processing impossible for paper texts and for inaccessible or use-restricted digital texts. OA is already lawful and doesn't require copyright reform. Now that the internet is at our fingertips, OA is within the reach of researchers and research institutions acting alone and needn't wait for publishers, legislation, or markets. Authors, editors, and referees—the whole team that produces peer-reviewed research articles—can provide OA to peer-reviewed research literature and, if necessary, cut recalcitrant publishers out of the loop. For researchers acting on their own, the goal of complete OA is even easier to attain than the goal of affordable journals.

A less obvious but more fundamental opportunity is that knowledge is *nonrivalrous* (to use a term from the economics of property). We can share it without dividing it and consume it without diminishing it. My possession and use of some knowledge doesn't exclude your possession and use of the same knowledge.

A less obvious but more fundamental opportunity is that knowledge is *nonrivalrous* (to use a term from the economics of property). We can share it without dividing it and consume it without diminishing it. My possession and use of some knowledge doesn't exclude your possession and use of the same knowledge. Familiar physical goods like land, food, and machines are all *rivalrous*. To share them, we must take turns or settle for portions. Thomas Jefferson described this situation beautifully in an 1813 letter to Isaac McPherson:

If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea. . . . Its peculiar character . . . is that no one possesses the less, because every other possesses the whole of it. He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening mine.<sup>24</sup>

We seldom think about how metaphysically lucky we are that knowledge is nonrivalrous. We can all know the same ideas, stories, tunes, plans, directions, and words without my knowledge blocking yours or yours blocking mine. We're equally fortunate that speech is nonrivalrous, since it allows us to articulate and share our knowledge without reducing it to a rivalrous commodity.

But for all of human history before the digital age, writing has been rivalrous. Written or recorded knowledge became a material object like stone, clay, skin, or paper, which was necessarily rivalrous. Even when we had the printing press and photocopying machine, allowing us to make many copies at comparatively low cost, each copy was a rivalrous material object. Despite its revolutionary impact, writing was hobbled from birth by this tragic limitation. We could only record nonrivalrous knowledge in a rivalrous form.

Digital writing is the first kind of writing that does not reduce recorded knowledge to a rivalrous object. If we all have the right equipment, then we can all have copies of the same digital text without excluding one another, without multiplying our costs, and without depleting our resources.

I've heard physicists refer to the prospect of room-temperature superconductivity as a "gift of nature." Unfortunately, that is not quite within reach. But the nonrivalrous property of digital information is a gift of nature that we've already grasped and put to work. We only have to stand back a moment to appreciate it. To our ancestors, the prospect of recording knowledge in precise language, symbols, sounds, or images without reducing the record to a rivalrous object would have been magical. But we do it every day now, and it's losing its magic.

The danger is not that we already take this property for granted but that we might stop short and fail to take

full advantage of it. It can transform knowledge-sharing if we let it.

We take advantage of this gift when we post valuable work online and permit free access and unrestricted use for every user with an internet connection. But if we charge for access, enforce exclusion, create artificial scarcity, or prohibit essential uses, then we treat the nonrivalrous digital file like a rivalrous physical object, dismiss the opportunity, and spurn the gift.

When publishers argue that there is no access problem and that we shouldn't fix what isn't broken, there are two answers. First, they're wrong. There are deep and serious access problems. Publishers who really don't know this should talk to the libraries who subscribe to their journals, and even more to the libraries who don't. But second, leaving that quarrel entirely to one side, there are good reasons to pursue OA anyway.<sup>25</sup>