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Some Knowledge Wants to Be Free

Senegal is among the world's poorest nations. At the law library of Cheikh Anta Diop University in Dakar, the stacks are full of photocopies of textbooks, not the books themselves. Eager for knowledge, obliged by their course syllabi to read, but unable to afford the texts, students vandalize the originals by tearing out the pages their professors assign. The library has countered by installing xerox machines—to make copies of the copies, rather than decimate what remains of the books.¹ Scarce resources thus prompt at least two offenses: destroying the books and then violating their authors' copyright with the library's tacit connivance.

How unfair that some parts of the world wallow in a surfeit of information while elsewhere a thirst for knowledge finds no slaking. What makes this crass disparity not just another instance of global maldistribution is that, in our era of astonishing intellectual flourishing, we also have the means to give all knowledge to every human at no significant new cost. Global redistribution of other resources—physical, costly, and rivalrous—remains expensive and politically fraught. Intellectual property has always been intangible. But in the past, it was embodied in physical media that cost money to make, reproduce, and distribute, which therefore were similar to other goods.

Digitality, however, has ephemeralized intellectual property. The first copy of a book or article is expensive, but every further digital copy costs almost nothing. Because intellectual property is non-rivalrous, many can use it simultaneously, with no one the worse off.² Distributing intellectual goods widely and freely has thus become possible in a way inconceivable for other resources. We live in a tantalizingly fecund moment when we see how knowledge can become a global public good but have not yet quite figured out how to achieve it.

Not everyone agrees that our era is a cultural cornucopia. Examples of decline abound—children stare at screens rather than read books, classical music is wasting away, modern figurative art is treated by collectors as a store of value, pornography has an oversized presence on the web, and tacky literary prizes proliferate to mark intellectual achievement—whatever one's favorite measure of postlapsarian degeneration.³ Is what was once known as culture *tout court*, the genteel art forms, prospering? Opinions differ wildly.

But if we take a more expansive view of culture to include also scholarship and science, things look up. No matter what is true for the humanities, the social sciences, and especially the life and hard sciences, are flourishing. As measured by practitioners, students, output, and funding, things have never been better. Almost 7,000 scholarly articles are published every day, two and a half million annually.⁴ As measured by the content in JSTOR, the main Anglophone social science repository, the output of scholarly articles has expanded tenfold, from one per 16,000 US residents in 1800 to one per 1,500 in 2000.⁵ Research funding increased from 1% of GDP in the early twentieth century to almost thrice that in 2017.⁶ Authors have published more books this past year than ever before, and that counts only conventional ones. Add in the self-published works now possible thanks to digital technologies and the number mushrooms.

Measuring our knowledge output is tricky, but it has rapidly expanded. It grew 1% annually into the mid-eighteenth century,

2% to 3% through the interwar years, and 8% or 9% in the post-war era. At the current rate, knowledge doubles every nine years.⁷ Humanity now produces more information every year than during its entire span from civilization's beginning to the year 2000.⁸ Granted, sudoku books make up a large slug of this. Nor is every field overfulfilling its five-year plans: Despite massive research funding, the number of approved drugs has fallen since the 1980s.⁹ And suppose that by information we mean only *data*. In that case, such production numbers are multiplied by the ever-growing avalanche of bytes spat forth by the internet of things, as it tracks traffic, mail, passengers, customers, doorbell ringers, and the content of our fridges.¹⁰ Quantity may not be everything, but it does indicate a certain rude health of our endeavors.

Knowledge's Inexorable Spread

A fundamental premise of modern society is that the more broadly knowledge is spread, the better. Priestly castes once monopolized access to the divine, to what counted as knowledge. So long as most people could not read, the literate derived power from mediating information. As literacy spread in the early modern period, new readers could forge their own immediate connection to the known. With the Bible translated into Europe's vernacular languages, the laity formed its own opinions of doctrine. Protestantism attacked the priesthood and its stranglehold on official truth. Its most fervent sects preached a universalist epistemology, giving each believer a direct connection to the godhead. With everyone equally knowledgeable, all followers, in effect, became priests, pursuing their interpretation of scripture regardless of doctrine.¹¹ The printing press fired the engines of the Reformation.

Knowledge's spread had both enlightened and nihilistic results. Giddy at the thought that everyone stood equidistant from the

truth, many who were emancipated into the light felt released from social bonds and conventions. Convinced of their omniscience and infallibility, the illuminati sometimes ran amok. In the twelfth and thirteenth centuries, the Free Spirits of northern France and the Rhine Valley thought their immediate relation to God unfettered them from the Church and its sacraments. Sinless and unbound by conventional morality, they indulged in spectacular feats of sexual promiscuity, even incest. Intercourse with the illuminated, the men cunningly claimed, restored a woman's virginity.¹²

With the Scientific Revolution, starting in the sixteenth century, knowledge shifted its foundation from religious revelation to empirical observation informed by secular theory. The scientific method assumed that any rational, sentient human could understand and practice the technique. In its everyday aspect, the scientific process was broken into bite-size pieces, so that carrying out experiments became a technical task—as anyone who has worked in a lab can attest. Yet, the caste mentality of the initiated persisted. Knowledge did not arrive effortlessly but required discipline, training, and perseverance. Even as most were theoretically capable of attaining it, only a few did in practice.

The distinction between knowledgeable insiders and benighted masses persists today. While education and even universities eventually democratized, they remained based on a hierarchy of expertise, topped by a mandarin class. Once an inherited status, the professoriate was passed like the family silver to male offspring. Eventually, it became more meritocratic. Still, requiring cultural capital to access and years of training, the university mandarin remains less open to raw talent than occupations where outcomes can be ruthlessly quantified, such as finance and some branches of industry. Untutored talent holds outsized sway also in activities where capability is distributed at random—music, acting, modeling. Yet, some aspects of academia became more meritocratic. Newcomers and outsiders, such as Jewish and working-class students,

succeeded better in emerging fields than in venerable subjects—physics more than chemistry, sociology more than philology.

In its time, every expansion of education has been resisted, whether mandating schooling for youngsters or opening universities to women. Not everyone was cut out for study; trying to educate the lower classes would sour them to their lot in life; knowledge would be devalued if dumbed down for all to grasp: such were the arguments against an unfettered opening of enlightenment.¹³ And yet, the spread of knowledge has been unstoppable. Compulsory secondary education, state-financed universities, night and professional schools, correspondence courses, continuing education, mass online university classes—all have served to breach the academy's palisades. Public expenditure on education in the developed world has risen tenfold, from 0.6% of GDP in 1870 to 6.1% in the 1990s.¹⁴

University attendance has not unstoppably increased. In the eighteenth century, university enrollments in England were lower than they had been in the seventeenth.¹⁵ But over the past century, university attendance has shot up globally. In 1869, 1.3% of American 18- to 24-year-olds went to university; in 1991, 54% did.¹⁶ The US was an outlier in how early it educated the mass of its population, but most Western nations followed suit over the twentieth century.¹⁷ In the many countries where at least 40% have now completed a first university degree, probably almost everyone who can go to college, and wants to, does. The developed world has likely hit peak university. Higher education has therefore become an export industry, especially in the Anglophone nations. Recruits from abroad supplement a flat-lined domestic applicant pool. How long foreign-student enrollment survives the sticker shock from skyrocketing tuitions and ever-improving alternatives at home remains to be seen.

There is more knowledge to delight and enlighten us, and not only are we better equipped to appreciate, enjoy, and employ it, but also it is more available. We think of libraries as a great public

good, an appurtenance of democracy, one of the palaces of the people.¹⁸ But neither ancient Athens nor the Roman republic had public libraries. At first, the great collections were the work of rulers like the Ptolemies of Egypt or the absolutist monarchs of Europe. Their books were available to only a few favored scholars, whose presence buffed their masters' reputations for culture and sophistication. Only later did things change. In the eighteenth century, lending libraries began to rent books to their subscribers, allowing members access to many more than they could buy on their own, much less ever read. The state then took on that function, socializing membership costs for all. Public libraries now serve everyone in the developed world. In the US, their number has steadily increased from 1833, when Peterborough, New Hampshire, opened the first, to over 17,000 in 2012.¹⁹ In Germany, borrowings from public libraries have increased a hundredfold over the twentieth century, from 3.8 million in 1901 to 377 million in 2010.²⁰

Buying books has become more affordable. Publishers have delivered an ever-cheaper product. In the Middle Ages, books were produced by hand, often adorned, expensive, and the property of the wealthy—or at best chained to the shelves in monastery libraries to prevent theft. The shift from vellum and parchment to paper in Europe during the late Middle Ages reduced prices by five-sixths.²¹ Gutenberg's printing press in 1439 made books an object of mass production, dropping costs perhaps 18-fold.²² Wood-pulp paper and steam-driven presses continued the trend in the nineteenth century. Paperbacks and then e-books have accelerated the decrease. More books than ever are sold. In the US, expenditure has tripled from 0.11% of GDP in 1929 to 0.38% in 2000. Book sales have outpaced population growth twofold since 1982.²³

Privileges were the monopolies monarchs granted publishers for their books, raising their prices. But pirates leavened this system by bringing out cheap knock-off editions. In 1710, copyright was first

created in England to bolster publishers' claims against such now-unauthorized use of their intellectual property. Yet piracy satisfied a pressing need for popular enlightenment and was hard to squelch. Some nations entirely sidestepped the international spread of copyright in the nineteenth century. The US long remained a copyright outlaw, reaping the benefit of cheap enlightenment without paying rights-holders.

American publishers ripped off their European colleagues, bringing out affordable domestic editions for the masses in an era when Old World books remained leather-bound, multivolumed, and pricey. American print runs were often quadruple the British runs, with each American volume costing but a quarter of its European counterpart. Entire novels were printed in periodicals sold at a fraction of book prices. Charles Dickens and other popular authors were serialized on the back of railroad timetables.²⁴

Digital technologies allowed another step toward widely available cheap content. Physical texts are what the economists call rivalrous. My use of a tablet, parchment, book, or newspaper means you cannot at the same time. This is not so with digital works. Once the costs of producing the initial digital edition have been met, the marginal last copy is essentially costless. Everyone can have their own simultaneous copy. For the first time in history, our nonrivalrous thoughts can be conveyed through nonrivalrous media.²⁵

Works that have fallen out of copyright and into the public domain are increasingly available for free on the web or as inexpensive reprints. Thanks to the stultifying effect of works remaining in copyright while out of print, there are ten times more books published in 1910 than in 1950 available on Amazon today.²⁶ Electronic editions of current books are often more affordable than paper versions. Self-published books, in turn, are even less costly. Their numbers now dwarf conventional publications. Amazon—the biggest venue for self-publishers—encourages cheap books by

staggering royalties inversely to retail prices.²⁷ Kindle Unlimited allows subscribers to choose ten e-books each month for a flat fee, having become, in effect, a digital lending library.

Today, everyone can speak directly to the digital public, skipping the book as an intermediary. Social media have become the biggest bullhorn ever. A global soapbox stands ready to be mounted at the digital Speaker's Corner. Dissemination has become even more democratized. Furthermore, fake news is not a modern invention. The *Malleus Maleficarum* appeared in 1486, shortly after Gutenberg's press. It encouraged the belief that witchcraft was widespread and pernicious, justifying the persecution of people accused of sorcery.²⁸ *The Protocols of the Elders of Zion* has been spreading its poison since the early twentieth century. But fake news thrives on new technologies. For example, the more scientific Covid vaccine information that was posted, the stronger the anti-vaccination movements became.²⁹ Those reliant on social media for information were also most likely to believe in conspiracy theories about the Covid pandemic.³⁰

Despite our celebration of it, openness has a dark side. Printing was hailed in the sixteenth century as depriving physicians of their monopoly on medical expertise.³¹ Today, physicians face patients bristling with Googled information and diagnoses.³² Doubtless, the professionals' reactions are complex.³³ While some patients challenge received opinion, others are made anxious by confusing and ill-digested data.³⁴ Self-diagnosis and treatment liberate patients from professional overbearance, but they also saddle the newly empowered with responsibility for their fates.

A tsunami of information—good, bad, and indifferent—washes over us. Fake news and social media manipulations are the dark sides of the web's success. Filters or other hurdles to access no longer blend out the cranks, fabulists, and conspiracy theorists. Every voice insists on its points equally loudly. Many are broadcasting. How many are listening?

The Networked Ape

The secret of *Homo sapiens'* success—cultural anthropologists have argued—lies less with our primate line's intelligence than with our talent for transmitting knowledge among ourselves and across time. We receive guidance from our ancestors, preserving and embellishing it for descendants. Thus, we may be the cleverest ape, but that does not most saliently distinguish us from our primate cousins. More interesting is our ability to cooperate and to develop knowledge collectively. We have domesticated ourselves sufficiently that we can collaborate instead of ceaselessly quarreling.³⁵ Chimpanzees and even the more pacific bonobos fight among themselves incessantly. Chimps are a hundred times more violent than humans. We are not happy packed into long-haul flights, but three hundred chimps confined for hours in similar circumstances would likely tear each other apart.³⁶

Self-domesticated, we cooperate and share knowledge. Human infants do not solve puzzles or tasks better than their primate peers, but they excel at discerning what others want and understanding nonverbal cues of intent. Marooned in inhospitable environments, Western explorers have starved, frozen, and perished even as the natives they called savages survived just fine. Bereft of local skills and knowledge, otherwise well-endowed outsiders failed to master their environment. Meanwhile, the locals drew on accumulated knowledge to harvest the right plants, to render them harmless and nourishing, to hunt where game was most plentiful, and to protect against the elements. The more extensive and ancient the knowledge network, the better they mastered the situation. Conversely, indigenous peoples have become deskilled when their numbers were decimated by attack or disease, their reduced populations no longer maintaining and transmitting a critical mass of know-how.³⁷

The more humans there are, the deeper the pool of accumulated wisdom, the greater our knowledge, the more likely someone is

to solve looming predicaments.³⁸ Yet sheer numbers do not automatically generate insight. Seventy thousand Florentines produced much of the Renaissance, fifty thousand Edinburghers, the Scottish Enlightenment. Those who would accomplish something must also be well educated and trained. Above all, they must be connected, learning from each other. The denser the networks, the bigger and more productive the collective brain.³⁹ Before the Industrial Revolution, technological advances arrived in brief spurts, rarely generating prolonged growth or development. Continuous and sustained progress became possible only as the pool of scientific knowledge deepened, sparking economically useful interventions into nature. As important as knowledge's specific content was, allowing inventors and entrepreneurs broad access was equally crucial. That became more common between the Scientific and Industrial Revolutions.⁴⁰ If it is not widely available, knowledge remains esoteric and useless.

Libraries are one embodiment of our collective minds. Though the web has surpassed them, in the analog era, they contained the largest accumulations of information possible. Alexandria's library under the Ptolemies sought to assemble all that was known. Its ambition was complete coverage of everything ever written. Often, it owned the originals, insofar as that was a concept when everything was embodied in manuscripts and copies of them. The Ptolemies ordered all works on ships passing through Alexandria's port to be copied, and they kept the one they had taken, returning the facsimile. By the first century BCE, the library had collected 700,000 rolls, some 100,000 works.⁴¹ As its store accumulated, researchers who tasted its distilled essence knew more about the world without going into it than those who merely experienced reality in its diluted everyday form. Some of the ancient world's best cartography and ethnography was produced by scholars who never ventured outside the library's walls.⁴²

A major research library contains undigested the potential answers to countless questions. The medievalist Michael McCormick

once described squeezing from the otherwise mute 300 billion or so words within Harvard's Widener Library an answer to his question: was European trade with the Arab world in the eighth and ninth centuries—the murkiest of the Dark Ages—partly responsible for kindling the fires of later economic revival?⁴³ Within a week, he and his students had tracked down data on archaeological discoveries of coins from the Levant in Europe. Obscure numismatic journals demonstrated contact between the two regions.⁴⁴

Networks, then, amplify the knowledge they connect. Thanks to the post office, Ramanujan, the brilliant Indian mathematical autodidact, was in touch with British colleagues before World War I. Yet, as an observant Brahmin, he long refused to leave India to study in England. His mentor, G. R. Hardy, wondered what Ramanujan could have accomplished had he encountered highly trained colleagues at age 16, rather than only a decade later.⁴⁵ Even his limited connections, in turn, stood in contrast to previous Indian mathematicians, such as Madhava in the fourteenth century, whose work was unknown just a few miles from his ancestral estate in Kerala.⁴⁶

Stealing ideas is a form of networking, the inverted homage paid to knowledge worth pilfering. Nineteenth-century American industry was seeded by inventions and know-how purloined by entrepreneurs from their English competitors. The mills of Massachusetts began as rip-offs of those in Lancashire, just as English fiction amused nineteenth-century Americans without the cost of royalties.⁴⁷

More recently, the power of networked knowledge was demonstrated by how rapidly researchers genetically sequenced the coronavirus in 2020. In 2002–2003, the SARS virus had taken several months, but the coronavirus just weeks. Earlier, data had been hampered away, anticipating publication in prestigious paywalled journals. Even as recently as the Ebola and Zika epidemics, scientific information still flowed sluggishly. During the Covid pandemic, barriers fell. After a rocky start, as the Chinese sat on information, epidemiological data began to be posted rapidly on the web as preprints, permitting its efficient use.⁴⁸ Indeed, a torrent of submissions

to scientific periodicals, not just about Covid, poured forth during the pandemic.⁴⁹

The human mind has also gradually extended beyond the skull, joining up more broadly with the world. Our senses have long been amplified by technology. Vision is the most obvious example, expanded through lenses and later their electronic offspring. Hearing has been enhanced via telecommunication, tying us aurally into the globe. Through writing, our memory has been outsourced onto papyrus, parchment, and paper. In 1946, Vannevar Bush envisaged his memex machine as a means for gathering our books, records, and communications, allowing them to be immediately available and thus becoming an “enlarged, intimate supplement” to our memories.⁵⁰ The web now functions as our collective memory, allowing us to offload the burden of data storage externally. Our brains meld with our surroundings, as we incorporate enhanced stimuli and externalize our thought processes via ever-more-sophisticated devices, whether abacuses, sextants, slide rules, calculators, computers, or whatever implants are heading our way.⁵¹ For most of history, we have been en route to becoming cyborgs.

Seen in this context, open access is but the latest instance of an evolutionary imperative. The momentary culmination of a venerable historical trend of increasingly available information, it supplements humanity’s armamentarium of collaborative resources. But, more deeply, it adds functionalist heft to an evolutionary imperative, allowing us as a species to enhance our ability to cooperate and to develop collectively. This richness of motives spurring the pursuit of open access is joined by a moral imperative, too—social justice.

Information Wants to be Free?

Information freely shared and widely available may be humanity’s greatest resource, giving us an evolutionary leg up as a species. But

information that can be privatized and kept exclusively for a few has an inbuilt constituency for hamstering it. That “information wants to be free” is the mantra of open access, perhaps of digitality more generally. But is it true? Steward Brand, usually cited as the source of the claim, also said that information wants to be expensive because it is valuable, and this tension is irresolvable.⁵² Broadly speaking, Brand was asking whether knowledge can, or should, be a public good. Should knowledge be like clean air or national defense, something we must underwrite collectively since none of us can, or should, be prevented from using it?

Posing the same question about education suggests some of the issue’s ambiguities. As a good, education is both public and private. Individuals benefit from being trained, both intellectually and economically as their earning power rises. But society also prospers as its citizens improve themselves, becoming informed voters, considerate neighbors, and skilled employees. Financing and access to education reflect this dual nature. Primary and secondary schools are usually free for the immediate consumer, while universities often require some copayment from students, even in the most heavily state-financed systems.⁵³

Are knowledge and the research that produces it also public goods? Not all—indeed, arguably only a small part—seems to be the answer. The bulk of R&D in industrialized economies (between two-thirds and three-quarters) is paid for by corporations and serves their interests.⁵⁴ Even within university research, a good slug is financed by the private sector—35% in the UK, reaching a high of 58% at Oxford.⁵⁵ Such knowledge is unlikely to be openly accessible. Nor are universities immune to the logic of proprietary information as they patent their research and partner with companies set up to commercialize their breakthroughs.

Similar to the corporate world’s grip on its knowledge is the nation-state’s. Nothing is as jealously guarded as national security data, nor as zealously plundered. Wernher von Braun and 1,600

other German rocket scientists were spirited off after the fall of the Third Reich to work in what became NASA. Sometimes knowledge relevant to corporate and national security are the same. Taiwan's lead in microchip technology, and the difficulty of reproducing its know-how elsewhere, help make the nation indispensable to all its customers, East and West. That safeguards it against takeover from the mainland.

Even if its owners allow it, can knowledge be freely transmitted? It depends on what sort. Formal learning fixed on paper can most easily be preserved and conveyed. But informal know-how is hard to transmit except in face-to-face encounters and is usually passed along on the job. It exists in practitioners' minds and muscle memory and is conveyed by word and deed to apprentices. Patents allow trade knowledge to be securely exploited, and their numbers have mushroomed. In fields such as pharmaceuticals and IT, large companies eagerly patent, but much other commercially valuable knowledge remains protected in more traditional ways. Secrecy is widely used, and first movers take advantage of their lead to exploit know-how ahead of the competition.⁵⁶

Nor does academic knowledge inherently make itself available to the world. Researchers on the cusp of a breakthrough maintain secrecy so long as they can hope for priority and more publications.⁵⁷ Even academic work fixed on paper and widely accessible is not always easily digestible. Without the broad spread of literacy and then further education, research remains a closed book for most. Insiders have aggravated such obstacles by not always making their work easily penetrable. Scientists' technical vocabulary saves time when writing for each other, but it also excludes the uninitiated. That keeps science journalists in clover. Nor are the humanities and social sciences immune. Lay readers often complain about the esoteric and abstruse language favored in certain literary and philosophical fields—a linguistic version of the emperor's new clothes.

And primary among the many forms of information that explicitly does not want to be free is our own personal data. We guard our privacy jealously. Nature serves as an apt analogy, most appreciated as we begin to lose it. Those whose lives are dominated by wolves, hunger, and cold are unlikely to wax lyrical about nature's beauty and bounty. But once it has been trampled underfoot, we begin to grasp the immensity of its destruction. So, too, with privacy. For most of history, humans had neither privacy nor anonymity. We lived in small communities, unable to keep secrets beyond those that remained within our skulls. But as cities grew, especially as they expanded to allow anonymity, privacy became possible.

"*Stadtluft macht frei*" (city air brings freedom) was the medieval slogan that reflected the legal emancipation from feudal bonds delivered by residence in a town for a certain time. Escaping their feudal masters, city dwellers were now free of arbitrary imprisonment and could pursue whatever profession the guilds permitted.⁵⁸ But the slogan could just as well have served as a reminder that only in cities could humans disappear, shuffling off their ties to kin and kith to become fully anonymous. What we today sometimes consider the anomie of urban life must have felt like a delicious liberation for escapees from restricted circumstances—as indeed it still does for those whose habits, beliefs, or predicaments condemn them to oppression in their home communities. At the historical moment that media saturation, electronic surveillance, and data accumulation have blanched most hopes of keeping personal secrets, privacy becomes seen as a right.⁵⁹ Not all information wants to be free.

What control do individuals have over their bodily tissues once removed? May they be used for further scientific inquiry without permission, as happened with Henrietta Lacks's cervical cancer cells thanks to their ability to grow outside her body?⁶⁰ Groups also guard their information. When pharmaceuticals or useful varieties are derived from local plants, what claim do the indigenous peoples

whose knowledge pointed in that direction retain? Thediosgenin found in Mexican yams was instrumental in developing contraceptive pills during the 1970s, but once the ingredient could be synthesized, yams were no longer needed.⁶¹ Without participating in downstream benefits, why would locals share their knowledge in the future? Native Americans have resisted genetic analysis of their ancestors' remains and whatever it might reveal of their ultimate origins or the current composition of their membership. In 2002, Navajos imposed a moratorium on genetically testing their members.⁶²

Yet, despite some information resisting accessibility, a kernel of truth remains in the slogan that it wants to be free. At least scientific and academic knowledge should not be encumbered. The inquiry into fundamental processes of nature and society, the discoveries motivated by curiosity and the yearning to know—not only should their results be available to all interested consumers, but information is also improved through openness. The scientific method relies on transparency and free critique. Without that bracing tonic, the outcome would be impaired.

Knowledge production became open to competition in an intellectual market at the dawn of the Scientific Revolution. The lid was blown off three centuries during which secrecy had been prized.⁶³ The political and social elites were in no position to judge the merit of the scientific work they underwrote. Only when subjected to the harsh light of intellectual evaluation and competition from peers was its value revealed. After all, who knew what a science hidden away was worth? Especially if the work was formulated using mathematics, inscrutable to even the most cultivated patrons. Might one have sponsored a charlatan or even a heretic? Public scrutiny was required to vet and evaluate the work of natural philosophy.⁶⁴

But once exposed to analysis, knowledge's value became primarily intellectual—the glory that redounded to breakthrough discoverers and, by association, to their patrons. Not that cultural credit

and prestige were all that awaited scientists and their backers. Some knowledge could pay off and improve the world in practice. In the thirteenth century, the median began being used as an alternative to the mean to grasp the significance of lumpy data sets with extreme outliers. Two centuries later, the median was put to practical use, allowing navigators dealing with divergent instrument readings in stormy weather to chart more accurate courses. A breakthrough scientific concept allowed more useful data organization with real-world payoffs.

That meant making knowledge public. The patent system allowed discoveries or inventions to be monetized fairly. Yet to reap their benefits, disclosure was the price. In return for revealing their secrets, inventors were granted time-limited monopolies. Because their claims were to ideas—not just their expression, as in copyright—the terms had to be limited. Had inventors been allowed to lock up entire branches of applied science indefinitely, chaos would have ensued. Cultural stagnation was one possible outcome if monopolies reigned; widespread piracy was another, if monopolies were undermined willy-nilly. Either way, the patent system worked by granting terms sufficiently long to promise some reward, yet short enough that competitors agreed to wait their turn to exploit the innovation freely, perhaps licensing it in the meantime.

For knowledge with no immediate prospects of being exploited or put to patentable use, however, free access seemed the most desirable fate. What was gained by secreting away insight into nature's basic processes, society's workings, or the past's inheritance? Once opened, knowledge is nonrivalrous and non-excludable. No one can be kept from knowing, and no one is worse off when others know, too. Yet, given the difficulties and cost of dissemination, in practice, even academic knowledge has been kept from most people, either by publications requiring subscriptions or by institutions limiting access to their members.

What is the argument, much less the moral imperative, for sharing knowledge?⁶⁵ Some argue that everyone who can benefit from access to information already has it; therefore, little is gained by making knowledge universally available. Others point out that, given national disparities in research funding, not everyone contributes equally to pushing back the frontier. Of the \$1.7 trillion spent annually on R&D, ten nations pony up 80%.⁶⁶ Nor does each country invest in the same areas. Asia favors the natural sciences and engineering, the West, life sciences and medicine.⁶⁷ Basic and applied research are funded variously among nations. So, even if one country's taxpayers deserve insight into research they have supported, does that also hold for the free riders?

Proponents of openness counter that, since the overwhelming majority of the world is excluded from conventional scholarly information, the likelihood that only a few would profit from access is tiny. National differences in scientific focus, in turn, serve equally well as an argument for opening access across borders to benefit from differential comparative advantages. A crabbed accounting of who pays for what, and who deserves to see it, thus falls away. When the virtues of networking are added, insights are disproportionately amplified as connectivity multiplies.

The argument for opening up then widens from altruism (imparting it even to those who have not contributed) to include self-interest as the whole expands to more than its parts. And if, as we shall see, the costs of dissemination remain much the same whether paid for by readers or by authors, whether closed or open, then even a mere Pascallian wager would favor open access. The costs being comparable, the upside of opening up is potentially great, the downside modest. For the first time, digitality permits disseminating information at a marginal cost approaching zero. With some goodwill, funding, and hard work, scholarly knowledge could become one of the first global public goods.

Social Justice

Agreed that at least scientific and academic knowledge should be a public good, we arrive at the most powerful argument for open access, social justice. Knowledge is unequally distributed. The developed nations' largest libraries are ten times as big as Africa's (the national libraries of Egypt and South Africa), and seven times Latin America's (Chile and Mexico).⁶⁸ Harvard's library subscribes to ten times as many periodicals as India's best-funded research institution, the Institute of Science.⁶⁹ Per capita, Americans buy four times as many books as Brazilians (South America's biggest market).⁷⁰ Including Asia, developed nations account for 97% of all patent applications, Latin America 1.7%, Africa 0.5%.⁷¹ Scholars in the Global South find it hard to participate in the research, conference, and publication circuits of the US and Europe.

Inflated subscription prices are especially prohibitive for developing nations' libraries, and article processing charges, an even greater barrier. Networks of scholars have sprung up in Latin America and Africa to substitute for those in the West. While better than nothing, this further balkanizes what should be a global enterprise.⁷² Such observations could be multiplied at will. They confirm a depressing reality evident to all—the precarious tilt of knowledge and its availability away from the developing world. Digitality, coupled to open access, promises to bridge such gulfs.

On rare occasions, the last are made first. The economic historian Alexander Gerschenkron gained immortality with his concept of the advantages of backwardness. Latecomer nations, he argued, could skip steps on the road to industrialization that early birds had to take.⁷³ With mobile phones, developing countries have leapfrogged the once-necessary infrastructure of cables, masts, and landlines. For those old enough to remember party lines in rural areas, with one phone per household, usually installed in the darkest, coldest

nook, its use limited by cost and the need to share, not to mention callers connected by operators plugging into switchboards, the idea of everyone with their own phone seems miraculous.

Even in emerging nations, phone availability has outstripped what it was in the industrialized world within current lifetimes. On a list of the world's 216 countries, mobile phone penetration reaches one line per person already at Zimbabwe (rank 137). Even South Sudan and North Korea have fourteen lines per hundred people—statistically speaking, one for every seven users. In practical terms, that differs little from the 78% landline penetration rate per household achieved in the US in 1968, assuming five people per residence.⁷⁴

Digitality holds out similar prospects. It permits the developing world to skip infrastructure once needed for dissemination: publishers, periodicals, libraries, and archives. As the world's libraries come online, anyone anywhere with an internet connection has the virtual equivalent of a global library card—with access at least to public-domain material.

Alas, technology and its possibilities are not the only drivers here. International law does not invariably encourage enlightenment's spread. Little could be done when the US pirated Europe's copyrighted works in the nineteenth century. America was not yet a major cultural exporter and taking revenge by inflicting the same on US works promised little. Only once the first American bestsellers (works by Harriet Beecher Stowe, Mark Twain, and Walt Whitman) were ripped off by European publishers in the mid-nineteenth century did the tide begin to turn.⁷⁵ When the US refused to join the international copyright system set up in Berne in 1886, Bismarck regretted the decision but realized he could do nothing. "Am I supposed to dispatch warships?" he wondered?⁷⁶ Nowadays, the rights-holding nations may not unleash the navy, but their armamentarium includes trade sanctions. The increasingly globalized world economy forces developing countries to play by the industrialized world's rules if they expect to trade.

Granted, this has not been a one-way street. During the 1970s and 1980s, Third World nations that insulated themselves from the global market did poorly as they inefficiently created second-rate substitutes for products otherwise available. Other developing countries, such as South Korea and Taiwan, profited from selling to the West, and their success highlighted the advantages of joining the world market and playing by its rules. Some nations had their own intellectual property to export and protect—India’s software and films, for example.⁷⁷ In the meantime, China has become a major exporter and therefore seeks to protect its intellectual property.⁷⁸

Yet, the poorest nations remain in a bind—unable to ignore global trade regulations yet keen for better access to knowledge. Some intellectual property regulations do consider developing nations’ predicament. India has wrested the right to produce generic copies of medicines.⁷⁹ Others have been granted some leeway, allowing them to license books for educational use, to translate without permission, and to import cheaper foreign editions. But more should be possible. In Africa, copyright is still applied much as elsewhere, with little regard for local circumstances. Indeed, some nations here hobble themselves needlessly. They adopt more stringent copyright criteria than international treaties demand—longer durations and self-contradictory licensing requirements for public-domain works, for example.⁸⁰

Open access is a rare example of a cause backed in theory by a global unity of interest. What is a convenience for the public in industrialized nations, sparing readers a trek to libraries, is a quantum leap for Third World citizens, who have limited access to the world’s scholarly knowledge. When such information is treated as a global public good and everyone can read it, the taxpayers who finance research are deprived of nothing.

That it is a virtue to spread knowledge, both to First World citizens without access and to developing nations, presumes that

this benefits humanity. Universities are not the only source of the knowledge whose access is disputed, but because they are among the main drivers, their role is unavoidable. Universities are certainly open to criticism. Higher education benefits the market. Industry profits from academia. Access to universities is not always universal, equitable, or fair. Academia itself is governed by internal markets whose criteria are both intellectual and mercenary. Academic credentialing supports hierarchies of status and salary in the broader economy. University-generated content supplies the bread-and-circus acts of commercialized entertainment empires. Like other large enterprises, universities use short-term and casual labor, not always justifiably. Among their main functions is training the mid-level worker bees of modern economies. In short, scholarship is one with contemporary capitalism.

One can, of course, attack academia as part of capitalism and open access as part of academia. Perhaps it is true that open access masks an underlying commodification of knowledge by pretending to make a gift of something that must still be paid for. Intellectual workers may be deprived of their labor's fruits by having to give them away. Open access could gloss over exploitative relations among the informalized ranks of university teachers or the publishing industry's casualized and ill-paid labor. Maybe when open access is granted to readers, it locks out authors who cannot afford publishing charges. Perhaps the data mining it permits by releasing information allows another intellectual land grab by media industries. And, possibly, open access helps pharmaceutical, medical, and computer businesses outsource their research functions to universities in return for creaming off the results of government-financed work.⁸¹

Open access also lends itself to neoliberal interpretations.⁸² Such suspicions often attach to solutions claiming to be technologically and politically neutral. Defined thus, open access sees freedom

as the centralized state's absence, leaving citizens free to choose among options.⁸³ It becomes part of the allegedly Californian evangelism of tech-based answers to information problems.⁸⁴

Although this is arguable, attacking open access by lambasting modern industrial capitalism is akin to complaining about gravity when feeling weary. Both the problems and their solution emerge from modern technologies and their exploitation. Open access may put pressure on young scholars compared to their elders, who faced no demand to make work available. But it also gives today's rising academics an audience potentially vaster than that of their seniors, immured in the ivory tower. Publications financed by processing fees may be accessible to readers, while their cost excludes would-be authors in the Global South. Yet open access can make all knowledge available in even the most distant nook. And it could unleash flows of ideas and information not just from North to South, or even in reverse, but as a global Brownian motion of data and insights.⁸⁵ Opening the channels of data promises to level tilted playing fields. It allows a potentially worldwide intellectual exchange, permitting many who have been excluded to participate and raising the chance of reciprocal influence across the equator. Entirely erasing the inherited division between culture exporters and importers, producers and recipients, may still lie in the future, but using digitality on behalf of open access is the single most powerful tool we have.

Some Distinctions

Let us clarify a few terms that recur here. In practice, *open access* means being able at any internet connection to read content that earlier would have been available only to journal subscribers, book buyers, or library patrons. Whether it means more is hotly debated. Should readers also be able to download content, reproduce it,

repurpose it, and publish it in new editions, translations, or other formats? Like other commercial enterprises, conventional publishing requires customers to pay for its products. Libraries breach the practice of treating content like other purchasable items. Readers can borrow or read in situ books or periodicals bought by librarians. No other commercial items are lent out in this sense. Rental car companies and airlines sell the temporary or partial use of what customers would otherwise need to purchase in toto. And agricultural machinery cooperatives are similar to private lending libraries, sharing the costs of common consumables. But for no other consumer items—except perhaps public transport, education, and medical care, insofar as they are considered commodities—does the state spend to grant citizens use.

Who pays to make content freely available? So far, consumers, including libraries, have underwritten conventional publishing. Thanks to digitality, open-access publishing could, in theory, be cheaper than paper and binding. Yet, however efficient digital production may be, costs remain to be met. Who should shoulder them? The obvious answer is authors, but this works only for some of them. Authors are motivated to write by the attention their work receives and the sales it generates. Intellectual property can be more easily pirated than material forms of ownership. Not until the state used copyright to give authors a legal monopoly on their content could they hope to make a living by selling it. Those who earn money from their work naturally have no interest in paying so that audiences may enjoy it. But not all content producers sell their wares, nor do most authors sell enough to make a living.

Spreading the word, advancing truth and enlightenment, enhancing their intellectual or aesthetic reputations—such motives have equally spurred authors on. Some are paid for their efforts by other means and do not need sales. Scholars, scientists, theologians, museum curators, think-tankers, and others with an institutional affiliation do not depend on selling content. They create to gain

attention and to have their ideas heard. Many work for employers who have a say in what they write and pay them for it. Some have little control over the final product and are perhaps not authors in the conventional sense. But others, such as many of Hollywood's creative staff, are certainly *artistes*, if not authors, and see their work as expressing their personalities, even if they are paid salaries.

Open access is intended for authors who do not earn a living from selling their work, who are salaried or otherwise provided for, yet who control their rights. For them, readers trump buyers. Expanding their audiences by making works freely available might well tempt them. Why charge admission if your aim is attention? William Masters and Virginia Johnson's 1966 book, *Human Sexual Response*, was written in a deliberately obscure style to lower the topic's sizzle. Yet it sold well. Masters described it as "the most purchased, least read book in history."⁸⁶ Masters and Johnson were in the anomalous position of being academic entrepreneurs. Although their research started while they were faculty at Washington University in St. Louis, it continued at their independently financed research institute. Doubtless, the royalties were therefore welcome. But in terms of getting their message out, selling their book was counterproductive. Had it been issued as open access, it would have remained unread by even more people.

Open access flips the funding stream from consumers to producers. At the point of what used to be a sale, the product is free. Who, then, is to pay? The debates distinguish various forms of open access. Gold open access has authors or their research funders pay. Platinum and diamond open access differ from gold only in that someone other than authors pays. Sometimes libraries band together to pool dissemination costs, thus gaining access to works not just for themselves but for all readers. In effect, this is cooperative bulk purchasing for humanity. Other times, funders subsidize presses or periodicals, allowing them to issue works without cost to authors or, of course, to readers. Works—especially books—can be

published both under open access in digital form and in print for a fee. Book buyers thus subsidize digital readers.

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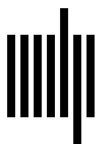
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