# 5

# Enclosing Nature's Code

The previous chapters have shown how a handful of legal modules have been used creatively over centuries to code various assets as capital, starting with land, a resource that exists outside the law, but quickly moving on to assets that owe their very existence entirely to the law: the corporate shares and bonds that were discussed in chapter 3, and the notes, bills of exchange, RMBSs, and CDOs we encountered in chapter 4. In this chapter, we will discover that the legal code can also be used to code knowledge, including of nature's own code, by legally enclosing it to the exclusion of others. Most intellectual property rights are of only limited duration so that the fountain of wealth they create will dry out eventually. Still, there are ways to prolong their life span by altering some features of the original invention, or by recoding them with legal modules that do not have an expiration date, such as trade secrecy law.

The genetic foundation of life was discovered only in the nineteenth century by the friar and botanist Gregor Mendel. By 1944, scientists had discovered that DNA (deoxyribonucleic acid) was the carrier for genetic information, and in 1953, James Watson and Francis Crick published a paper in which they depicted the double helix structure of the DNA.[1] Their work marked a major breakthrough

that revolutionized our understanding of biology, inheritance, and evolution and earned the two scientists, together with Maurice Wilkins, the Nobel Prize in Medicine in 1962. Genetic research has made huge strides ever since. Fifty years after the publication of the double helix, the Human Genome Project completed a map of the entire gene sequence for *homo sapiens*, giving us "the ability, for the first time, to read nature's complete genetic blueprint for building a human being."[2]

The race to convert this knowledge into wealth-producing assets did not wait until the full sequence was known. It kicked off decades earlier, as patents were filed to protect biotechnological inventions. The US government, which funded the Human Genome Project at the National Institutes of Health (NIH), is responsible for keeping the human genome in the public domain rather than being monopolized by patent holders. Still, bits and pieces of human genetic code have been patented, most of them in the United States, whose patent regime boasts that it will create an intellectual property right for "anything under the sun that is made by man."[3] This expansive perspective on intellectual property rights is the backdrop for the aggressive enclosure not only of our discovery of nature's code, but of skills and knowledge in other areas as well.

In 1918, Justice Brandeis could still claim that "[t]he general rule of law is, that the noblest of human productions—knowledge, truths ascertained, conceptions, and ideas—become, after voluntary communication to others, free as the air to common use."[4] Indeed, why should anyone have exclusive rights, even if only temporarily, over goods that remain undiminished even after some have made use of them? Knowledge, after all is a "non-rivalrous good," for which there cannot be a "tragedy of the commons"; instead, everyone should be able to share the knowledge that has been accumulated over centuries. Nonetheless, less than a century after Justice Brandeis wrote these wise words, legal enclosure has reduced the "knowledge commons" much further than he could have imagined.[5]

Legal enclosure battles have always pushed the limits of existing boundaries as we have seen with respect to the enclosure battles over land in England and its colonies. Once the genetic code had been

discovered, it did not take long for the Supreme Court to confront the question of where to draw the line when nature's own legal code was slated for legal enclosure.[6] The first major case involved the synthetic creation of bacteria with the capacity to break down crude oil. These bacteria do occur in nature, but not in this genetically engineered specific form; the court affirmed the patent.

Finally, in 2013, 60 years after Watson and Crick had published their paper about the structure of DNA and 10 years after the completion of the human genome project, the US Supreme Court had to decide whether unaltered human genes were patentable—i.e., whether nature's raw code could be legally enclosed with the effect of granting a patent holder priority rights over the rest of humanity.[7] The Court's answer was a unanimous no, but only a qualified one. It did not raise the fundamental normative question of the patentability of genes. Instead, it took a black letter approach to interpreting the Patent Act, which had first been enacted in 1790, and which in its current version states that "whoever invents or discovers *any new and useful* process, machine, manufacture, or composition of matter, or any new and useful *improvement* thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."[8]

The statute emphasizes novelty and usefulness and includes not only original inventions but also "improvements," a concept we have also encountered in the context of land enclosure in the colonies. Its language is broad, leaving it to the judiciary to police the outer boundaries of patentability, which the Supreme Court has stipulated as "laws of nature, natural phenomena, and abstract ideas."[9] These exceptions may seem self-evident, but their boundaries are anything but. A whole gene sequence may be part of nature, but what if humans isolated only parts thereof; would this be patentable? And what if lab technicians replicated nature's ingenuity, altering it just a little bit, for example, by cutting off a sequence where nature typically would not do this?

This is where the line was drawn by the US Supreme Court in 2013: The mere isolation of a DNA sequence without any man-made change or alteration falls into the law of nature exception and is therefore not patentable. In contrast, the *synthetic* creation of cDNA,

which does not occur exactly in this form in nature, was deemed to be patentable. The justices were unmoved by scientists arguing that the distinction they drew in law made little sense in science. "The nucleotide sequence of cDNA," they argued, "is dictated by nature, not by the lab technician."[10] Instead, the Supreme Court was satisfied that humans had generated an intron-less DNA and thereby had created an exon-only molecule. It did not even matter that such intron-less molecules occur in mature messenger RNA (mRNA), of which the cDNA is an exact copy, only written in DNA.

The Court also took pains in its decision to point out that the ruling in this case had no bearing on the patentability of scientific alterations of human genes.[11] This could be read as an invitation to private parties to test the boundaries of gene patenting in future cases. The Court has drawn another line, but it has not closed the door to further challenges.

## Whose Choice?

In an op-ed entitled "My Medical Choice," the actress Angelina Jolie disclosed in May 2013 that she had undergone a double mastectomy.[12] She had made this difficult decision after a genetic test confirmed that she was carrying BRCA (the breast cancer susceptibility gene) type 1, which greatly increases the likelihood that she might develop breast cancer. Whereas the average woman has a 10–15 percent risk, her own was estimated at 87 percent, paired with a higher risk of developing ovarian cancer as well. The op-ed was very personal; it was about her mother, who had died of breast cancer at age fifty-six, her children, her husband, and her own surgery and recovery from it. Only at the end of the op-ed did Jolie hint at a bigger battle that was being waged in the background: the battle over privatizing genetic testing. The costs of genetic testing for BRCA, about $3,000, she suggested, were well beyond the means of many women, who were therefore denied the choice she had.

What she did not say was that the $3,000 fee for the genetic test went to a company that held multiple patents for the BRCA sequence and which had monopolized the market for genetic testing

in the United States, even as unpatented tests that were available before BRCA was patented cost as little as $100.[13] It was this patent that gave the US Supreme Court the opportunity to determine the patentability of human genes in the case mentioned earlier. Oral hearings had already been held in April 2013, and the decision was announced in June 2013.

The background story of this legal dispute is intriguing, because it showcases yet another enclosure struggle, this time not over land, not just over human know-how or skills, but over nature's own code.[14] Myriad Genetics poses in this story as the landlords who banned the commoners from the land they had shared in the past.[15] It is a publicly traded for-profit corporation located in Salt Lake City.[16] The company was established in 1991 by Dr. Mark Skolnick, a member of the faculty at the University of Utah, jointly with a local capital venture group. The founding of the company came on the heels of the publication of a path-breaking scientific paper that demonstrated that breast cancer was linked to a gene and identified its location, though not its sequence.[17] This breakthrough had been made possible by a major collaborative scientific undertaking, the International Breast Cancer Linkage Consortium, in which hundreds of scientists, supported mostly by government grants, had participated.

Identifying the precise sequence would be next, and the NIH had already funded a major research undertaking to do just that. Dr. Skolnick spotted an opportunity and urged private investors to add money behind his own efforts to out-compete that consortium. Academic scientists, of course, compete head-on all the time, that is, as long as patents or similar restrictions don't prevent them from doing so. Their prize is a publication in a leading journal, such as *Nature* or *Science*, recognition among peers, and better access to future funding cycles as well as promotions. Dr. Skolnick and the venture capitalists he mobilized, however, were after a different prize: the revenue that would flow from owning the patent for the breast cancer gene.

In September 1994, Myriad and its collaborators announced that they had the sequence, and Myriad quickly proceeded to patent it. A few years later, they also received a patent for BRCA2. On the

other side of the battle over access to human genes were the mostly academic scientists who invested time and effort that was paid for by universities, research labs, and government and private grants, to research the underlying genetic defects of major diseases.

Several clinics had already offered tests for BRCA to women with a family history of breast cancer. These were the commoners of knowledge, if you will. Before long, however, they confronted the legal equivalent of the hedges and fences the English landlords erected against the commoners in the past. After friendly overtures to sign collaborative license agreements, but with limited scope for research and information sharing with patients, did not bear any fruit, Myriad hired a law firm that sent "cease and desist" orders to clinics at Pennsylvania University, New York University, and the Cancer Genetics Network Project, among others, threatening lawsuits if they failed to comply with the company's newly registered patent.

For patents, there is no equivalent for hedge-breaking and ploughing fields the landlords had claimed as their own; patents are creatures of law and the only battlefield therefore is a court of law. And so, the commoners joined forces and brought suit to invalidate Myriad's patents. The lead plaintiff was the Association for Molecular Pathology; others included the American College of Medical Genetics, and the American Society for Clinical Pathology, as well as several doctors and scientists who had received Myriad's cease and desist orders and had been forced to stop offering tests to patients and to discontinue related research. It was not an easy battle. The district court held for the scientists, but the appeals court sided with Myriad. The plaintiffs had to push the battle all the way to the US Supreme Court, where they finally scored a win.

The ruling surprised many patent experts who had relied on the fact that the US Patent Office had patented gene sequences quite liberally for more than two decades. Myriad even argued that the court owed some deference to the US Patent Office, but to no avail. The Supreme Court asserted its prerogative over determining the meaning of the US Patent Act and applying it to new technological developments. Nonetheless, the positive outcome for the plaintiffs has little effect on all the other patents that had been granted earlier and now

potentially conflicted with the new ruling. Unless private contenders mobilize the resources to attack them in court, one by one, these monopolies will continue to enclose nature's code to enrich the patent holders and their shareholders.[18] And they will continue to invoke the time-tested argument that in the absence of financial rewards, innovations of this kind won't happen. The background story to the BRCA case, however, proves the contrary: there are a lot of scientists, governments, as well as private foundations, who are willing to invest their resources to discover the root causes of devastating diseases and to understand the laws of nature. Indeed, basic science tends to be funded by governments, not private companies, as the returns on this investment are highly unpredictable. Private entrepreneurs wait patiently for discoveries that can be made profitable and, with the help of the legal code, can be turned into capital.[19]

Given the monetary value of patents, one would have expected that the loss of its patents should have been a severe blow to Myriad. In fact, the company suffered less of a blow financially than one might have expected. The reason is that between 1994, when the first patent was registered, and 2013, when the DNA-only patents were invalidated, Myriad had built a monopoly over BRCA breast cancer testing. The company claimed its test as the new "gold standard," but others have been less sanguine, arguing that the monopoly had prevented superior tests from gaining prominence. Either way, between 1997 and 2013, Myriad "sold around one million tests and generated $2 billion in revenue, 80 percent of it coming from its RCA Analysis product."[20] Revenues in 2017, four years since the BRCA gene had been invalidated, stood at $771 million, 74 percent of which the company's financial statements attributed to "hereditary cancer testing."[21]

The US Constitution granted Congress the power to "promote the progress of science and useful arts, by securing for a limited timed to authors and inventors the exclusive right to their respective writings and discoveries."[22] It thereby acknowledges that intellectual property rights are creatures of law and allocates the power to define them to Congress. The justification for creating these temporary monopolies is to incentivize the inventor or artist by allowing them to fully capture the monetary value of their creativity for fear that

they would otherwise cease activities that might be of tremendous social value. Yet, human creativity has been driven over the millennia by motives other than monetary gains. Even with a comprehensive system of intellectual property rights in place, most authors, composers, and inventors receive only a tiny return for their creativity. The ultimate beneficiaries of the legal monopolies that intellectual property rights create are corporations that extract returns from patents for the financial benefits of their shareholders.[23] Indeed, most patents in the United States today are filed not by individuals, but by corporate entities, creatures of law that have neither intellectual power nor creativity of their own. Between 2002 and 2015, more than 4.6 million patents were granted by the US Patent Office to US and foreign patent holders. About 12 percent went to individuals, less than 1 percent to governments, but 43.5 percent to foreign and 44.1 percent to US corporations.[24] These numbers highlight that the power of patents is more closely associated with commercial use than gratification for creativity.

Granting monopolies is always about creating gains for some (the monopolists) and costs for the rest; it may be justified in exceptional circumstances but requires a careful balancing act between the costs and benefits on both sides of the equation. The social costs of enclosing knowledge can be huge, because control over knowledge is monopolized even though it could benefit everyone without taking anything away from the inventor. And yet, states have supported the enclosure of knowledge and left it to the code's masters and official agents in patent offices to police its borders, with only sporadic court oversight.

## Intangible Capital

At long last, economists have discovered that capital is not a thing, but a quality, although most don't know it yet. In a recent book entitled *Capitalism without Capital*, Haskel and Westlake argue that the market value of leading corporations today is not determined by the physical assets they own and use to produce goods, but by intangibles: the patents, copyrights, and trademarks they own, and

the branding and business processes they have developed.[25] However, the authors limit the definition of capital to physical things that you can see and touch, and therefore conclude that we live in a wondrous new world of capitalism *without* capital.

This happens when one relies on the outward appearance of things and ignores the code that determines their look, for appearances can be deceiving. Haskel and Westlake are not oblivious to law; in their book, they even compile a table that lists variants of intangibles and map them into their treatment in law on one hand, and in national accounts on the other.[26] As they show, about half of the intangible investments are not recognized in national accounts; but law has a label for all of them, called patents, trademarks, property rights, and a catchall category of "other," which can be deciphered as trade secrets as well as business processes. Still, the authors hesitate to draw the obvious conclusion that there is a powerful link between law and intangibles, indeed, that the law is the source code for transforming ideas, skills, know-how, even processes, into capital.

The reluctance of these accounting experts to cut through their own belief structure resonates with the late US Supreme Court Justice Scalia's personal struggle over the scientific basis of the BRCA case against Myriad. In a concurring statement, he distanced himself from the first part of the Court's ruling that detailed the scientific knowledge about genetics as the source of life. "I am unable to affirm those details on my own knowledge or even my own belief," the devout Catholic wrote.[27] And as accounting experts, Haskel and Westlake seem unable to recognize law for its central role in coding capital, and, as a result, leave it outside the equation.

More generally, economists and accountants have clung to the notion that capital is a physical input, one of the two factors of production, when in fact, capital has never been about a thing, but always about its legal coding; never just about output and input, but always about the ability to capture and monetize expected returns.[28] Marxists at least hold that capital is a relational concept, emphasizing the exploitative relation between capital and labor. Yet they too underestimate the role of law in the process of wealth creation.[29] By grafting the modules of the legal code of capital onto an asset,

its holder obtains a right over and above others; her claims enjoy greater durability and face fewer obstacles to lock in past gains by converting them into state money. Last, these special rights are universal and can therefore be enforced against the world.

Exceptions prove the rule; some economists have recognized that restricting the world to things one can see and touch can be highly misleading. The eminent scholar Robert Solow, for example, remarked in 1987 that "you see the computer revolution everywhere except in the productivity data."[30] Since then, efforts have been made to measure intangibles for national accounts, firm productivity, and shareholder wealth. As the saying goes, "that which is measured, improves," but in this case, the reverse seems to hold: because there seems to be something of value here, we must be able to measure it.[31]

Measuring and valuing intangibles has become more important since the more conventional "bricks and mortar" capital in the form of land, factories, machines, and other tangibles has been in decline. Available evidence suggests that traditional capital investments have accounted for only 8 percent of economic growth in the United States between 1995 and 2003, whereas investments in intangibles have increased from only 4 percent in the late 1970s to more than 10 percent by 2006.[32] In the United States and the United Kingdom, though less so in other leading economies, investments in intangibles now exceed investments in tangibles.[33]

The powerful arguments in favor of enclosure of assets for the promotion of private investments and creativity notwithstanding, monopolizing knowledge has not been an unmitigated success for economic development; to the contrary, the shares of intangibles in the market value of major corporations has gone hand in hand with a *decline* in investments. Several economists have called the current state of affairs, in which firms are sitting on stockpiles of cash but with few investment projects on hand, a "secular stagnation." Some argue that once investments in intangibles are fully accounted for, this phenomenon will disappear.[34] Others, however, have suggested that the enclosure of knowledge is responsible for the decline in viable investment opportunities and has led to an "investment famine."[35] Even though patents are only temporary monopolies,

their longer-term effects go well beyond the duration of the patent itself. They preclude others from using, perfecting, and investing in knowledge and thereby contribute to the skewed distribution of wealth. As Pagano writes,

> there seems to be an evident paradox in the institutional tendencies of modern capitalism: the knowledge-intensive characteristics of its technologies should favour a democratic economy made up of small firms employing non-rival knowledge; by contrast, however, thanks to knowledge private ownership, big global firms, whose shares are traded on global financial markets, are increasingly predominant in the world economy.[36]

From the perspective of this book, this is not a paradox at all; it's the logic of capital coded in law, which rests on the principle that some assets, and by implication, their holders, enjoy legal privileges over others. They obtain stronger rights against the world and even get to make them durable in order to withstand not only unexpected events, the "exogenous shocks" that create imbalances in standard economic models, but the forces of competition. Competition is essential for the operation of markets; it fuels the forces of creative destruction, which, according to Joseph Schumpeter, are the drivers of economic progress.[37] But the legal code of capital does not follow the rules of competition; instead, it operates according to the logic of power and privilege.

## Property Rights as Industrial Policy

The rulers over cities, regions, and countries discovered long ago how by offering special legal protection they could retain local and attract foreign craftsmen and artisans. And those professing superior knowledge and skills have pleaded with rulers for centuries to protect them from competitors by cloaking their skills in legal privileges. Historical records of these protective privileges date back to the fourteenth century. In 1331, for example, King Edward III assured John Kempe protection for his company, Flemish Weavers on the English isle.[38] And in 1440, John Shiedame received a patent for a

new technique for processing salt.[39] In England, patenting foreign artisans became particularly prevalent during the Tudor dynasty, when artisans from all over Continental Europe were brought into the service of the Crown. It was a form of industrial policy that allowed England to compete with rulers on the continent who displayed their power in beautiful architecture, textiles, ceramics, and the arts.

The earliest example of a general legal statute that assured all craftsmen full legal protection was a decree the Senate of the city of Venice passed in 1474.[40] It required artisans to register "new and ingenious devices, not previously made in our jurisdiction" with the local authorities. Once registered, everyone else was prohibited from using the same device. Its holder could file a case against the violator "before every office of this city, by which office the aforesaid infringer would be compelled to pay one hundred ducats and his artifice would be immediately destroyed." The city itself, however, was free to use it "for its own use and needs."[41] The Senate, it seems, was unwilling to extend legal privileges without reserving the right for the city to access it, making sure that private privileges would not crowd out their public use and benefits.

There is an important difference between ad hoc conferrals of legal privileges on one hand, and a general statute, like the Venetian Statute of 1474, on the other. Ad hoc privileges are discretionary; they can be used to grant favors, increase revenue, attract foreign artisans, or promote local craft and industry. The highly discretionary use of such monopoly rights especially by Queen Elizabeth I eventually gave birth to England's first statutory law on patents, the 1624 "Statute of Monopolies." The statute was meant to restrict the promiscuous granting of patent and similar monopoly rights by the Crown, including letters, grants, commissions, licenses, or patents.[42] Aggrieved parties were empowered to challenge such privileges under general principles of the common law. Notably, "new" manufacturing in the realm of the "trust and first inventor" or "first manufacturer" was exempted from such challenges, and so were patents and other privileges granted by Parliament.[43] Apparently, Parliament thought itself to be above the fray of fashioning special privileges for a few.

By regularizing the granting of privileges, Parliament curtailed the Crown's discretionary powers, but regularization produced its own costs. Patents used to be a narrowly construed exception to a general prohibition of monopolies; now they became a valuable capital asset to be fought over in court or lobbied for in legislatures. The patent hunters invoked natural rights and the Lockean freedom to enjoy the fruits of one's labor, while opponents of patents emphasized monopolies' anti-competitive effects. In many states, the regularization of intellectual property rights was hotly debated and fiercely opposed. The Netherlands went as far as abolishing patents in 1869; other countries changed course several times in response to both internal and external pressures.

When the Austro-Hungarian Empire sought to attract companies from all over Europe to an international exhibition held in Vienna in 1873, prospective attendees insisted on legal protection for their intangibles before committing to attend. To ensure the success of the exhibition, the Austro-Hungarian Empire adopted a temporary law that protected the intellectual property rights of these foreigners.[44] In the end, the exhibition turned out to be a colossal disaster, but because of two unrelated events—a major financial crisis and a cholera outbreak. Still, it had put the question of transnational property rights on the agenda of domestic and international lawmakers, and it provided the impetus for the first international treaty, the 1883 Paris Convention for the Protection of Industrial Property.[45]

By signing up for international treaties such as the Paris Convention, sovereign states committed to recognize the legal protections of intellectual property rights that were created under foreign law, but they did so strictly in a reciprocal fashion: they would recognize the rights granted by foreign states provided these states did the same for the rights they created under their own laws. The internationalization of property rights in intangibles created a powerful argument in favor of domestic protections and it is easy to see why. Countries that did not follow the trend now faced the unpalatable choice of staying outside the club, thereby undermining their ability to attract foreigners while also exposing their own companies to intellectual property "theft" abroad.

The battle between free traders and advocates for temporal monopolies also waged in the United States. For much of the nineteenth and early twentieth centuries, the balance tilted against comprehensive protections for intellectual property rights. With an economy that was still relatively backward and seeking to catch up with the industrializing powerhouses of Europe, especially the UK, the country had little reason to take a strong position on protecting intangibles and thereby potentially closing off critical sources of knowledge that could be used for economic advancement. As the country matured into a leading industrialized nation, however, attitudes changed, and the United States morphed into the foremost champion for intellectual property rights in the globe.

US-based private industry took the lead in the elevation of US intellectual property rights to global legal standards; it pleaded not only for strengthening intellectual property rights at home, but for extending these protections globally. This was easier said than done, because principles of comity among sovereign states limit the reach of each country's domestic laws beyond their own territory. The solution was to characterize as unfair competition infringements of property rights that were protected under US law, whether or not this was also the case under the laws of the country where this infringement occurred. Moreover, private industry urged the US government to use trade sanctions against countries that failed to adhere to US norms.[46] Under the new Trade Act of 1974, companies even obtained the right to petition the US government to bring trade sanctions against other countries.[47] Such a petition was nonbinding, but gave industry a powerful tool to twist the arm of its government. The 1974 Trade Act also introduced a system of advisory committees that embedded the private industry's interests deeply in US global trade policies. The Act speaks of "citizens," who shall inform the government about their needs; yet most, if not all of the individuals who have sat on these committees over the years were chief executives (CEOs) or presidents of major corporations, not ordinary citizens.[48]

One person in particular left a deep mark on the globalization of US patent protection: Ed Pratt, the CEO of Pfizer Pharmaceuticals, who assumed the chair of the Advisory Committee for Trade

Negotiations (ACTN) in 1981 and shaped the committee's direction for years to come.[49] The company was a major supplier of penicillin to the Allied Forces during the Second World War and operated under a government-imposed compulsory license system. When, after the end of the war, these restrictions were lifted, the rush by each company to patent its own drug resulted in a highly inefficient fragmentation of property rights.[50] For the US market, companies soon agreed to swap patents to consolidate their respective gains—a practice that eventually gave rise to an anti-trust investigation. There were, however, markets beyond the United States and the reach of its patents where wound infections needed treatment, and Ed Pratt directed Pfizer to build a significant global market share in developing countries. At first, Pfizer did not bother much about patents for its overseas operations; as long as these countries lacked the technical skills to compete, the company could reap profits simply by relying on the know-how gap as its major comparative advantage. Increasingly, however, Pfizer faced two obstacles: some developing countries, India foremost among them, enacted laws that encouraged the production of cheap drugs for their people while also imposing restrictions on the scope of private rights.[51] In addition, more and more developing countries acquired the know-how that put them within reach of competition with companies from the West.

The answer to this conundrum was to globalize patents on the standards that US law had developed, and the ACTN, the committee Pfizer's CEO Ed Pratt chaired, became a critical tool to advance this agenda. Strengthening the US trade sanctions systems was part of this strategy. The United States pushed for better protection of intellectual property rights elsewhere by making this a condition for signing new bilateral or multilateral trade deals, without which countries lacked access to the US market.[52] Ultimately, though, the goal was to incorporate the standards US companies had secured in the United States into a single multilateral agreement.

## Forcing Other States' Hands

On January 1, 1995, the World Trade Organization was established, an organizational umbrella for governing international trade that

had been long in the making. The idea for it dates back to the end of World War II, but the International Trade Organization faltered when the US Congress did not ratify its founding treaty. Multilateral trade negotiations under the auspices of a much looser General Agreement on Tariffs and Trade (GATT) took its place; the GATT was used as a platform that was controlled by the most developed economies to liberalize international trade step by step, in a series of negotiation rounds. As the scope of the agreements expanded and more countries participated, a renewed push was made to create an international trade regime, the WTO. Just as global free trade was finally institutionalized, The Agreement on Trade-Related Aspects of Intellectual Property Rights, or TRIPS, created major carve-outs from the free trade regime for monopolies under the label of intellectual property rights. TRIPS gave the technologically more advanced companies of the global North the option to enclose their know-how and thereby remove free access to it by potential competitors in less advanced countries.

The TRIPS agreement does not fully harmonize intellectual property rights, but instead establishes minimum standards for the scope and duration of these rights. Following the US model, it mandates that not only processes, but products are also patentable—an increase in scope relative to patent rights that existed in many countries. Further, the duration of patents was standardized at 20 years. The most remarkable aspect of TRIPS, however, was that it was adopted at all. Preliminary inquiries by the US trade representative had found little resonance in other advanced economies and had been met with stern opposition from the developing world.

The fate of international agreements and norms is not always determined by states and their representatives. Closer inspection of how global rules emerge suggests that the capacity of key private players to organize themselves domestically is crucial.[53] Indeed, the making of global intellectual property rights can be traced directly to the organization of private businesses in the United States and their ability to mobilize their fellow businesses in other advanced economies as well. In the United States, business took the lead by establishing the Intellectual Property Committee (IPC) in 1986. It was modeled on the ACTN, which had paved the way for using trade

sanctions to protect US intellectual property rights abroad, and its explicit goal was to extend the US intellectual property rights regime to the rest of the world. Membership of the IPC included a cross-section of industry leaders in sectors from pharmaceuticals to computer technology and communications, including Bristol-Myers, DuPont, FMC Corporation, General Electric, General Motors, Hewlett-Packard, IBM, Johnson & Johnson, Merck, Monsanto, Pfizer, Rockwell International, and Warner Communications.[54]

These companies reached out to their counterparts in Europe and Japan and jointly with them formed a global business alliance that demanded stronger intellectual property rights protection.[55] The US trade sanction regime helped win over developing countries and emerging markets after several of these countries had learned the hard way that the United States would be willing to employ trade sanctions to protect US intellectual property rights in foreign countries. In 1989, for example, the United States levied tariffs worth $59 million against Brazil, which were removed only after Brazil pledged to update its IP regime. Fearing similar repercussions, Mexico agreed to extensive IP protections in the North American Free Trade Agreement (NAFTA) of 1994, prompting an industry representative to remark that "Mexico gave us all we wanted."[56] Other countries agreed to TRIPS for fear that they would be squeezed out from major markets should they fail to do so. Yet others counted on better access to markets for their agricultural products if they agreed; this proved to be a bad bet, as the agricultural trade negotiations have faltered, largely because of resistance in the global North.

Despite the powerful voice of industry, TRIPS had many critics, including most leading trade economists in the United States and elsewhere.[57] They classified intellectual property rights as monopolies that would create new obstacles to global trade, mirroring the arguments free-trade advocates had made back in the nineteenth century. Nevertheless, TRIPS was adopted. One observer put his finger on the underlying mechanisms. "States coerce other states," Drahos opined, often with military, but in this case with economic, power.[58] But states were not the main drivers behind legal reforms

in this case; rather, some states, foremost among them the United States, were doing the bidding of powerful industry interests.

States may make a lot of commitments in international agreements, but whether they will implement them is usually a different matter; and there is little that other states can do to ensure compliance. Even if they bring a case before the International Court of Justice and the court rules in their favor, they cannot rely on bailiffs or other enforcement agents to execute a judgment should a sovereign state ignore it. Unlike most international agreements, the WTO incorporates a full-blown dispute settlement mechanism, even an appellate body. It does not have sheriffs or bailiffs and as such lacks the insignia of coercive law enforcement that characterizes sovereign states. Instead, WTO law empowers a state that won a dispute to retaliate against the losing state if it fails to comply with the ruling.[59] Importantly, only the disputing state can take retaliatory measures, rendering this an empty weapon for countries with little economic prowess, but making it an even more powerful tool for states with big economies. It still takes a state to bring a case, but certainly in the United States, private parties have secured powerful levers over the US government to ensure that this enforcement mechanism will be used.

The story of TRIPS has interesting parallels to the legal conquest of land in foreign territories discussed in chapter 2. When the settlers arrived in the "new world," they claimed that no one before them could possibly claim prior title, because only the settlers had discovered the land and improved it. No matter that the indigenous peoples had been there first; they were expelled from their land without due process or just compensation, because their claims were not recognized in law. Discovery and improvement were deemed sufficient to override the principle of seniority for ranking competing claims to the same resource.

In a similar vein, early attempts to ensure that TRIPS would mediate between different approaches to defining intellectual property rights were rejected by private business from the global North. Their telling argument was that such alternative legal treatment offered "inadequate treatment of IP rights."[60] In their minds, there was only

one way to configure intellectual property rights—the American way. In truth, there is no such thing as a generic property right, whether intellectual or otherwise. The Privy Council and the Supreme Court of Belize understood as much when they recognized indigenous land use practices as property rights—and the same principles could and arguably should apply to intellectual property rights. By endorsing a singular approach based on the business interests in the most advanced economy, the world missed a critical opportunity to create an intellectual property rights regime of meaningful diversity and, critically, to preserve at least parts of the global commons in knowledge. Then and now, the quest to monetize assets won over, requiring their coding as capital.

## Trade Secrets in the Age of Big Data

Property rights are state-endorsed legal privileges that extend an owner's priority rights against the world. States don't offer their coercive powers to protect just any claim; property rights tend to be enumerated and subject to formalities and disclosure requirements. This is true also for patents; they have to conform to the standard the law establishes for patenting an invention, such as its novelty and utility. As a quid pro quo for obtaining a patent the patentee must disclose the core features of the invention, which implies that some information about the product will be leaked to others. If, however, the inventor needs a state to recognize and protect her rights against the world, others must be put on notice about their contents and scope. How else would others know when they trespass them?

Disclosing the details of the invention, is, of course, rarely in the interest of an aspiring monopolist. Of course, nobody is forced to seek a patent for an invention or discovery. Prospective patent holders who fear that too much secrecy might compromise their discovery or invention may therefore decide to forgo patenting altogether and to rely on the law of trade secrets instead.[61] Even better, they might combine the two. In the age of big data and technological advances, patents and trade secrets are no longer

sought in the alternative, but they have become complements, and with powerful, exclusionary, effects.[62]

Myriad's ability to turn the BRCA patent into profits years after the patent had been struck down illustrates how this works. Myriad obtained the patent for BRCA type 1 in 1994 and it was struck down by the US Supreme Court in 2013. Nonetheless, as late as 2017, Myriad was still living off the BRCA patent. The secret for the ongoing success is that the company had used the BRCA patent to generate data, building a database that had no match among its competitors. Myriad used its BRCA patent to compel doctors and patients to use their process to test for the gene and to share data with the company, and the company now protects its unmatched data with the help of trade secrecy law. The BRCA patent has been aptly described as a "data-generating patent" and the data, not the patent as such, proved to be the lasting fountain of wealth for Myriad. From a social welfare perspective, these data would be even more valuable in the public domain to advance public health concerns, but public and private welfare don't always correlate, and neither do private and public wealth.[63]

Myriad's founder, Dr. Skolnick, spotted the potential of marrying genetics with genealogy early on in his career, when he pursued his doctoral research for a degree in genetics (he already had a degree in economics) in Italy and came across three Mormons who were collecting parish records to identify the ancestors of their communities in Utah. A few years later, he suggested linking the Utah Mormon Genealogy to the Utah Cancer Registry to facilitate the process of identifying genes.[64] After Myriad had identified the BRCA sequence and patented it, the company did not just offer the test, but it collected detailed data from every patient, including her specific variation of the defective gene, the manifestation or phenotype of the cancer, her family history, and the gene pool to which she belonged. This database became Myriad's greatest asset. In 2005, the company stopped contributing information to public databases and stopped sharing its own data with others.[65] As Simon and Sichelman observed, "[w]hat began with patent protection over genetic information now includes trade secret protection for Myriad's databases of

patients' full genetic sequences and phenotypic information, as well as correlations and algorithms resulting from access to that wealth of data."[66]

In essence, "data-generating patents" give the patentee a head start over others in building a huge, private database that will be enforced through trade secrecy law long after the patent itself has expired. In contrast to conventional intellectual property rights, trade secrets have no time limit.[67] It is, of course, not without irony that the companies at the cutting edge of technological progress in the twenty-first century are employing one of the oldest tricks in the trade, one that is more closely associated with the protectionism of guilds than with free markets. But this is nothing new either; recall that the newly minted landowners of early modern times took refuge in the feudal law of the entail to protect their property rights against creditors.[68]

The guilds of the Middle Ages revolved around clubs of artisans and craftsmen who protected their interests against outside competitors. Members of each guild were sworn to protect the skills of the trade and apprentices who joined a master to learn a trade had to take an oath that they would not divulge their master's secret to outsiders. They would learn it, master it, and pass it on to the next generation of apprentices, who bowed to the same principles of secrecy. It is unlikely that all guild members or apprentices always lived up to these promises, but there has been astonishingly little litigation in courts.[69] One can only speculate that these norms were enforced informally through reputational bonds and, as a last resort, expulsion.[70]

The barriers to competition that guilds created were eventually dismantled in the name of free and competitive markets. In Polanyi's account, "deliberate action of the state in the fifteenth and sixteenth centuries foisted the mercantile system on the fiercely protectionist towns and principalities."[71] In so doing, the state cleared the path for the rise of the market principle, subordinating society to it.[72] Equally important, the changing organization of the workplace, from small shops that were individually owned to big factories with thousands of employees, fundamentally changed the old master-servant relationship.[73] Freeing labor from bondage and destroying

anticompetitive practices of the guilds set the stage for the emergence of large business operations with thousands of employees. Yet, these new businesses soon began to resort to guild-style practices, which they often defended successfully in court, in order to keep their employees from freely trading their knowledge on the labor market. Freedom, it seems, is a double-edged sword, and the winners of the last battle to free assets and their holders from the shackles of previous rules soon find themselves adapting these very rules to protect their own gains.

The gist of the trade secrecy doctrine, as it evolved in the United States, is that certain information and know-how can be shielded from use by others, even if it does not reach the level of a patentable innovation. In the nineteenth century, this body of law was put to use to prevent employees from using the skills they had acquired in one company to freely employ them elsewhere. The US company DuPont spearheaded the use of contractual covenants to this end.[74] US courts readily enforced these restrictions, thereby bringing the feudal calculus of Middle Age labor relations into the modern age. The result is a deep contradiction at the very heart of US labor relations. On the one hand, US labor law endorses "employment at will," which gives employers great flexibility in firing workers, on the other, it allows employers to restrain employees' ability to re-deploy their skills.

In the past, patents and trade secrets rarely crossed paths; inventors chose between patenting and relying on trade secrecy law depending on the nature of the invention, the costs, and the likelihood of obtaining a patent. The advent of big data, however, has created conditions for a new and powerful mix of patents plus trade secrets—and this is not limited to the pharmaceutical industry. Google's success story, for example, parallels that of Myriad in interesting ways. It is often said that Google and other big tech companies don't use patents. They seem to be able to do without the coercive powers of the state when it comes to protecting their most valuable asset: data about us. That story, however, is at best incomplete. The search technology Google has deployed to build its data empire *was* patented. Stanford University owned, but Google held the exclusive license to PageRank (which has since expired). Google's own patent lawyer

called PageRank "one of the most famous and valuable of all modern software patents."[75]

This may be dismissed as the typical hyperbole of a lawyer, but it fits squarely the worldview of patent lawyers who have claimed that patents, not humans, were responsible for the Industrial Revolution.[76] Yet, we often celebrate the new discoveries and technical breakthroughs, but ignore the legal work behind the scenes that gives these breakthroughs lasting wealth effects. The notion that patents propelled the Industrial Revolution aligns well with the argument advanced in this book that capital is coded in law; and that includes the coding of human intellectual "property." Patents have been equally central in producing the private wealth associated with the two post–industrial revolutions: biotech and software. Making the case that BRCA was patentable was already quite an achievement in legal engineering, even if it ultimately failed, but Google's PageRank is a close match. Google's lawyers were able to obtain a patent for something that is best described as a filing system, something so ordinary that it is difficult to see why it would qualify as an invention at all. What set it apart from ordinary filing systems was not its substance but its digital form: an algorithm for organizing and ranking digital documents based on the quantity and quality of links between them. This pushes the envelope of requirements for process-patents, which require some output or "transformation," not just a change in form, to be patentable.[77]

The patent allowed Google to build an enormous database of ordinary Internet users that is matched only by close rivals such as Facebook or Amazon. And Google has not shied away from using trade secrecy law to restrain former employees, thereby undermining one of the greatest comparative advantages of Silicon Valley's legal landscape: the non-enforceability of non-compete clauses.[78] When information technology first came of age, other technology companies, such as IBM along Route 128 in Massachusetts, were invoking these rules to keep know-how in house but were soon outcompeted by Silicon Valley with its free-wheeling start-up culture. It did not stay this way. Google recently sued Uber after one of its prized employees switched sides, claiming that he had appropriated

trade secrets for self-driving cars of one or more of the company's subsidiaries.[79] The civil case was settled, but criminal proceedings continued and Google cooperated with the authorities.[80] The pattern should be familiar by now: The former disrupters of existing law or technology learn quickly that only by invoking legal protection of their own (often the same protection they only recently fought) can they protect their own gains. Remarkably, they often get a court, even the legislatures, to side with their new worldview.[81]

The second enclosure (this time of knowledge rather than land) is occurring more quietly than the first and without physical violence, but its repercussions may well go further. It was traumatic for the commoners to lose the basis for their sustenance, or the First Peoples to be pushed from the lands they had occupied and used for centuries. We are now in danger of losing access to our own data and to nature's code for the sole purpose of giving select asset holders yet another opportunity to expand their wealth at the expense of the rest.