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'Genius', 'Faction' and Rescuing Intellectual Property Rights

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ABSTRACT *Intellectual property rights have been driven relentlessly towards a unitary system for the entire world, originally through passive copying of flawed United States arrangements, but more recently as a result of determined lobbying by American interests. But diversity and competition have the same beneficial potential for institutions themselves as they have for the economic development they can foster or hinder. A financial dimension in measuring grants, protecting innovation directly, compulsory technical arbitration of disputes, and some positive discrimination in favour of smaller firms could contribute to moving the balance back towards the diversity in rights that other countries need.*

Keywords: intellectual property rights; US Constitution; TRIPs

Introduction

Abraham Lincoln is perhaps a somewhat surprising person to find praising patents for being just as important to the human race as the inventions of writing and of printing, because they 'add the fuel of *interest* to the fire of *genius*'.[1] But it is not inappropriate to begin a discussion of intellectual property rights with his comment, because the story worldwide is so intimately tied into the origin and history of American government. Other landmarks of intellectual property rights history, such as the Venetian ordinance of 1474, the English Statute of Monopolies of 1623/4, the Statute of Anne of 1712/13 and the French patent act of 1791, are, of course, important, but the effective origin of modern intellectual property rights everywhere is Article 1, Section 8, Clause 8 of the United States Constitution.

In fact, the history of intellectual property rights illustrates with special clarity the issues that were debated so strongly around the drafting of that Constitution. The most important of these related to what was known as 'faction' at the time, but which today would be called 'special interest' or 'vested interest'. The Framers of the Constitution had a vision of a government that would act for the public good, but their great fear was that it could be captured by 'faction' or special interest groups. This is why they were so concerned, as Thomas Jefferson put it, 'that the powers of government … be so divided and balanced among several bodies of magistracy, as that no one could transcend their legal limits, without being effectively checked and restrained by the others'.[2]

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Public and Private Interests

The existence of an intellectual property rights clause in the Constitution is something of an anomaly because the Framers were very careful to leave legislation on property rights to the individual states. Jefferson argued against it on the grounds that 'the benefit of even limited monopolies is too doubtful to be opposed to that of their general suppression'.[3] But during the colonial period, several of the states had registered patents already granted in England, and followed this up by passing copyright and patent acts of their own, so that by 1786 every state except Delaware had its own copyright act.[4] Against this background, Jefferson's view was not supported, and the Constitutional Article was nodded through. (He later changed his mind about patents, through his experience as Secretary of State of having to operate the Patent Act of 1790.)

Whether he would now regret this or not, contemporary intellectual property rights show how right the Framers of the Constitution were to be afraid of faction. They feared what Jefferson called 'elective despotism' (that is, voters acting without concern for the public good), but they could never have envisaged the growth of faction in the form of *corporate* power to influence politicians in the first instance, and through them, legislation. Business in its corporate form became general only from the 1860s, but its influence increased enormously throughout the last century, a trend which was noted as long ago as 1962 by Buchanan and Tullock:

> We may observe a notable expansion in the range and extent of collective activity over the last half-century—especially in that category of activity appropriately classified as differential or discriminatory legislation. During the same period we have witnessed also a great increase in investment in organized interest-group efforts designed specifically to secure political advantage.[5]

Since they wrote, the coming of television has increased the cost of getting elected by an order of magnitude, thus forcing politicians to be correspondingly more responsive to those who can finance their campaigns.

This makes the Framers' careful checks and balances ineffective, and the change may have gone further in relation to intellectual property rights than in any other field. The record in the United States shows that the relevant laws were made substantially independent of interests for about a century and a half, but that increasingly thereafter they came under the control of those who could benefit from them. This process is now virtually complete, although lip service continues to be paid to the Constitution, which is also used in international negotiations as an excuse for alleged inability on the part of the US to agree to something which other countries want.

Constitutional Constraints

Article 1.8 of the US Constitution gives Congress power 'To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries', and Congress used this power to pass patent and copyright acts in 1790. It is important to note that, according to American jurisprudence, powers granted to Congress by the Constitution also carry corresponding limitations. These involve 'an absolute constraint on Congress … positive prohibitions on congressional conduct, not simply lack of

authority to legislate'.[6] That is, Article 1.8 enables Congress to pass laws to protect authors and inventors, *but nothing else.*

Further, the Constitution's use of the word 'author' means an individual author, not someone effectively hired by a publisher, just as 'inventor' does not mean someone working to instructions in a corporate research laboratory. This is illustrated by a 1969 case in which the judge made the point that 'the Constitution authorizes only the enactment of legislation securing "authors" the exclusive right to their writings. It would thus be quite doubtful that Congress could grant employers the exclusive right to the writings of employees regardless of the circumstances …'.[7] US patents continue to this day to be awarded only to individuals, who then assign them to their employers, a practice which had to go to the Supreme Court to be formally allowed.[8]

Inevitably, the existence of an exclusive rights clause made US intellectual property rights inflexible, particularly because of the reverence that Americans have for their Constitution. This genuinely reflects what Thomas Jefferson said it should be for them, that is, 'akin to the ark of the covenant, too sacred to be touched'.[9] A modern writer on US politics has observed that 'The very idea of an unchangeable plan of government resting on unchallengeable eighteenth-century beliefs was a powerful conservative influence … [It] tethered us to the pre-industrial past and led to repeated spiritual crises'.[10]

If 'spiritual crises' is replaced by 'legal crises' in this quotation, it is a remarkably apt description of the history of modern intellectual property rights until late in the twentieth century. Because there is an exclusive rights clause in the US Constitution, the founders' teachings *were* controlling, and the quite exceptional reverence with which Americans treat them greatly limited possibilities of flexibility and change—they froze intellectual property rights in place. It is precisely because of this clause that the relevant laws were tethered for so long to the pre-industrial (or 'pre-invention-by-investment') past, making them correspondingly unsuited to the industrial present, much less the future.

As the guardian of the Constitution, the US Supreme Court was strict in keeping intellectual property rights from breaking out of the limits set for them. Examples include striking down the first Federal Trademark Act of 1870 (because it could grant monopolies to others besides the authors and inventors specified in Article 1.8) and the State of Florida's recent very sensible legislation to protect boat hull designs.[11] It is also because of the Constitution that the US Patent and Trademark Office claims that it has to persist in granting patents to the 'first to invent' rather than 'first to file', even though aspects of this practice left it in clear breach of its obligations to foreign inventors under the Paris Convention until 1996.[12] This strictness, which is both a formal expression of American respect for their Constitution and an endorsement of it, made the US authorities unwilling to think about non-traditional ways of protection, even when new kinds of information manifestly needed these because they fitted so badly into existing arrangements.

Capture of Legislation by Interests

The strength of influence of interests on United States intellectual property rights legislation appears earlier in copyright than in patents, which could be because patent interests were widely dispersed. So were the authors whom copyright was intended to protect, but their publishers formed a coherent group that was concerned to maintain the denial of copyright to foreign authors. This persisted

through the Acts of 1802, 1831, 1846 and 1870, until that of 1891, and even afterwards copyright was contingent upon local manufacture of foreign authors' works. Evidence of sustained lobbying by publishers presumably lies behind one scholar's claim that 'copyright legislation in the United States has for at least a century been crafted not by the Congress, and not by the executive branch, but by multilateral negotiations among private industry representatives, sometimes with the assistance of the legislative branch'.[13]

In the case of patents, invention by individuals was progressively replaced by invention from investment in corporate laboratories by researchers paid to invent, during the second half of the nineteenth century. It was this evolution that brought about the need for the *US v. Burns* court decision about the effective ownership of employees' inventions. Corporate patenting also encountered problems with the definition of invention. However, in 1941 the United States Supreme Court held that evidence of an individual's 'flash of creative genius' was a necessary condition for patentability, and, moreover, that this had always been the case.[14] This ruling is fully in line with the only kind of invention that the Framers of Article 1.8 could have known about, but of course does not suit modern corporate inventing at all. As a result, by 1945, nearly two-thirds of the patents coming before Circuit Courts of Appeal were being ruled invalid, mainly for lack of evidence of such a 'flash of genius'.[15] The 'ever-widening gulf between the decisions of the Patent Office in granting patents and decisions of the Courts which pass upon their validity' was even the subject of a concerned Message from the President in 1943.[16]

Changing the Novelty Criterion

This issue came to a head with the antibiotic revolution. Although the drug which originated this, penicillin, was never patented, the way in which it was found could certainly have met the 'flash of genius' requirement. Its great counterpart, however, streptomycin, had been discovered through systematic, uninspired trawling through large numbers of possibilities, a method on which the German chemical industry had been built in the latter part of the nineteenth century.[17] Since exploiting the huge potential of antibiotics would use the same techniques, without any 'flash of genius', it was clear that the results would have severe difficulty in getting valid patent protection. Without the prospect of this, the investment needed could not be justified, so there was no alternative for the pharmaceutical industry except to get the novelty criterion changed. This would require subtle drafting, because a law which recognized frankly that investment had replaced individual creativity as the source of what is to be protected, would not be in accordance with the terms laid down for Congress by the Constitution. Given this constraint, change could only come about in a way that concealed the reality of invention from investment under the pretence of invention by individuals.

This was achieved in the US Patent Act of 1952, the first major revision since 1870. The first crucial provision of this was that 'Patentability shall not be negatived by the manner in which the invention was made'. This made the result of mindless labour just as patentable as that of creative vision. The second was to eliminate the 'flash of genius' criterion by changing the condition of patentability to 'that the subject matter should not be obvious to a person having ordinary skill in the art to which it pertains'. This new law thus made it possible to obtain valid patents for inventions produced by purposive investment, which had been becoming progressively more difficult for more than a century. In the words of a judge who as a

patent attorney had played an important part in shaping them, the result of both these changes is that 'long toil stands on an equal footing with flashes [of genius]'.[18]

Complex Technologies

The 1952 Act was substantially the work of the pharmaceutical industry. As the same judge commented '[it] was written basically by patent lawyers … A good 95% of the members [of Congress] never knew that the legislation was under consideration, or that it had passed, let alone what it contained'.[19] Its provisions solved the patentability problem for the chemical industries, although not for others unless they were in complex technologies. For these, it brought quite unexpected benefits. This was because the new criteria of patentability allowed large numbers of patents to be granted which would never stand up to judicial scrutiny, but which never have to, because they are not being used for any purpose which was an intended part of the patent system. Instead, they are bargaining counters between firms in complex technologies to facilitate the transfer of technology between them, replacing the much more efficient method of doing this through patent pools, which Anti-Trust policy had ruled to be uncompetitive.[20]

The reason why the 1952 novelty criterion allowed patents to be granted for a low level of invention in complex technologies is because the test of 'non-obviousness' used in practice is whether a patent examiner could find earlier patents which 'taught' the claimed invention when put together. Such a search works for chemical inventions because patent protection is so important for them that every invention will be patented. All these published patents will then be available for future examination of applications. In complex technologies, where what is being claimed as an invention is most frequently a specialized incremental change, there would rarely be previous patents, and it was not Patent Office examining practice to look for prior art in non-patent sources. The applicant is bound to call the examiner's attention to such sources, but since the kind of changes in question are rarely the subject of journal articles and the like, such citations would be rare, and most applications would pass the 'non-obviousness' test.

From the public interest aspect, this outcome of the 1952 Act and the way in which it was operated in practice by the Patent Office, made the patent system into a reinforcement of the market power of the large firms in complex technologies, instead of being a means of bringing about challenges to them from new firms built on inventions.

Article 1.8 continued to influence the US authorities against any move that seemed to lead away from the patent/copyright paradigm that it explicitly sanctions. This subsequently led them to force quite new kinds of information, which needed their own appropriate type of protection, into one or other component of this paradigm, however badly they fitted. The novelty criterion of the 1952 Act and the way it was applied in practice became part of the paradigm, so that the wider the range over which the protections it sanctioned came to be used, the less satisfactory have the results been.

Biotechnology

In 1980, the US Supreme Court held in *Diamond v. Chakrabarty* that biotechnological discoveries were patentable, on the ground that in passing the 1952 Act,

Congress intended statutory subject matter to 'include anything under the sun that is made by man'.[21] But patents in their present form are altogether unsuitable for protecting them because of the way in which the 'non-obviousness' criterion of patentability works in respect of genes. When applied to engineering inventions, it leaves scope for a good deal of 'inventing around' a patent, which is why protection in this area is notoriously weak. Such scope is largely absent in pharmaceutical inventions, and consequently patent protection is effective in this industry. But when the criterion is used to grant patents for DNA sequences, protein structures and the like, it is dealing with entities that are unique—there is simply no alternative to them. This remains true even though the subject matter for a patent application through purification or other treatment may be a step away from 'what occurs in nature'. Any kind of 'inventing around' is impossible, so that a patent delivers a real monopoly.[22]

When it is considered that such complete protection may now be granted in exchange for a disclosure resulting from the work of one of the machines now available for automatic sequencing of DNA, it is clear how far such a grant is from fulfilling the intention of the US Constitution to provide for protection of the results of individuals' creativity. The Court of Appeal for the Federal Circuit has even given two rulings that the non-obviousness criterion does not apply at all in respect of biotechnology patents.[23] The confusion of all such outcomes is the result of the attempt in the 1952 Patent Act to pretend that invention through investment is actually invention by individuals, as Article 1.8 requires.

Indeed, de Carvalho argues most persuasively that the possibility of a result being achievable alternatively is an essential fourth condition of patentability in addition to novelty, non-obviousness and utility. Citing three Supreme Court interpretations of Article 1.8 in the 1850s to the effect that patents can be granted only to technical ideas that can be invented in more than one way, he calls for both the *Diamond v. Chakrabarty* decision in the US and the European Directive on the legal protection of biotechnological inventions to be reversed.[24]

It has also been argued that because commercialization of the results of this type of research may require the use of a number of gene fragments, the holder of a patent which gives monopoly control of a single one of these is in a classical 'blocking' position. The resulting costs of assembling enough licences for a commercial application can make the patent system an impediment rather than a stimulus to innovation.[25] Yet another reason why patents are particularly unsuitable for biotechnology is that so much of the research is publicly funded, and to that extent should be available for use by all, and not given over to exclusive private control.

Computer Programs and Business Methods

Arrangements for protecting computer programs also reflect the rigidity whose ultimate cause is the existence of Article 1.8. These are quite a new type of information, in the shape of 'text which *performs*'.[26] They consequently need a correspondingly new kind of protection, and in fact both the French and the Japanese developed *sui generis* arrangements for this purpose. The United States, however, could not square these with Article 1.8, and insisted that programs be protected by copyright. Later, the Supreme Court first ruled that they were not patentable,[27] and then that they were.[28]

Here again, the limitation of the 'non-obviousness' criterion of the 1952 Act as it has been administered, is very evident. The most widely known expert in searching

for prior art in this field is constantly calling attention to the number of patents for computer programs issued without a search by the examiner outside earlier patents, which makes them worthless.[29]

The combination of the scope of the non-obviousness criterion and the way in which the Patent Office administered it may have been pushed beyond rational limits by the Supreme Court in the 1998 State Street case.[30] In this, the Court ruled that methods of doing business are also patentable, and this has led to the issuance of many patents which are not just dubious, but absurd.[31] Where, for example, could an examiner be expected to find published prior art to enable him to reject claims for a 'means for cutting or styling hair using scissors or combs in both hands', or for a 'method of shared erotic experience and facilities for same' as being obvious to one skilled in the relevant art?[32] Such results are inevitable when a criterion of patentability that had been specifically devised by attorneys for the pharmaceutical industry is used far beyond its limitations.

Explosion of Intellectual Property Rights

Although the 1952 Patent Act had put an end to judicial rejection of US patents on the grounds of lack of 'a flash of genius', there were still wide differences in the stringency with which patent claims were construed in different judicial circuits. This led to 'forum-shopping', in which litigants sought to have cases heard where they hoped for a favourable result. To deal with this, the Court of Appeals for the Federal Circuit was established in 1982, as the appellant court for intellectual property rights cases from anywhere in the United States. The CAFC quickly showed itself to be decidedly pro-patentee, and some very large awards, such as that in *Polaroid v. Kodak*, sent a clear signal to business people that investment in intellectual property rights was likely to be much more profitable than it had been in the past.

This perception initiated a 'seemingly unstoppable growth of copyrights, neighbouring rights, *sui generis* rights, trademarks and other rights of intellectual or industrial property'.[33] According to James Boyle, this enormous extension of intellectual property rights amounts to:

> a far-ranging enclosure movement over the public domain, paralleling the eighteenth century's enclosure of common lands. Intellectual property rights have been broadened to cover more subjects, deepened to cover them for a longer time, widened to cover them in more ways. Current law is actually nibbling at the two areas that supposedly could never be owned, facts and ideas respectively.[34]

Where the legislation for these could not be squared with the intellectual property clause, it was passed under the commerce clause of the Constitution, and even the US Supreme Court weakened in its role as guardian of Article 1.8. A publisher-sponsored 1998 act added 20 years to the copyright term, and although the case was made to the Court that this could not be of the slightest benefit to authors, but was worth a great deal to publishers, it was ruled to be constitutional. Such evidence that the Supreme Court has abandoned its traditional strictness helps to explain how '[d]espite the limiting language of the Intellectual property rights Clause, Congress has recently enacted, or is seriously contemplating enacting, more than a dozen laws that seem to ignore or purport to avoid it'.[35]

At present, lobbying to strengthen and widen the scope of intellectual property rights is particularly evident on the part of firms which have traditionally relied on copyright, because technical developments have eliminated most of the protection publishers used to have from the actual cost of making copies. Copyright first became necessary when printing brought about the first such major reduction; the coming of plain paper copying (xerography) was the next revolution in this field; and finally the Internet reduced the marginal cost of making and transmitting a copy of material in digital form almost to zero. Publishing and media interests have consequently been active in promoting the use of contract law, the law of trespass and new laws such as those forbidding interference with encryption, to protect their intangible investments.

Protection Rackets?

Stuart Macdonald has called attention to a particularly malign aspect of the explosion of interest in intellectual property rights. Much of this interest has been on the part of lawyers and accountants, and is consequently unrelated to actual innovation. Indeed, it has led to activities that are anti-innovation, even though their supposed contribution to innovation is the only justification for the existence of such rights. These activities include using patents strategically to prevent competitors putting products on the market that are within the degree of closeness of substitution that the system allows. They also frequently involve intimidating competitors with implied threats of causing them huge costs and delays in litigation. At the limit, such policies cause firms to avoid actual innovation altogether, because if they innovate, they can be sued for infringement by predators whose primary motive in obtaining patents is to extort money from innovators.[36]

Worldwide Diversity of Rights Regimes

Until after World War II, there was wide diversity of intellectual property rights regimes between countries. For example, US patents were examined before grant from the establishment of its patent office in 1836, something which did not happen in Germany until 1877 and in Britain until 1905. Germany only gave patents for processes, whereas the US and Britain protected products also. Until 1925, local manufacture was a condition for a patent to be valid in France and some other countries. Holland gave up having a system at all in 1869 and did not have one again until 1912. This diversity was not interfered with by the Paris and Berne Conventions, whose fundamental 'national treatment' provision of course reflected it.[37]

After the War, however, what was substantially a common world-wide set of IP arrangements progressively came into being. Behind this was the common experience of large-scale investment replacing individual creativity as the source of what needed to be protected. Like the United States, other advanced countries had encountered the problem of incongruity between patent arrangements designed to protect the results of individual creativity, and subject matter that now came from purposive research and development. Werhner Siemens had grasped that the electrical industry could never attract the capital it needed to achieve its potential without an all-German patent law which dealt with this problem, and he actually went into politics to bring about the 1877 act in that country.[38] This dealt with the problem for investment of the grant of patents to researchers rather than to the firms

which employed them, and Siemens also devised a compulsory licensing measure that diffused attacks on the very idea of patents because they were monopolies. The 1877 legislation played a vital role in making Germany into a great industrial power.[39]

However, all the advanced countries also faced the same problem as the United States in defining invention that now came from corporate investment, and the solution that commended itself to them was to copy the non-obviousness criterion of the US 1952 Patent Act. Japan was the first to do this, in 1959, followed by Sweden in 1967, France in 1968, Germany in 1976 and Britain in 1977. Under the convention of 1973, which established the European patent, this criterion, now called the 'inventive step', was built into examination of applications from the start. So from the 1970s, it is fair to say that the patent systems of all the developed countries were based upon the United States model. The secretariat of the Paris and Berne Conventions played a significant role in promoting this, through its active endorsement of the goal of 'harmonization'. This was even encapsulated in the 'model law' which it pressed upon newly-independent and poor countries, and which could hardly have been less suited to their needs.

The US on the Offensive

For several decades after the 1952 Patent Act, this extension of the US intellectual property rights system to the rest of the world depended upon the passivity of other countries. The US was content to see its influence operate through the conventions' secretariat. However, this was changed because of three developments.

First, that secretariat became the World Intellectual Property Organization (WIPO) and a specialized agency of the United Nations after World War II. The United States and the other advanced countries had controlled the old secretariat, but many poor countries could now bring influence to bear on the WIPO bureaucracy because they were UN members. Extension of US-style intellectual property rights was rejected by these countries, and as their influence increased over time, the United States eventually concluded that WIPO no longer served its interests. Secondly, US firms, which experienced the increased value of intellectual property rights after the establishment of the Court of Appeal for the Federal Circuit, naturally wanted to get more value from foreign intellectual property rights as well.

The third and most important factor in changing United States attitudes to these rights was a radical deterioration in the country's international competitive position. With the astonishing and unforeseen emergence of manufacturing capability in the Far East, first in Japan, then in countries like Taiwan and South Korea, many American industries became highly vulnerable, even leading to rustbelts in several regions. Parallel with this, other US firms that depended on copyright, such as those in entertainment and information processing, were the victims of wholesale copying, especially from such countries as Hong Kong, Singapore and China. The interests of manufacturers, whose primary interest was in patents, and of other firms which mainly used copyright for their protection, therefore converged.

Retaliation Measures

The beginning of US retaliation can be seen in the Section 301 amendment to the Trade Act in 1984. This allowed sanctions to be imposed on any country which did not provide intellectual property rights protection for US firms. It was quickly used

against Brazil, Columbia, South Korea, and some Middle Eastern and Far Eastern countries. Another version of retaliation was used after litigation about copying of Apple Computer's operating system by Franklin, a Japanese firm. The US 1984 Semiconductor Chip Protection Act was then brought in to prevent any repetition of this. What it provides is copyright protection, and this needed nothing more than an amendment to the Copyright Act. However, delivering protection in this way would mean that foreign (specifically, of course, Japanese) firms could also benefit from the new protection through the national treatment provision of the Universal Copyright Convention. Instead, by passing a quite separate act, it was possible for this to include a condition that its benefit could be obtained only by citizens of states which passed similar legislation to protect US chip producers.

Significantly, Japan complied within a year, and it was quite clear that without this requirement in the Semiconductor Chip Protection Act, it would happily have accepted the new protection for its firms in the United States and done nothing in return. This was another piece of confirmation for the US authorities of the potential value to them of requirements for reciprocity, imposed outside the existing institutional framework of the conventions and the General Agreement on Tariffs and Trade (GATT) which had been set up on US initiative in 1947.

Consequently, by the time one of the routine revisions of the GATT began with a ministerial conference in Punta del Este in 1986 (the Uruguay round), United States interests were determined to use the negotiations to get a worldwide settlement which suited them. Those concerned with intellectual property rights were especially well organized to bring pressure to bear. The eventual result was the changing of the GATT into the World Trade Organization (WTO), and the coordinated government and private sector effort that brought about this radical change can only be understood by keeping in mind how far it arose from American despair about what seemed to be the growth of universal unfair competition.

TRIPs

The agreement which brought the WTO into existence was signed at Marrakesh at the end of 1993, and contains an annex on Trade-related Aspects of Intellectual Property Rights (TRIPs). The story of how this came about has been well told in Drahos and Braithwaite's fine book, *Information Feudalism*[40] and Susan Sell's study, *Private Power, Public Law*, in which her expertise as a political scientist complements theirs as lawyers.[41]

According to Sell, in 1986 the chief executives of 12 US multinational corporations formed the Intellectual Property Committee (IPC) to lobby for extension of developed-country intellectual property rights internationally. By 1994, they had achieved this goal in TRIPs. 'What is new in this case', she writes,

> is that industry identified a trade problem, devised a solution, and reduced it to a concrete proposal that it then advanced to governments. These private sector actors succeeded in getting most of what they wanted from an IP agreement, which now has the status of public international law. *In effect, twelve corporations made public law for the world* (emphasis added).[42]

Sell points out that an important element in achieving this was extraction of US commercial policy out of its foreign policy. Those responsible for the latter were believed to fight shy of trade retaliations because they wanted to be able to use

trade as a bargaining tool for non-trade issues.[43] The Omnibus Trade and Competitiveness Act of 1988 freed the US trade representative to act on behalf of American business interests overseas in a completely predatory way, unconstrained by any of the factors which the president and the State Department have to take into account, such as the country's international reputation, its military alliances, even its need for friends abroad.

Why Did Countries Join?

The poor countries of the world joined the World Trade Organization in almost total ignorance of intellectual property rights and of the implications the TRIPs annex to the Marrakesh Agreement had for them. They were made promises of better access to advanced country markets for their agricultural produce and a reduction of subsidies to the farmers of the advanced world (which have not been kept). The implications of the agreement for such countries are altogether disastrous. Much of the protest against TRIPs has focused on what it does to the availability of drugs, but TRIPs also forces trademark legislation on poor WTO members. This makes them highly vulnerable to a marketing onslaught from tobacco firms acting to make up losses in advanced-country markets. As a quite inescapable consequence, smoking-related diseases will increase there at rates which could even counterbalance any victories there may be over, for example, HIV/AIDS and malaria.[44]

Japan joined because its *keidranren,* the lobby group of its large firms, had allied itself with the IPC, and in any event the country had been successfully getting advantage out of Western intellectual property rights for a century and expected to be equally well able to look after itself in the new regime.[45] Amongst the reasons why other developed countries joined was that they had become used to following US leadership in IPR affairs.

Brussels handled the negotiations for the EU member countries, but developing coherent laws is particularly difficult for the European Union, reflecting the division of powers between national governments, the parliament, the council of ministers and the commission (as initiator of proposals for change). Such a system is highly vulnerable to lobbying, and in fact a former vice-president of the European Investment Bank has observed that 'US companies and lobbyists have been able to play this system much more efficiently than their European counterparts'.[46]

This is evident from the ease with which the IPC was able to recruit UNICE, the Brussels-based lobby group for 33 industrial and employers' federations from 22 countries, for its objectives.[47] Even without pressures on the EU's negotiators from local sources, nothing could withstand the efforts of the US trade representative's team, single-mindedly focused on ensuring that the world's intellectual property rights laws operate in the interest of American business. This is now a reality which will continue for any country or group of countries until they decide to start thinking and acting about intellectual property rights for themselves.

Intellectual Property Rights in Trouble

All this national and international activity has resulted in a world-wide mismatch between intellectual property rights and the new sources and new kinds of information which have arisen since these rights were inaugurated in their modern form. The combination of the inflexibility which is the legacy of Article 1.8 of the US

Constitution and the growth of pressures from special interests, have brought about a situation where intellectual property rights have never been as widely used as they are today, and equally have never been as strongly criticized.

Recent academic publications claim that patents deliver far less protection than they promise;[48] yet that too many patents are being granted at too low a standard;[49] that they are inappropriate for protecting publicly-funded research,[50] and that in biotechnology, they can be an impediment rather than a stimulus to innovation.[51] Copyright protection of computer software has been described as '30 years of bad logic and bad law',[52] and the database protection of the EU Directive as 'a monstrous caricature of intellectual property laws'.[53] It is argued that the public domain is being encroached upon so much that *bona fide* users of information are 'drowning in a sea of intellectual property',[54] and that the costs of IP dispute resolution have been growing faster than investment in R&D.[55] For one academic, the entire system is 'in crisis';[56] and a well-known economist has insisted that 'the world's one-dimensional intellectual property system must be overhauled to create a more differentiated one. Trying to squeeze today's developments into yesterday's system of intellectual property rights simply won't work. One size does not fit all'.[57]

So What Can Be Done?

The trend associated with all these complaints about intellectual property rights has been towards a unitary system, whether in terms of types of information or as applying to countries at varied levels of wealth. It was never in the interest of other countries to take the rigidities originating in Article 1.8 of the US Constitution upon themselves, either through inertia in developing IP arrangements to suit their own circumstances, or by allowing their own large firms to collude with those of the United States to lobby for TRIPs.

Continuing moves for international standardization, such as those ongoing for a Substantive Patent Law Treaty, are therefore headed in the wrong direction. 'Harmonization' is a Trojan horse, because it simply means uniformity of existing flawed arrangements throughout the world.[58] These reinforce the market power of firms that already have all they need to innovate, through their production capabilities and their resources for marketing whatever they produce. An aspect of harmonization is the 'Trilateral', in which the US, European and Japanese patent offices come together to agree on intellectual property rights matters. What they settle on is then available to be promoted to other countries by WIPO as harmonization.

The first step in righting this imbalance must therefore be to develop and spread understanding that the world's current intellectual property rights system is not designed to encourage the scale and kinds of innovation that are needed (and could be obtained) from firms which are not on the present list of multinationals. Whether or not there can be the fuel of interest to mount challenges to the firms on the multinational list depends upon the institutional arrangements which condition economic innovation, especially, of course, intellectual property rights.

In fact, nothing but better intellectual property rights can underwrite such challenges, because the other mechanisms that protect innovation depend upon sheer firm size.[59] Firms that do not have large resources for production and marketing simply cannot do without intellectual property rights, if they are to innovate competitively. The same applies to countries: those which do not have many large firms with international market power, have no alternative but to develop their national intellectual property rights laws to enable their own firms to innovate

successfully. Naturally, this would not suit already established multinational firms, whose interest is in a unitary worldwide system.

The second step is to put an end to inertia that is rooted in the belief that changes cannot be contemplated because the international agreements on intellectual property rights are set in stone. It is perfectly possible for countries to improve their intellectual property rights arrangements without infringing TRIPs or the Paris or Berne Conventions. TRIPs only establishes minimum standards, and the key provision for 'national treatment' in both it and the Conventions only requires a country to 'accord to the nationals of other Members treatment no less favourable than it accords to its own nationals'.[60] Moreover, under Article 19 of the Paris Convention, 'the countries of the Union reserve the right to make separately between themselves special agreements for the protection of industrial property, in so far as these agreements do not contravene the provisions of this Convention'. Consequently, there is nothing to prevent any group of countries from agreeing to develop and operate better intellectual property rights as long as they respect the national treatment provision.

There are several changes that could be incorporated in intellectual property rights laws in this way with advantage. In what follows, these can only be outlined briefly, but more detailed description and discussion of each proposal will be found where indicated.

Bringing Accounting into Measurement of Grants

Since so much of what intellectual property rights exist to protect now comes from investment of money, these rights can be properly measured only by money. A promising potential reform is therefore to add a financial dimension to the existing measure of grants by time. The famous experimental principle that 'we advance according to the precision of our measures' surely does not only apply to science.[61] The use of time only to measure grants is an aspect of the inflexibility of existing arrangements—for example, just because computer programs were forced into copyright for their protection, it is absurd that this should last for 120 years, as it now does in the United States.

Time on its own is a hopelessly primitive yardstick for the complex arrangements for information protection that are needed now. These arrangements should provide a proper balance between the need to provide an incentive to generate information, and the need to preserve the widest possible access to information. Limiting the measure of the incentives to time has seriously damaged this balance. To the extent that invention now comes from investment of money, a financial dimension in measuring the protection of its results is needed to reconcile the incentive needed by the investor with the free access to information needed by his competitors and by potential new entrants to the market.

Even though they have strong claims to be the inventors of double-entry bookkeeping, the Venetians had no choice but to use time to measure grants for patents for invention in their 1474 decree, any more than the Framers of the US Constitution had when they were writing Article 1.8. However, the techniques of accounting have long since been sufficiently developed to be used in measuring patent grants. An EU expert committee has recommended investigation of a specific proposal of this kind.[62] This would combine compulsory licensing with a prescribed payment for a licence. This payment would be a socially-acceptable multiple of the investment that had been made to bring about the invention.[63] The multiple reflects the

risk that had been taken by the originator, but that has now been eliminated as a result of his investment. It means that if another firm is now prepared to share retrospectively, not just in the investment that led to an invention, but also in the risk of that investment, it could get a licence to use the result. Empirical research has shown that the calculation of such 'multiples' is quite feasible, and that in opening up an invention to being innovated along more than a single trajectory, these multiples would still generally leave originators better off than under existing patent arrangements.[64]

The EU expert committee pointed out that this proposal 'is consistent with Articles 7, 8(1), and 8(2) (though Article 31 should also be noted)' of TRIPs. The only subsections of Article 31 that could cause any difficulty are (c), which excludes semiconductor technology from general compulsory licensing, and (f), which would make such licensing 'predominantly for the domestic market'. This condition has now been eliminated in respect of pharmaceuticals, which is a possible precedent for wider relaxation in the future.[65] Any government that wanted to introduce a financial dimension into its measurement of intellectual property rights could probably do so under TRIPs Article 30, which allows 'limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with the normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties'.[66]

Reichman has argued persuasively for a move from a property regime to one of liability for the protection of sub-patentable inventions.[67] This proposal also introduces money into the measurement of protection, by allowing a competitor to copy an invention, provided he pays appropriate compensation to the owner. Such enabling of development of an invention along multiple trajectories is to be welcomed, but with the Reichman proposal it might be achieved only at the cost of multiple lawsuits to settle compensation terms. The 'socially acceptable multiple' would avoid these by setting the price for a licence in advance (although, of course, it would not preclude any alternative freely agreed between the parties). Also, the present proposal would not be limited to sub-patentable inventions, and indeed it is not appropriate for the protection of individual inventors and small firms, since these have no significant investment to which the 'multiple' could be applied.

Advantages of Financial Measurement

There would be many advantages from introducing a financial dimension into grants of all kinds of intellectual property rights. Invention and radical innovation can never be other than a cost. In today's complex technologies, money is made only by those firms that can develop inventions into commercial products through subsequent incremental changes. There is now persuasive evidence that progress in any field of technology is made most rapidly when several firms are competing to capture a share of a new market, and to widen the scope of application of an invention through making such incremental improvements along different and competitive trajectories. No firm can exploit more than a single trajectory of incremental change properly. Proprietary rights as they are at present can prevent firms that could exploit other trajectories from doing so, thus also depriving the originator of competitive stimulus to move along his own learning curve as fast as possible. At the outset of the industrial revolution, high pressure steam was such an alternative trajectory of development, competitive with the low pressure one of

Watt and Boulton. Yet their patent blocked development along this line for years, and Watt never took on board that high pressure would be the steam technology of the future.[68]

A major objective of reform must, therefore, be to multiply opportunities for diffusion of innovations. Unfortunately, much innovation diffusion at present is the result of failure of the patent system to deliver the protection it promises—especially in non-chemical fields. The firms that have not made the original risky investment reap most of the rewards from it. The British firm EMI invented, patented and innovated the brain scanner, but it was US firms, such as General Electric and Ohio Nuclear, that made money from its diffusion. Awareness of many cases such as this causes prudent managements and venture capitalists to avoid investing in R&D and innovation. This increases still further the advantage held by the largest multinational firms. Measuring grants in the way proposed would deliver big rewards for originators, whilst at the same time speeding up innovation diffusion. It is in the public interest that any invention should be exploited along as many different trajectories as possible.

Next, there is widespread unease about a growing tendency to grant exclusive rights 'on what used to be considered as "science" and introduced into the public domain'.[69] With limited (if any) scrutiny of non-patent prior art, the 'non-obviousness' criterion can be pushed far too close to protection of pure science, and frequently has been. Objections to this are all the stronger because so much basic research is publicly funded, and the direct results of this should not be open to capture for private advantage. This is particularly an American problem, since several US universities have ten times more inventions patented in a year than the best one in Europe.[70]

Introducing a financial dimension to measurement of patent grants would ensure that firms could make full use of the results of all research carried out with public funds, but could not get any exclusive rights on them. The 'multiple' which firms could charge for a licence on any downstream invention of their own would apply only to the amount of R&D investment they themselves had made. The way in which the 'non-obviousness' criterion operates for biotechnology inventions delivers unacceptably impervious protection. This leads to justifiable fear that whole areas of development in the life sciences will be monopolized by individual firms. Measuring protection by money and time in the way proposed, rather than by time alone, would combine freedom of access to information with high rewards to discoverers. It would also ensure that the results of research that had been paid for by public funds could be used without restriction.

If measurement of grants had this financial dimension, there would be much less infringement and waste of time, energy, talent and money in disputes. Because investors in innovation recognize the value of lead time, they are more likely to see the advantage in taking out a licence and getting into production quickly. Their alternative would be to risk losing early mover advantage in the market as well as an infringement action. Also, it would be reasonable to expect the courts to treat infringers more severely than they do now, because they would have had an option to purchase a licence that they had not exercised.

Protecting Innovation Directly

In anything to do with individual creativity, it is not the creative act itself that needs to be protected (because the more creative it is, the less it will be dependent on

money), but its diffusion. Without protection for this, there is no 'fuel of interest' to justify the cost and risk of backing the fire of literary genius. George Bernard Shaw, who played a key part in bringing about the 1911 British Copyright Act, wrote that because Tolstoy was a rich landowner, he did not think it right that he should get money also from his novels, so he waived his copyrights. The result was that, until his sensible wife made him change his mind, no publisher could risk the investment it required to publish them.[71]

The transfer of copyright that an author makes to a publisher gives the latter the protection needed for his risky investment because there is perfect identity between what was originally written (and instantly protected by copyright) and what is published. Similarly, protection of inventions can protect them only to the extent that there is identity between the invention and its embodiment in concrete reality, that is, its innovation. This illustrates a second reason why the present system works well for chemicals, including pharmaceuticals, apart from the fact that the modern patentability criterion was designed for them. The link between an invention and its innovation in these fields is so close as to amount to identity. What is discovered in the laboratory, what is patented, and what is eventually bought and used, are all the same. Consequently, in this case, patents work, just as copyright does.

In contrast, in fields such as engineering, where the link between an invention and its innovation is much weaker than it is in the chemical field, a patent for invention gives poor innovation protection. What is therefore needed for these technologies is a means of protecting the innovation directly. This should be explicitly commercial, because of the large amount of money that usually needs to be invested at the innovation stage, and it should also be capable of capturing the tacit knowledge which is so important in such technologies. Instead of the 'inventive step' criterion currently used for invention, with little or no scrutiny of non-patent prior art, 'non-availability in the ordinary course of trade' has been proposed for the direct protection system. Pre-grant opposition (a characteristic of the German patent system in its early days) would then mobilize all the resources of an applicant's competitors to bring comprehensive prior art information to an examiner's attention. The practicality of protecting innovation directly has been investigated and discussed for innovation patents and innovation warrants.[72]

Direct Protection in Practice

There is, in fact, a remarkably successful operating example of direct protection of innovation in the 'orphan drug' legislation of the United States. This is a direct replacement of patents as a means of protection. Its background is that there are diseases that affect too few people to be of interest for the R&D of drug firms if nothing better than patent protection is available for the results. These firms cannot justify the investment needed to produce a profitable product if there is any danger at all of being copied or of being involved in litigation. A 1983 act in the US empowered the Department of Health to provide an alternative incentive for the production of relevant drugs: that once a product for an 'orphan' disease had been approved for sale by it, no licence for a competing product would be issued for seven years. Since no drug can be sold without Health Department approval, this is an effective monopoly. It is far better than a patent because it is completely unchallengeable. The results of this legislation have been quite spectacularly positive.

There has been a 12-fold annual increase in new orphan drugs and both actual and relative death rates from the relevant diseases have declined.[73]

It can safely be assumed, therefore, that before the Orphan Drug Act, there was so much less innovation of drugs of this kind because of poor protection of the results of risky investment in R&D for them. The protection given by what was available—patents—was not considered to be enough to justify the risk. The existing patent system works at its best for pharmaceutical inventions for the reasons discussed earlier. If protecting innovation directly could release so much untapped potential from the field where patents work best, how much greater must the possibilities be in areas where they work badly or do not work at all?

Three more points are worth making about the performance of the Orphan Drug Act. First, it is successful precisely because it gives direct and irrevocable protection, not to a concept, but to the innovated product, fully tested and ready to go on the market. Secondly, it has been claimed that some large drug firms have taken advantage of the way in which the Department of Health has administered the arrangements, such as by taking old or unsuccessful drugs from their repertoire and marketing them for orphan diseases.[74] Even if this is the case, the balance of the record is clearly favourable to the existence of this type of protection, which, after all, lasts for only seven years.

Thirdly, it was because the Department of Health could offer firms an alternative to patents for protecting the results of their high risk investment in R&D that these new drugs have come into being. The drugs could not exist, and the decline in death rates could not have happened, without this breach of the Patent and Trademark Office's *de facto* monopoly of delivering protection. This is further confirmation of the argument for diversity in ways of protecting invention, discovery and innovation, which should extend to multiplying international sources for them. It tells correspondingly against harmonization, which, at the limit, would give the world only a single pattern of intellectual property rights from a single source. The point Thomas Jefferson made to the Founding Fathers in the US, that 'the benefit of even limited monopolies is doubtful' applies above all to institutional arrangements.

The Special Needs of Smaller Firms

Smaller firms are the source of a quite disproportionate amount of invention and innovation, but have the greatest need for intellectual property rights if they are to benefit from the fuel of interest in the form of financial backing. There are several changes that could be made to help them. The United States Patent and Trademark Office has already taken a first step towards discriminating in their favour, by giving 'small entities' (independent inventors, small firms and not-for-profit institutions such as universities) a 50% discount on all fees.[75]

For all smaller firms and their backers, a huge deterrent to prudent investment in invention and innovation is the cost of defending patents or of otherwise being involved in litigation. Firms with large resources for this can intimidate those that are weaker, and almost invariably do so.[76] By far the greatest practical encouragement for small firm innovation would be an inexpensive, quick and simple means of resolving disputes. The recent Report of the National Research Council of the National Academies of the US recommended legislation for open review of issued patents before administrative judges of the USPTO as a means of controlling the rapidly escalating costs of resolving disputes.[77] This would be a welcome move

towards the even better solution of compulsory technical arbitration, which has been advocated for some time.[78] It is because of the use of arbitration that so few disputes in technical areas other than patents ever reach the courts. In fact, patents are unique in the world of technology in not using this device to reduce the cost of dispute resolution. The difference between these other technical areas and patents is that in the former the parties involved are related by a contract, which invariably includes the arbitration condition; obviously, there is no contract between two parties in contention over a patent. For settling patent disputes, therefore, the compulsion for technical arbitration must be a condition of the contract that does exist (between the inventor and the state, which is the patent grant) to make up for its absence in any arrangement between the parties in dispute.

Even with compulsory technical arbitration of disputes, some means would be needed to prevent intimidation re-emerging in the form of strong firms forcing weaker ones to face the costs of appeals to the courts. Legal aid for the respondent party (the one that accepts the arbitration and does not appeal) is an attractive way of solving this problem. Failing such a measure, compulsory arbitration might make insurance economic as it would then have to cover only the costs of appeal. The Danish Patent Office has been advocating this strenuously for some years, but has come up against the unhappy experiences of commercial firms that have offered this type of insurance. The EU has funded a consultancy report on the topic, a key point of which is that compulsion would be essential.[79] Responding to this, the UK Intellectual Property Advisory Committee noted that the EU study found 'widespread opposition amongst respondents to any form of compulsory insurance for patentees'. It concluded 'that there is, at present, no *commercially* viable economic model for patent litigation insurance, either in the UK or in Europe'.[80]

Compulsory arbitration would be of great advantage to the Patent Defence Union and is being actively investigated by the SMART group of inventors in the UK. This was proposed in the EU study, *Enforcing Small Firms' Patent Rights*.[81] Selected patent cases would be taken to court to show infringers that they could not intimidate weaker firms with complete freedom, contingency fee arrangements would be made with lawyers in the US for protecting members' patents, and large firms would be persuaded not to intimidate smaller ones with threats of litigation costs as part of their corporate social responsibility.

Longer Priority Period

Smaller firms could also benefit from an extension to the priority period, which is prescribed as a year for patents by Article 4 of the Paris Convention. However, as pointed out earlier, under the Convention's Article 19 there is nothing to prevent a group of countries from agreeing a longer priority period amongst themselves for their small firms, as long as they also offer it to similar firms in the other countries entitled to national treatment.[82] Doing so would relieve such firms from having to waste their money on foreign filings until there are good grounds for believing that these would be worthwhile. It would also greatly strengthen their hand in negotiations with firms about licensing or sale of their patents. Large firms regularly drag their feet in such negotiations in the knowledge that, as the time approaches when serious money has to be spent on foreign patenting, the position of the patentee becomes correspondingly weaker. A priority period of only a year puts a small firm at a severe disadvantage in such negotiations.

Smaller firms almost always need external funding to exploit their intellectual property rights, but the virtual inevitability of litigation if these rights prove to be valuable makes experienced venture capitalists wary of providing these funds. It would help greatly, therefore, if patents owned by small firms were to be unchallengeable on any ground for a period. If necessary, this could be conditional on pre-examination opposition. This, in itself, would have the further value of forcing more use of the informational aspect of patents, which would contribute to innovation. Competing small firms would then have to monitor patent specifications as these are published, in case of need to file oppositions, and such monitoring would undoubtedly be a source of new ideas for them.

Conclusion

Why is it reasonable to claim that reforms of the kind suggested above could make a positive difference to innovation? The answer is that the world has been here several times before. As just one illustration, in 1856, W. H. Perkin invented the first synthetic dye and then built a factory near London to produce it.[83] This could reasonably have been expected to become a great British industry because Britain dominated world textile manufacture to provide the new dyes with their market, and it also had unlimited quantities of the raw material needed to make them, coal tar. Yet, by the end of the century, German manufacturers held no less than 85% of the world market for synthetic dyes.[84]

There were, of course, several reasons for this, including better and wider scientific education in Germany. But the difference between the two patent systems must surely have played a great part. German patents granted under their 1877 act were rigorously examined and the consequent degree of certainty they offered made it easy to find capital to exploit them. British patents were not examined before 1905 and so could offer only an inferior basis for investment. Also, it was primarily because of how well they learned how to use the Paris Convention that German firms dominated the world's chemical and pharmaceutical markets up to 1914. The success of both the US and British pharmaceutical industries was dependent upon the expropriation of German patents in World War I—and again in World War II. The lesson is clear: better and more appropriate intellectual property rights means more, and more successful, economic innovation.

Attention was called above to how drugs are now available to sufferers from 'orphan' diseases because the US Department of Health set up a rival to patents for protecting drug research and development. For close on two centuries, the granting of intellectual property rights was accepted to be the exclusive responsibility of the Patent and Trademark Office. The language used by the Supreme Court in striking down Florida's boat hull design protection—'the federal patent laws must determine what is protected, but also what is free for all to use'[85]—illustrates and endorses this assumption. But what the Court was ruling in that case was that individual s*tates* had no power to grant intellectual property rights, because Article 1.8 had specifically reserved this power to Congress. And because Congress passed the Orphan Drug Act, its breach of the USPTO's historical *de facto* monopoly of granting intellectual property rights is in line with the Constitution. Now that a start has been made, it is not impossible to imagine that Congress might pass other laws allowing the grant of new kinds of intellectual property rights to make up for the failings of the existing patent and copyright regimes.

Just as in the United States it was assumed for so long that only the USPTO could grant intellectual property rights, so even before TRIPs, it came to be assumed internationally that such rights ought everywhere to follow the US model. This has, of course, been assiduously fostered by those industrial interests for whom such protection arrangements are advantageous. A remarkable aspect of this assumption is that those who see the advantage which diversity and competition bring to economic development do not seem to grasp that they have just the same beneficial potential for *institutions*. That is, they would allow a particular approach to be tried in one country, and if it was a success there, it would be available to be copied in others. For example, the remarkable social innovation of general limited liability did so much for business in England that its 1856 law was copied everywhere in Europe within 10 years.[86] The French invention of trademark registration was similarly copied so widely that it became the international model of the Paris Convention.[87] The success of the orphan drug legislation in the United States has caused it to be copied in the EU, Japan, Australia and Singapore. If there were similar diversity in all intellectual property rights, competitive pressures on the authorities in individual countries to provide laws to facilitate the innovative capacity of their industries could be expected to result in trials of new rights regimes. Those that succeeded would be copied elsewhere, resulting in more and better innovation worldwide.

In contrast, a unitary world system, such as that imposed by TRIPs, leaves no such room for institutional trial and error. It means that economic innovation will continue to be dominated by the firms that present arrangements suit. These firms have shown that they have the ability to determine the conditions of intellectual property rights internationally in their own interest.

The Framers of the United States Constitution wrestled with the perennial conflict between public and private interests in law-making, and Article 1.8 expressed their vision of the public interest in protecting the achievements of authors and inventors. Laws derived from this Article succeeded in delivering the fuel of interest to the fire of genius for quite a useful period, until private interests gained the upper hand in the shaping of intellectual property rights. The proposals discussed above might be useful components of a rescue operation to restore the balance.

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