

Introduction

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INNOVATION GOVERNANCE AND PROPRIETARY CULTURE

This book offers original perspectives on knowledge management as viewed through the lens of history. It illustrates a diversity of possible management approaches, which can be placed along a continuum from highly formal public law strategies to far more informal ones. By formal, we mean ones that rely on statutory law and contract and tend to be based on the use of intellectual property (IP) protection, especially patents. Informal strategies take advantage of the fact that those in possession of valuable knowledge, irrespective of whether the law recognises them as its owners, can deploy practices that nonetheless enable them to take secure control of it. Secrecy is extremely important in this respect. Secrecy has a dual nature and thus arguably occupies more than one location along the continuum. While it is generally informal at the everyday level, international law protects ‘undisclosed information’ including know-how that may be essential to a manufacturing process. Such formalised protection is of course subject to certain conditions. It hardly needs to be said that successful knowledge management depends on the effectiveness of the practices adopted. But it is worth saying that these in turn are influenced by – and themselves may influence – the shifting and evolving business innovation culture, the opportunities offered by the legal and regulatory environments, and the existence, or absence, of moral economies shaping that culture.

Given the high financial stakes and the social welfare impacts of technology diffusion, intangible asset management continues to attract legal scholars, philosophers, historians, business and innovation analysts and policy makers. As before, there is considerable debate in industry, government and academia on how best to manage knowledge for innovation-led growth and what should be done to support effective management in the public interest. Such debates inevitably include discussion on ways to use IP rules and

policies, and also how to design them (Andersen, 2006). But such discussions are not confined to these; nor should they be if the chapters in this book are anything to go by. As this book testifies, and as others have convincingly argued, knowledge management and innovation are about much more than IP protection in its formal sense (Castle et al., 2010).

The role of formal IP rights in innovation systems appears inherently paradoxical. On the one hand, they provide exclusive rights over the use of new, original and distinctive artifacts, processes, cultural works and signs and in so doing are considered to encourage inventive activity, cultural production and consumer choice; on the other, as legal monopolies – albeit not necessarily market ones – they may be used perversely to retard innovation by reducing competition and blocking off areas from research (Lubar, 1986: 90–4).

The patent system and IP rights more generally are private rights. But by virtue of their state provision, patents can be considered not just as business assets but as legislative governance tools to regulate knowledge and technology production so as to achieve positive outcomes far beyond the level of single firms. This is why governments adopt laws and policies on IP and why this aspect of knowledge management is covered in this book.

Intellectual property law, policies and management strategy constantly evolve. The longest established rights are patents for inventions, copyright for literary and artistic works, trade marks for distinctive signs and industrial designs for aesthetic (non-functional) product forms. But in recent decades they have been expanded with the addition of plant breeders' rights, semiconductor chip maskwork rights, and database rights. Increasingly one encounters the overlapping of all these rights so that subject matter may be protected by more than one right. A good example is software programs which are covered by patents and copyright in the United States, as well as in Europe where they need to be referred to as computer-implemented inventions to overcome the formal (but possible to circumvent) computer programs bar. Many companies are also highly skilled in using more than one IP right, not to cover the same subject matter but to control different aspects of its commercial exploitation. For example, pharmaceutical companies are heavy users both of patents and trade marks. Put simply, the patents protect the drug itself while marks protect and promote the goodwill in its name, preferably one that is simple and catchy and thus easy to remember. This overlap and the use of more than one right in such ways obviously provides many new knowledge management opportunities (Derclaye and Leistner, 2011; Wilkof and Basheer, 2012). The market consequences of such knowledge regulatory 'largesse' have not been fully assessed.

Intellectual property may be ‘property’ nowadays, but this was not always the case; that is, if we apply the term in its broadest possible sense as denoting some kind of enforceable interest in practical ideas of commercial value. Since the Middle Ages, various types of prizes, grants and privileges have existed for importers, developers and users (locally) of new skills, practices, innovations, products and technologies. At first, these were bestowed not as incentives to innovate but either to attract foreign craftsmen or as rewards given in exchange for providing or disclosing these ‘knowledge assets’ to the rulers or to the general populace. In 1474 the Republic of Venice established the first known patent code under which inventions were given ten years’ protection. It also provided public interest safeguards in the then novel but now standard form of compulsory licensing provisions. The new legislative framework was established by the republic with the aim of boosting invention and innovation by attracting talented technicians and engineers from outside.

The legitimacy and appropriateness of patents to protect individual inventive activity was promoted strongly throughout the nineteenth century, a period characterised by the ‘hero-isation’ of invention and inventors. However, with changes in the politics of science and technology and the emergence of industrial laboratories, first in Germany and the United States but spreading elsewhere, inventive activity came to be conceived as a highly complex social activity in which single individuals played less decisive roles. Such ‘social inventing’ had at least five elements: (i) increased investment in in-house R&D; (ii) the assembly of large teams of formally educated and highly skilled personnel working in corporate laboratories; (iii) enhanced private-public sector collaboration engaging, inter alia, companies and universities; (iv) a new accountability in research disciplined by the commercial bottom-line; and (v) the professionalization not just of inventing but of knowledge management too. This entailed the engagement of corporate managers, researchers, scientists and patent attorneys, and, less directly, lobby groups, government policymakers and members of the judiciary interpreting the law, sometimes in quite activist ways.

However, there was also considerable debate. Indeed, the history of IP rights in various national settings and periods shows that tensions and reactions have never been far away. The issues being debated today are more or less the same as those being disputed historically.

In the nineteenth century, adopting *and resisting* patent laws were both quite fashionable in Europe. By 1820 Austria, Russia, Prussia, Belgium and Spain had introduced relevant laws while in the next 20 years Portugal and Sweden joined the group of countries with formal patent systems, which included Britain with its 1623 Statute of Monopolies. Yet despite this proliferation of national regimes, debates over their efficacy remained

heated in several European countries. Indeed, some European countries chose to forgo patent laws. Switzerland had one briefly from 1799 to 1802, but only re-introduced it in 1888 largely due to German pressure. The Netherlands prohibited patents from 1869 until 1912, a benefit for a certain Gerard Philips whose family business was established to produce Thomas Edison's and Joseph Swan's great invention: the carbon filament lamp. Philips is now associated with such products as compact audio cassettes and compact discs which ironically are protected by vast numbers of patents (Dutfield and Suthersanen, 2005: 135).

During the nineteenth century several different arguments were made both to justify patents and to have them abolished. These were informed by the evolving, ever-changing political and social dynamics of the period. Some promoters used natural right arguments. According to these, inventors had a 'natural' property right to whatever emanated from their brains that passed the patentability criteria. One is tempted here to ask why there are term limits and limitations and exceptions to patent rights if they are 'natural'. Advocates have tended usually to side-step such enquiries. Others gave a more moralistic perspective by introducing a concept of justice stressing that inventors' reward was a moral right. Industry continues to find such justifications useful notwithstanding the increased difficulty in attributing an invention to an individual genius (Fisk, 2009: 252).

The instrumentalist justification views the patent system as a social contract between inventors and innovators and society for the benefit of us all. The inventors get a monopoly in exchange for making public their inventions instead of keeping them secret. This becomes a socially acceptable bargain that promotes innovation and industrial growth as well as public access to knowledge and the means of production. This justification is, at best, simplistic. Disclosure is of course an inherently good thing. However, instrumentalism fails to accommodate the reality, which this book amply illustrates, that the motivations of patent applicants and the different ways that patents are put to use are actually quite varied and cannot really be captured by stale utilitarian rationales which see patents as an efficient means to encourage inventive activity. Doubtless, patents are incentives. Otherwise who would file them other than 'vanity patenters'? The unavoidable question that arises is: what modes of behaviour do patents *actually* incentivise? Only empirical study can provide reliable answers. In addition, instrumental rationales fail to accommodate the highly politicised nature of IP policymaking.

Nineteenth-century abolitionists were a varied group: protectionists were concerned about foreign patent monopolists dominating local markets. Others, favouring unbridled free market capitalism, were inherently hostile to monopolies. Thus the Dutch government's decision to abolish patents

was influenced by free trade ideologues *and* infant industry protectors (Cullis, 2004: 183-4). In June 1869, *The Economist* confidently predicted the patent law's demise in a June 1869 editorial. Many supporters and abolitionists had a direct stake in patent laws' existence. Inventors could be found in both camps. One high-profile critic was the great Victorian engineer Isambard Kingdom Brunel (see below).

Some of the abolitionists' arguments were based on collectivist epistemologies that stressed the collective and collaborative process of knowledge production and inventive activity. They claimed that major inventors profited by the cumulative character of knowledge; thus they owed the most to the activities and contributions of fellow scientists and engineers rather than to their own inventive ability or genius. A determinist's ideology was developed depicting the inventors as ordinary labourers that happened to be the final links in the inventive activity of something that would be unavoidably invented. Furthermore, they argued that while the patent system can provide useful protection to the individual inventor, at the same time it was prone to abuse as the majority of the inventions were trivial, incremental and lacked substantial originality (MacLeod, 1988; Machlup and Penrose, 1950). One of the most prominent critics of the patent system was Brunel who – unlike his engineer father Marc Brunel – refused to patent his own inventions and argued that:

the most useful and novel inventions and improvements of the present day are mere progressive steps in a highly wrought and highly advanced system, suggested by, and dependent on, other previous steps, their whole value and the means of their application probably dependent on the success of some or many other inventions, some old, some new. I think also that really good improvements are not the result of inspiration; they are not, strictly speaking, inventions, but more or less the results of an observing mind, brought to bear upon circumstances as they arise, with an intimate knowledge of what already has been done, or what might now be done, by means of the present improved state of things, and that in most cases they result from a demand which circumstances happen to create. (Quote in Buchanan, 2002: 177)

Beyond the economic stakes involved, public discussion strove to elucidate such categories as 'invention', 'inventor', 'scientist', 'creativity', 'discovery' and 'public good'. Accordingly, while the debate was often conducted beyond the realm of economics, it was linked to the political economy of knowledge as well as to the identity of the inventor and the scientist. It was not only about the legitimacy and appropriability of financial rewards and rights of the inventors, but also about character and morals (Johns, 2010: 247–89).

Thus, we find different conceptions, perceptions and views on the appropriateness and legitimacy of patents alongside an increasing range of patent management practices, whether devised and conducted by collectives like companies or individuals such as local industrialists, scientists and engineers, some, but not all, of whom were very commercially minded. For example, the early period of wireless telegraphy was characterised by the attempts of Oliver Lodge, Alexander Popov, and Jugadis Chunder Bose who for different reasons decided not to pursue any patents – at least initially – and instead to seek alternative modes for the commercialisation of their research and innovations. State patronage and commercialisation of research through publications of books and paid lectures were prioritised over patent rights. But the situation changed when Guglielmo Marconi entered the wireless industry scene and was granted a patent in March 1897. The proprietary attitude of one single actor triggered others to respond by changing their business strategies in like fashion (Arapostathis and Gooday, 2013).

What of non-patent related informal management of knowledge? Christine MacLeod and others have shown that the importance of patents and of patent systems varies widely and depends on local particularities and the characteristics of each industrial sector. Further, her historical work demonstrates that a large proportion of inventions emerged outside the patent system and remained there (MacLeod, 1988). Robert Allen has coined the term ‘collective invention settings’ to denote that inventive activity can be developed through informal and formal networks of knowledge exchange even among competing manufacturers (Allen, 1983). He links the culture of collective invention in specific industrial areas at specified periods to the incremental character of inventions occurring there. Thus innovations might be unpatentable, or else they may be pooled among engineers, manufacturers and firms in order to increase knowledge capacities without investing in expensive and time-consuming competitive research and development activities. The development of such collective invention settings can turn out to be an effective strategy for the optimal management of knowledge assets and local capabilities, human and natural resources, financial risks and sources. The case of the iron industry of Cleveland in Northeast England that Allen has studied and that of the Cornish mining industry researched by Nuvolari (2004) constitute historiographic exemplars of the collective invention approach that emphasises local industrial culture and social networking, and the implications of these for effective knowledge production and management beyond formal IP regimes. It should be noted, first, that there were no in-house R&D facilities in Cleveland as were starting to be established in Germany during the time its iron producers were innovating so well without patents; second, secrecy

was impossible to maintain due to the mobility of workers and the absence of rules governing employee inventions.

In the event, notwithstanding the efforts of the abolitionists and the viability of non-patent knowledge management strategies, the patent system proved to be both resilient and flexible in accommodating changes in how knowledge was produced, and the interests of industry in using new knowledge for commercial gain as well as in using patents themselves as business assets. The transformation of industrial research was marked by the fading of the heroic status of the inventor alongside the growing social, professional and cognitive legitimisation of new professional genres. In this new context, inventing, as opposed to doing science, lost prestige and social status as a social, cognitive, practical activity, particularly in Edwardian Britain (MacLeod, 2007). Nonetheless, some space remained for heroic inventors past and present, such as Thomas Edison, Kary Mullis and James Dyson whose esteem attracted admiration and media attention, and in Mullis's case a Nobel prize. Such fame could be exploited for propaganda purposes, *and* in some cases to help to defend patents and other IP rights of sometimes questionable validity.

In the twentieth century, formal and strong IP regimes were supported and actively promoted by industrial and capitalist concerns and interests. The tendency for strong intellectual property¹ was reinforced further in the 1980s with the emergence of a new mode of capitalist economy characterised, *inter alia*, by the neoliberal construction of a knowledge economy emphasising the aggressive stocking and deployment of intellectual capital and intangible assets (Granstrand, 1999: 316–17). And yet, despite the extensive diffusion of this genre of intellectual capitalism, national, sectoral and institutional divergences remain. Accordingly, space continues to exist for a variety of means, within and outside the formal IP system, to appropriate as much as possible of the innovation chain from initial discovery to distribution and sale in the market.

Divergencies in patent regimes remain despite the incessant efforts to harmonize in accordance with the interests of transnational corporations. Historically, difference was the norm and something to be preserved rather than to be treated as an aberration, notwithstanding the international consensus on national treatment and priority among the signatories to the 1883 Paris Convention for the Protection of Industrial Property (see below). Patent law has always been territorial, and in most respects it still is. Historically, national laws including those of the United States, Britain, Japan and Germany varied to reflect different legislative cultures and divergent national innovation systems, and there was little if any interest in changing that state of affairs until quite recently. In the late nineteenth century, on account of new emerging industries and technologies, there was

an increasing interest in international coordination and harmonisation of certain basic principle as long as substantive patent law divergence remained. But still, strict territoriality prevailed.

In the final decades of the twentieth century things began to change. Transnational corporations have been influential and effective in shaping the knowledge management and patenting policies of states and organisations. What they would like is the global adoption of homogeneous, standardised regimes backed up by cooperative relationships between patent granting offices, judiciaries and international organisations like the World Intellectual Property Organization, that would facilitate international patenting at reduced time and cost. Inevitably, this would reduce state discretion, effectively giving support to unchecked corporate control over their intangible assets.

The United States government and its transnational corporations have been especially aggressive in this regard. Ostensibly, the motive was to reduce 'piracy' by weak forms of IP protection in developing countries that enabled local market actors with impunity to engage in copying on a mass scale, thereby threatening the economic hegemony that the transnationals were seeking to achieve (Kranakis, 2007). However, one may also regard this 'piracy' not as cheating or as grand larceny but rather as a perfectly rational type of knowledge management strategy. Undoubtedly it is one that is commonly used today, as it was in the past, ironically by some of those who are currently most vociferous in their condemnations, by those who are entirely reliant on applied scientific knowledge originating elsewhere. 'Borrowing' as freely as one can get away with is practiced because it so often works. Yesterday's pirates may not become today's innovators but many business historians should be able to cite some very high-profile examples of this happening.

International law has certainly moved on in recent decades. After the Paris Convention, the 1970 Patent Cooperation Treaty and World Trade Organization's 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) advanced the cause of global patent coverage through enhanced coordination, standardisation and facilitated overseas patent filing. However, substantive patent law harmonisation remains a step too far for a number of large developing countries like India and Brazil, and two recent efforts to develop a binding treaty under WIPO's auspices have failed. This opposition reflects an awareness that patent regime design has broad implications beyond corporate laboratories and boardrooms, and also, perhaps, a keen sense of history. As Eda Kranakis has strongly stressed, 'patents are not just tools of power and control; they are also agents of social welfare and development' (Kranakis, 2007: 691).

Indeed, harmonisation is far from complete, and in fact may prove to be impossible to achieve. This is not just because of increased awareness of the high welfare and development stakes. Harmonisation requires agreement on substantive rules, identical patent granting office practice, including mutual recognition of search and examination reports or results, and common judicial interpretations. A certain amount of cooperation is taking place (see Drahos, 2010). But there is much more that national governments would have to agree upon. Even then, that would not be the end of it: the legal infrastructure and level of expertise available in the United States, Europe and countries like Japan, South Korea, Singapore, Canada and Australia must also be available globally, and there must be local stakeholders with as much awareness of patent law and interest in using it in pursuit of their business interests as in the above nations. Otherwise patent systems are exterior impositions that serve only to protect, in the words of Frederick Abbott (albeit not from a particularly critical perspective), 'First World assets in the Third World' (1989). As such they will lack credibility and local firms elsewhere in the world will continue to use informal knowledge management strategies that pay little heed to whatever is patent-protected, some of which are presented in this book and that may, it must be said, be quite effective.

THE PRESENT VOLUME

The variety of strategies presented in this book emphasises the co-existence of multiple activities by individuals, firms, non-commercial entities and governments. These span the divide between supporting and practicing informal means of control to aggressively proprietary strategies, and between the single-minded pursuit of profit and far less commercial motivations stressing human development goals. The book places these activities in their socio-historical contexts and seeks to give due weight to the specificities of their industrial, social and developmental settings. Accordingly, it aims to provide a framework for a more flexible understanding of current issues in patent systems and knowledge management more generally, issues which, it turns out, have always been present. These include such challenges as how to promote socially useful innovation while safeguarding appropriate access to knowledge and information, and how to enhance the development of major public goods like foodstuffs and health products. In this context the issues at stake are not just about business and profit, but also about social welfare, democracy and human rights.

The book is organised thematically. The first part, 'Innovation Cultures and Knowledge Management', concerns knowledge management's

dependent relationship with innovation culture as prevails in different industrial sectors. 'Individuals, Institutions and the Management of Intangible Assets' focuses on the representation of invention in various institutions from the patent system to the courts and the research institutions whilst at the same time addressing the issue of how practitioners' and inventors' management approaches functioned within institutions, taking advantage of institutional capacities and the institutional and legislative framework. The third part, entitled 'Knowledge Management and the Industry-State-Academia Nexus', deals with the development and shaping of IP cultures and knowledge management in sciences and technologies in contexts where market priorities meet with state or academic concerns. The fourth and final part, entitled 'Techno-sciences and Global IP Regimes: From History to Present Concerns', explores the linkages between historical trends and development in the emergence of IP regimes with policy concerns addressing issues of the North-South divide, including the alleviation of poverty.

Part I: Innovation Cultures and Knowledge Management

Paul Israel's chapter focuses on the management of intellectual property by Edison in the different industries in which he was involved as inventor and entrepreneur. Factors such as the market and competition structure of each industrial sector, the prevailing patterns of ownership in each one, and the differences between domestic and foreign patent regimes all helped shape Edison's management strategies. He was very skilful in his management of collective research activities and knowledge production, and adept at understanding the potential of technologies even from the stage of experimentation and in his use of key mediating actors like patent attorneys and corporate lawyers who helped to define his proprietary claims.

Andrea Maestrejuan discusses the emergence of corporate management of inventions in the industrial world of Germany in the early nineteenth century whose patent law was specifically geared to collective invention to the extent that inventors did not even have to be named on patents. The issue at stake for German chemical companies was the creation of a controlled working environment that would secure individual creativity through a system of rewards and financial incentives while at the same time guaranteeing the corporate interest in the exclusive exploitation of their employees' inventive activities. Furthermore, Maestrejuan argues that the German patent law of the nineteenth century with its conceptualisation of inventive activity as a collaborative effort promoted an ethos of collaborative research that was echoed in the 'Big Science' era of American twentieth-century science.

In contrast, Joris Mercelis's chapter concerns knowledge management by means other than using patents as employed by Leo Baekeland, a pioneering inventor most commonly associated with early plastics. Baekeland's involvement in the development of Velox, a type of photographic paper, shows clearly that for entrepreneurial scientists inventions are assets for securing economic returns and for lending prestige even when they are not patented. Baekeland's case casts doubt on the glib assumption that patents are a second best solution when secrecy is unavailable as if no other forms of appropriation exist. To express this view plainly: the ideal way to protect an invention is to keep it secret. But if that is impossible or possible only for a short time, the only alternative is to patent it. Baekeland did use secrecy but his motivations were actually quite varied.

Theodore Lekkas analyses the lack of patents in one particular field in relation to cultural practices shared by groups of computer users. Software programs were not patentable at all, and the only way to stop misappropriation was by resort to unfair competition law. The emergence of software piracy in Greece can best be understood by reference to particular characteristics of the domestic situation: the fragmented character of the market and the roles of mediators like the semi-technical journals. The chapter argues that software piracy should be understood as a social phenomenon which arose within a culture that stressed the role, agency and freedom of the user to intervene and engage directly with the technology. It emerged as a different way of using home computing and as a social practice with its own moral economy that challenged established concepts of creativity and commerce that were based on proprietary approaches to knowledge and technology.

Part II: Individuals, Institutions and the Management of Intangible Assets

Graham Dutfield seeks to solve a puzzle that tends to be overlooked by scholars: why individual inventors continue to be named on patents despite the law's generally accommodating position with regard to the collective nature of modern inventing. In brief, notwithstanding the collectivisation of research and invention, the named individual can serve as a useful attracter of credit and authenticity. By maintaining a prominent place for 'the inventor', the invention can more convincingly be traced in exact space and time than may be possible for anonymous inventions. Inventor naming may also afford moral legitimacy to the patent system in a way that anonymity cannot do, especially when the rights tend increasingly to be held exclusively by large corporations.

Elizabeth Bruton focuses on the interplay between the individual inventor and the institutional culture of research and inventing. The context is early wireless telegraphy. Studying the early experiments conducted by William Preece and his collaborators in the Post Office, Bruton shows that there was a collectivist approach to the invention of wireless that involved non-proprietary patterns of innovation. Scientific and technical publications in journals were the media of communication and the forums for the attribution of credit. This changed drastically with the entry of Guglielmo Marconi into the wireless industry and with his attempt to establish monopolistic regimes through patents and exclusive contracts with government departments and the British Navy.

Stathis Arapostathis discusses patent disputes as they can be viewed from archival research into legal documents and court proceedings. Studying three major court cases in the British electrical industry of the late nineteenth century, the chapter examines how discourse on the ownership of ideas and artifacts was constructed in the courts and the contemporary technical journals. The chapter shows that patents for the electrical science and technology practitioners were tools to control the market and secure monopolies whilst at the same time serving as formal means of credit attribution for the electrical practitioners of the period.

Andreas Fickers studies the role and agencies of patents in the technological issue of colour television standardisation. For Fickers the European standardisation process was far from being rational, apolitical or unproblematic. On the contrary it was a highly complex political, economic and technical process. The chapter focuses on the relationship between the *Compagnie Française de Télévision* (CFT) and *Telefunken* as main patent holders of the SECAM and PAL systems. It shows that patents as non-human ‘actants’ contributed in shaping the debate over technical standards.

Part III: Knowledge Management and the Industry-State-Academia Nexus

Susan Morris investigates the emergence of academic entrepreneurship through patents and consultancies. She focuses on the work and activities of Henry A. Rowland at Johns Hopkins University, Edwin F. Northrup at Princeton University, and Charles F. Burgess at the University of Wisconsin. The chapter provides an in-depth understanding of change from when universities hosted entrepreneurial academic scientists but were not at all entrepreneurial in their mission, to the situation today where many universities seek themselves to be entrepreneurial. She suggests that a return to the past may be a good thing.

Berris Charnley's chapter traces the emergence of British Mendelism in agricultural research. Mendelian breeders were keen to defend the scientific credibility of their theory, the superiority of the crop varieties they bred, and also their professional standing. Charnley aims to integrate the consolidation of Mendelism within a broader historiography that considers issues of research traditions and patterns of publishing and producing knowledge. He argues that in Biffen, Bateson and Wood's activities as individuals and within evolving institutional settings can be found what historian of technology Thomas Hughes refers to as 'system building activities' of the kind associated with Thomas Edison. Going beyond Hughes, Charnley also factors in IP rights and the role of consumers as sources of practical knowledge of use to the Mendelians. In doing so, Charnley depicts a very dynamic scene in which Mendelian breeding work involved the founding of new institutes along with a continuous management of the reputation and good standing of the varieties and the theory that supposedly informed their production.

Secrecy and patenting are not necessarily alternatives to each other. Simone Turchetti's chapter concerns certain patenting activities during the Second World War. He depicts the uncertainties, constraints and complexities that the war introduced in the management of knowledge. He argues that a new regime of intellectual property emerged out of atomic research for the military. The characteristic of the new hybrid regime is, ironically given the disclosure function of patents, a combining of secrecy with patents. Normally, the patent system is supposed to facilitate control over inventions and their commercial exploitation by publicly disclosing them. But during the Second World War and the early Cold War period, at least in this technological field, some governments used the patent system to secure state control over military applications, gaining patent monopolies without disclosure.

Part IV: Techno-sciences and Global IP Regimes: From History to Present Concerns

Henk Van den Belt and Michiel Korthals argue that the international IP rights regime which increasingly holds all nations to high standards of protection has evolved rapidly in the latter part of the twentieth century with insufficient attention paid to ethics and justice. Early critics of IP during the period included not only Marxist scientists like J. D. Bernal but opponents of social planning like the economist Friedrich Hayek and the chemist and philosopher Michael Polyani. As IP becomes ever more deeply entrenched in our economies, our politics and even our everyday social and cultural lives, critics have re-emerged to challenge the status quo by offering

alternative ways to secure rights to access knowledge and participate in its production as well as to acquire affordable products like medicines where they are most badly needed.

Niels Louwaars, Bram de Jonge and Peter Munyi study the co-evolution of plant breeding in Europe, the U.S.A. and developing countries with IP law taking into account changing scientific, technological, business, societal and developmental contexts. The authors' account begins in the late eighteenth century when commercial seed production began in Europe. They use this historical investigation as a way to explore the economic development dimension of efforts to harmonise IP rules in the areas of plant breeding and agricultural biotechnology. They question whether in developing countries the evolution of plant breeding targeted at poor farmers is supported by new IP rules that have been imposed on them. It follows that managing knowledge using the available IP tools will mostly be done by foreign firms and will not be in the best interests of these countries trying to overcome poverty and lack of food security.

The final chapter, by Eda Kranakis, analyses the relations between large United States corporations, IP rights and the North-South divide. She focuses on the recent history of institutional and legislative changes brought in by the World Trade Organization's Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS). Kranakis shows that the Agreement had the strong support of American private companies and the U.S. government within a context that prioritised their interests. However, the normative and ideological dominance of the United States and its developed world allies has been quite effectively challenged. The unintended consequence of the TRIPS Agreement is that alternative norms and ideological positions stressing other values, assumptions, concerns and goals have had to be accommodated and are having an impact on international negotiations and national policies, as well as views on how to frame patent rights so that they are utilised and knowledge is managed optimally to further public interest goals. When all is said and done, governments in consultation with their own citizens and local stakeholders have to be the ones that decide how best to do this.

NOTE

1. "“Strong” and “weak” are frequently used in relation to patent law, but they tend not to be explained. By “strong” [we] refer to the extent of enforceability of the rights and the absence or lack of exceptions to patentability by subject matter or technological field, and of limitations to such rights like compulsory licensing, *Bolar* exemptions, and legal parallel importation' (Dutfield, 2013).

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