PATENT LAW AND SOCIAL UTILITY: MAXIMALIST RIGHTS AND CROP GENETIC RESOURCES

by

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ABSTRACT

This thesis examines how patent rights governing crop genetic material were structured and implemented in US law and incorporated into the TRIPS Agreement during the period of neo-liberal ascendancy in the late twentieth century. It reveals major fault lines between the philosophical underpinnings of intellectual property and the real world of commerce in these resources. Claims that patents on crop genetic material promote wide social utility are found wanting. In addition to significant distributive, ecological and social consequences, the expansive definition of patentable material and the relaxation of the criteria for patents governing these resources have resulted in the enclosure of genetic information and scientific knowledge, stifling new innovation and the spread of socially valuable knowledge. This work points out the logical flaw in "the-more-rights-the-better" rhetoric about intellectual property and social utility, because innovation *depends* on having rules that establish a balance between the public domain and private property.

Keywords: biotechnology patents, crop genetic resources, enclosure, public domain, patent philosophy, patent criteria, TRIPS

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ACRONYMS AND TERMS

ABS	Access and Benefit-sharing Agreements
ACTN	Advisory Committee on Trade Negotiations
CAFC	Court of Appeals for the Federal Circuit
CBD	Convention on Biological Diversity
CGIAR	Consultative Group on International Agricultural Research
CGRFA	Commission on Genetic Resources for Food and Agriculture
COP	Conference of the Parties (CBD)
DFI	Direct Foreign Investment
DNA	Deoxyribonucleic Acid
EPO	European Patent Office
ESTs	Expressed Sequence Tags
FAO	Food and Agricultural Organization (UN)
GATT	General Agreement on Tariffs and Trade
IARC	International Agriculture Research Centre
IP	Intellectual Property
IPC	Intellectual Property Committee
IPR	Intellectual Property Right
ITPGR	International Treaty on Plant Genetic Resources
IU	International Undertaking on Plant Genetic Resources
MFN	Most Favoured Nation
PBRs	Plant Breeders Rights
PCT	Patent Cooperation Treaty
PGRFA	Plant Genetic Resources for Food and Agriculture
TRIPS	Agreement on Trade Related Intellectual Property Rights
UPOV	International Convention for the Protection of New Plant Varieties
USAID	US Agency for International Development
USPTO	US Patent and Trademark Office
USTR	US Trade Representative
WIPO	World Intellectual Property Organization
WTO	Word Trade Organization

INTRODUCTION

An understanding of both the structure and philosophical foundations of intellectual property is essential to a critique of the institutions and technologies that purport to facilitate knowledge development and dissemination in contemporary western society. This is especially true in today's so-called "knowledge economy," in which the greater proportion of corporate assets in technology based firms is intellectual property holdings (Granstrand 10). Over the last few decades intellectual property (IP) has become increasingly important to national economies in the industrialized world, so much so that the knowledge economy has become a defining feature of contemporary society, and intellectual property rights are a key component in international trade agreements. Intellectual property rights provide rights holders with the right to exclude others, for a specified time, from copying, using or profiting from a claimed invention unless some form of economic rent (licenses or fees) is paid.

Like any laws in a democratic society, intellectual property law requires a social justification, some rationale that gives it moral validity in the eyes of the population at large in order for it to gain wide support. Philosophical justifications for intellectual property rights in the western liberal tradition tend to rely on a utilitarian perspective, an economic rationale that says the pursuit of individual interests will maximize the public good and the totality of social welfare. Patents, which are the subject of this work, protect products of intellectual endeavor deemed to have wide social utility in addition to being directly linked to individual and corporate economic gain. According to the utilitarian perspective the prospect of reward from the exploitation of patents provides a necessary incentive for the production of socially useful goods.

The utilitarian rationale speaks to the needs of the capitalist economy, but there are important limitations to all IP rights that are intended to protect the interests of the public of users. These interests derive from the non-material nature of the goods being commodified and the importance of the spread of knowledge in a liberal democracy. The underlying premise of IP, therefore, is that there must be a balance between private rights and the public interest, a dynamic that suggests this could be a site of some

contestation. The authorial regime as described by Boyle (1996), which is predicated on recognition of the individual transformative author or inventor[1], provides a mechanism for achieving this balance through the idea/expression divide. In the realm of patents it is commonly referred to as the "patent bargain" –the inventor is granted a limited exclusive monopoly right to profit from the material manifestation (the "expression") of his or her intellectual endeavour, and in return the information underlying the invention (the "idea") must be published, thus enriching the public domain of knowledge and promoting further innovation. In addition, patent applications must satisfy strict criteria for grant of patent. These qualifications are intended to ensure that the patent is merited and that the public domain of knowledge is not diminished by its granting.[2]

This work was prompted by a growing sense that in the complicated world of intellectual property, particularly with respect to developments in agricultural biotechnology, the balance between private rights and public interest has been badly skewed to the advantage of the former. New developments in genetic engineering have unlocked the biological frontier, and, supported by a facilitating intellectual property rights regime, have made genetic material available for conversion into commodity form. Proponents of property rights over plant genetic material argue that patent rights are a necessary incentive for innovation and capital investment to support the development of new genetically engineered crops. They claim that agricultural biotechnology[3] can alleviate world hunger by developing crops that consistently and reliably provide increased yields and that withstand pests, drought, and other unpredictable forces, but only if strong, clear and defensible property rights are in place. From a utilitarian standpoint, property rights in crop genetic material would appear to be justified if these claims stand up to scrutiny.

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1 According to the authorial regime of intellectual property rights, the transformative act utilizes the resources of the public domain of knowledge to produce a product or good which is an unique expression of an individual's intellectual endeavor.

2 The public domain of knowledge is admittedly a somewhat contested concept, but whatever the fine points of disagreement are, it generally refers to a realm of knowledge to which there are no property rights attached.

3 The definition of biotechnology adopted in this paper is that expressed in Article 2 of the Convention on Biological Diversity (CBD): "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use." See http://www.cbd.int/convention/articles.shtml?a=cbd-02

However, while biotechnologies may hold the promise of significant scientific advancements, the "ownership" of genetic material has engendered significant debate and resistance around the world. Many voices claim the extension of patent rights to crop genetic material has facilitated the enclosure by large transnational agro-chemical corporations of resources which were once commonly or publicly developed and freely traded and shared. Accusations of biopiracy and unequal exchange emanate from developing countries. There are claims that the vast majority of products in agricultural biotechnology have been designed to capture markets rather than alleviate world hunger, and there are growing concerns worldwide about patent monopolies over basic food crops and the role they play in diminishing crop genetic diversity and foreclosing research in an area of fundamental importance to humanity's well-being. Moreover, the philosophical and technical validity of patents on genetic material is being challenged.

Many critics, activists and academics alike, believe that intellectual property has drifted too far from its theoretical foundations in favour of powerful corporate interests, with significant negative distributive, ecological and social consequences (Richards: 2004; May: 2000; Drahos and Braithwaite: 2002; Boyle: 2003, 2004; Lessig: 2006; Rifkin: 1998; Cripps: 2004; Eisenberg: 2002). Legal scholar James Boyle claims that there is a logical flaw in the contemporary rhetoric about intellectual property and innovation. He says that western industrialized countries have adopted a "maximalist rights culture" in which it is believed that "to promote intellectual property is to automatically promote innovation... and therefore, the more rights the better" (2004:2). Boyle says the flaw in this argument is that it fails to recognize that innovation depends on balancing the rights of the innovator and the rights of the public of users. He argues that an intellectual property system that is based on an authorial regime tends to privilege protection of private property rights over the dissemination of socially valuable information and discounts the contributions of other sources who do not fit the mould of the individual transformative innovator. Too much emphasis on protecting knowledge assets will impoverish the public domain and discourage vital research and development activity (Boyle, 1996).

This work undertakes an examination of Boyle's critique within the context of the concurrent revolution in molecular biology techniques and rise of neoliberalism in the latter half of the 20th century, with a particular focus on developments in US patent law

and practice as they pertain to agricultural biotechnology. The US took a leadership role (along with Britain) in promoting the global ascendancy of the doctrine and prescriptions of neo-liberalism, which informs economic globalization and free trade, and it was US standards that were used as the model for the Trade Related Intellectual Property Rights (TRIPS) Agreement, the global regulatory regime governing intellectual property imposed through the World Trade Organization (WTO) framework. In fact the impetus for a global intellectual property regime originated in the US, the world's largest net intellectual property exporter (Drahos and Braithwaite 11). In the neo-liberal paradigm, the public domain and commonly held resources are typically viewed as a wasteland of inefficiently managed resources that can only become productive through privatization. According to this line of thought, market mechanisms are self-correcting, allocate resources efficiently, and serve the larger interests of society. They should therefore be the sole factor directing the fate of human beings and their natural environment. Boyle's theory of a maximalist rights culture suggests that a close examination of the way that patent rights governing plant genetic resources in agriculture were structured and implemented in US law and incorporated into the TRIPS Agreement during the period of neo-liberal ascendancy should reveal major fault lines between the philosophical underpinnings of intellectual property (IP) and the real world of commerce in these resources. Claims that patents on agricultural bio-resources promote wide social utility, including stimulating further innovation and promoting the dissemination of socially valuable information, should be found wanting.

Chapter one examines the philosophical arguments in support of intellectual property in the western liberal tradition and the evolution of the authorial regime in the 1700s. By the 1900s cracks in the façade of the authorial regime would appear in the US as industry realized the potential of patents to keep valuable knowledge hidden and to structure knowledge cartels.

Chapter two describes the changes made to patent law covering plant genetic material, made primarily to accommodate the emerging biotechnology industry in the US, and the successful campaign led by industry to implement a more aggressively protectionist trade-based global regime of IPRs. The link between neoliberalism and the emergence of a maximalist rights culture becomes clear.

Chapter three looks for the fault lines between the rhetoric and the reality of a strengthened global regime of intellectual property rights in the realm of agriculture, with particular attention to the distributive and ecological consequences of patented seed and germplasm in developing countries. It looks at issues arising out of the epistemic schism between traditional models of managing, preserving and disseminating agricultural knowledge, and the formal scientific model of knowledge generation and innovation. The efficacy of alternate forms of protecting agricultural biodiversity and addressing issues of unequal exchange is discussed.

Chapter four focuses on the challenges to the integrity of the patent system and the public domain of knowledge posed by the erosion of patent criteria and the gene's dual status as information and patentable entity.

CHAPTER 1:
PROPERTY IN THE WESTERN LIBERAL TRADITION

Property and its attendant rights underwent a "major reformulation" during the intellectual foment of the 17th century (May 22), when primacy of rights theories and the doctrine of liberal individualism arose.[4] Liberal individualism conceives of individuals as discrete and independent beings whose principal means of interaction with the material world and with each other is through the acquisition and exchange of private property. In the sphere of the political, it is "the rational pursuit of self-interest through the accumulation and exchange of ...goods" that defines individual life (Monahan 18). The meaning of property in the liberal canon was not so much at issue during this reformulation as were the prevalent and accepted notions of what could justify ownership. According to Macpherson, two major changes in the concept of property emerged during this period. Firstly, the distinction between property as mere physical possession and property as a right enjoyed by a sovereign individual emerged. Property began to be conceived of as things to which a bundle of rights was attached rather than rights to benefit from certain things or relations. Property in this perspective could only be privately owned, either by an individual or an organization. Secondly, where there had previously been recognition of both private and common property, the notion of common property began to be treated as a "contradiction in terms" and virtually disappeared from the political and economic landscape (Macpherson 1978,9). As May explains, theories of property in the western liberal tradition thus tend to focus exclusively on individual ownership despite the existence of other socio-cultural traditions of property worldwide. He notes that after the seventeenth century, the idea of a comprehensive all-encompassing theory that enabled all property, including intellectual property, to enter a system of exchange began to dominate considerations of property. The rights of property owners were extended in several key areas, including protecting an individual interest in property, recouping value for property damage, and the right to dispose of property – particularly land (May 22-23).

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[4] See for instance Macpherson, C.B. (1980) "Editor's Introduction." *Second Treatise of Government* and Charles Taylor (1979) "Atomism." *Powers, Possessions and Freedom.*

Property thus conceived is generally agreed to be a social institution in as much as it involves rights which are held against others and against the state itself, protecting the interests of owners from the danger of theft by others and from the danger of state appropriation. It is also subject to change according to social and political requirements and, in that sense, is always constructed to serve particular interests (May 16 -17). These interests are embedded within a legal framework enforceable by the state, and as many scholars have noted, this framework reflects the power relations that are extant within social relations (May, 2000, Richards 2004, Sell 2003, Drahos and Braithewaite 2002). However, while laws are given validity through the exercise of state authority, there is also a "moral topography" or social justification that normalizes the "preferred contours" of the social world and marginalizes other ways of seeing (May 17). Justificatory theories in support of property offer a legitimated philosophical history (May 17, Richards 27), but as it will become evident in this work, they do not apply particularly well to the concept of intellectual property. This suggests there may be major fault lines between the justificatory theories for IP and the real world of commerce in intangible goods.

There are a number of well-established philosophical defenses of property and property rights in the western liberal tradition (Richards 27).[5] For the purposes of this analysis, I will utilize the taxonomic approach taken by May. May divides these defenses into three "justificatory schemata:" the instrumental perspective, in which labour is rewarded with property rights; the self-developmental perspective, in which possession contributes to the development of self; and an economic or utilitarian approach, in which property rights are justified only if they create wide social value. These justificatory arguments are often utilized as accepted precedents in discussions about the emergence of property as a social institution (May 24). May's schemata are not intended to represent a comprehensive overview of theories of property, but rather to provide a useful way to analyze the common arguments that are invoked in support of intellectual property (28).

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[5] In chapter two of *Intellectual Property Rights and Global Capitalism*, Donald G. Richards provides a useful discussion of some traditional philosophical approaches to the concept of property right, including those of Locke, Hegel, Bentham and Godwin. See also Tom G. Palmer's article "Are Patents and Copyright Morally Justified?" at http://www.tomgpalmer.com/ for a libertarian perspective on property rights, and Alan Carter, *The Philosophical Foundations of Property Rights*, Harvester Wheatsheaf: Hertfordshire, 1989 for a critical discussion of early justificatory theories. John Locke is generally acknowledged to be the great philosopher of property. He articulated his ideas on property in his *Second Treatise of Government* published in 1689.

Instrumentalist justifications are associated with the seventeenth century British philosopher John Locke, who articulated his ideas on property in his *Second Treatise on Government* published in 1689. Locke believed that property derives from "natural law," (meaning that what is natural is in some fundamental sense right) and is instrumental to the ends of promoting "profitable human activities" (Richards 18, May 25). Underlying Locke's philosophical position is atomism, which refers to the doctrines of individualist social contract theory that arose in the 17th century to promote a vision of society constituted by people seeking the fulfillment of ends which are primarily individual (Taylor 39). Atomism and primacy-of-rights theories have been one of the "formative influences on modern political consciousness" according to Taylor (39-43).

Most who assert the primacy of rights are primarily interested in the right of freedom – in particular the freedom of the individual to accumulate and dispose of private property (Taylor 53). Locke proposed that by mixing his labour with God's gift of nature man establishes a "natural" private property right. He states that "... every Man has a property in his own Person...The Labour of his body, and the Work of his Hands, we may say, are properly his. Whatsoever then he removes out of the State that Nature hath proved, and left it in, he hath mixed his labour with, and joined to it something that is his own, and thereby makes it his Property" (section 27). May interprets this to mean that for Locke, the commons functions only as an opportunity for industrious and rational men to remove parts of it for their own through the exertion of labour, thereby improving and adding value to what was previously un-owned (May 25). For Locke, "acquisition derives from a fundamental, inviolate principle of self-ownership" (Richards 29). Furthermore, violation of ownership "constitutes an infringement of liberty" (Palmer 1990:832). Palmer further contends that, in beginning with the notion that one's own body is the "one tangible thing that is so clearly one's own that no-one else can claim it," Locke was able to demonstrate how property rights can "legitimately emerge without requiring universal consent" (1990:832).[6] In Locke's words, "Thus the Grass my Horse has bit; the Turfs my Servant has cut; and the Ore I have digg'd in any place where I

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[6] It should be noted that the coherence and meaning of some of Locke's arguments on property are the subject of much debate. In his "Editor's Introduction" to Locke's *Second Treatise of Government,* C.B. Macpherson provides a very accessible discussion of the inconsistencies and ambiguities in Locke's case for the limited constitutional state and his doctrine of property rights. See also Alan Carter, *The Philosophical Foundations of Property Rights,* Harvester Wheatsheaf: Hertfordshire, 1989. Carter also maintains that Locke's argument contradicts itself in several respects (see page 24). Andrew Hacker notes that what Locke meant by property is "one of the most vexing questions in political theory" (qtd. from Willinsky, p. 3)

have a right to them in common with others, become my *Property*, without the assignation or consent of any body" (section 28). Furthermore, as Macpherson notes, it was Locke's introduction of money into the state of nature before civil society and government was instituted that led to the removal of natural or moral limits to the accumulation of property, which made class and inequality possible (xviii). One of the primary functions of government thus becomes the preservation of property and the defence of rights that already exist in the state of nature, albeit only for those with capital (Richards 30). For Locke, the accumulation of private property for productive purposes was taken to be the rational expression of natural law; that not all individuals accumulate is taken as evidence of their lack of rationality. The "mass of property-less labourers are ... therefore incapable of full participation in the political life of civil society" (Richards 31). Locke's *Second Treatise* became a classic in the history of political theory, providing "invaluable ideological support for the liberal constitutional state and the market society on which the liberal state has been built" according to C.B. Macpherson (xxi). Richards notes that while the Lockean doctrine on property may also have served to "undermine the political and economic prerogatives of vestigial medieval authority," it more importantly provided a justification for differential property rights and the exclusion of the non-propertied from full participation in civil society (31).

Underlying the "Lockean stream" of instrumental justifications are two assumptions: firstly, that an individual possesses his or her self and has ownership of his or her efforts; and secondly, that the property resulting from this effort is alienable, thus providing the opportunity to realize an appropriate reward (May 92). May stresses that while there are questions about the coherence of Locke's overall position, the notion that the prospect of ownership inspires individuals to labour and that the application of individual labour should be rewarded through ownership of the object worked on is still widely recognized today and lies at the root of instrumentalist justifications (26-27).

The second justificatory schema proposed by May is the "self-developmental" justification associated with the eighteenth century philosopher Georg Hegel. It too is premised on the existence of a commons, where everything resides until an individual exercises his or her "will" over an object and asserts ownership of it (Chander and Sunder 1344). Hegel believed that property acquisition, control and ownership provide the basis for an individual's full participation and recognition in an ethical society; the

respect that others show to an individual by not trespassing on his property is an acknowledgement of him as a person (Richards 38). Property enables the individual to make the transition from the internal subjective world to the external, objective world where ownership is protected as a legally constituted right. Like the instrumentalist perspective, property is linked to human endeavour, but rather than focusing on labour and its material reward, the self-developmental perspective asserts that labour changes an object in ways that reflect the individual's will, particularly to control and dominate nature (Richards 37-38, May 26-28). And for Hegel, labour also extends to intellectual labour where property and personality simultaneously result from the creative act (Richards 45, May 27). Property ownership as an expression of self and the right of individuals to use and dispose of their possessions and material creations as they see fit are embedded in the self-developmental schema and in contemporary political consciousness.

The third justificatory schema identified by May focuses on a strictly economic rationale for property rights. Jeremy Bentham, the 19th century philosopher most closely associated with the utilitarian philosophic tradition, believed that rational agents in an efficient resource-allocating market will be driven by the "guiding behavioural assumption" of utility maximization, or getting the greatest benefit from scarce resources (Richards 31). In this schema, property rights are considered essential to provide economic incentives and protections for producers. Once a good is deemed a commodity, it can be appropriated through rights of ownership for profitable enterprise (48). Competition for scarce resources will ensure efficient and productive use of these resources. Richards notes that utilitarianism provides another "keystone philosophic concept supporting much of the neoclassical economic edifice" that has become so prevalent (31). Boyle agrees, referring to neo-classical theory as "sophisticated utilitarian language" whose disciplinary assumptions (efficiency and rationality, for instance) describe a liberal vision of the marketplace in which the pursuit of individual interests will maximize the public good and the totality of social welfare (1996:44). Monahan states that neoclassical economic theory owes much to the body of political theory known as liberal individualism or possessive individualism found in the political theories of Thomas Hobbes, John Locke and others (18). According to Monahan, liberal individualism has become the "default understanding of the political world in the majority of Western "liberal" democracies, particularly in the U.S." (18). He observes that liberal

individualism underpins what has become known as neo-liberalism, which "implicitly, and often explicitly, informs the justification for the policies and institutions of globalization, deregulation, and free trade" (18).[7] Furthermore, liberal individualism has become inextricably linked to science to the extent that, as Weintraub points out, "to challenge the neoclassical approach was to seem to challenge science and progress and modernity" (n.p. "Neoclassical Economics").[8] This linking of the economic and the scientific realms would emerge as one of the great political victories of neo-liberalism, manifesting in (among other things) the TRIPS (Trade- Related Aspects of Intellectual Property Rights) Agreement of the WTO, as will become evident in this study.

From Locke onward, modern thinkers have maintained the centrality of property in political philosophy and the idea that the state arose in order to ensure the regulation and security of indissoluble individual property rights. While these theorists did not have a great deal to say about intellectual property as such, most ideological justifications of intellectual property rely on some combination of these traditional philosophical defenses of property and property rights (May, Richards 18). But as the next section points out, extending economic and legal principles regarding property from the physical to the intellectual realm is a problematic notion.

1.1 Philosophical Justifications for Intellectual Property

The history of intellectual property, like the history of material property (and in particular the land enclosures in Europe), is the story of the construction of a "legal scarcity relative to a previous commonality" (May 13). Monahan observes that a viable concept of public or common goods is not only conditioned but limited by the values and tenets of classical liberal political theory (17-21). As noted earlier, a common feature of the classical liberal canon is that of fundamentally atomistic political agency; individuals exist as discrete and intelligible beings whose principal means of interaction with the material world and with each other is through the acquisition and exchange of private property.

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[7] Neo-liberalism,began its ascendancy in the US during the Thatcher/Reagan era. See *Anarchy, State, and Utopia* (New York: Basic Books, 1974) where Robert Nozick argues that any redistribution of property based on egalitarian principles is an unacceptable restriction on individual freedom. See also the writings of Harold Demsetz (listed at http://cepa.newschool.edu/het/profiles/demsetz.htm). These writers epitomize the neo-liberal view that markets will perform optimally when unfettered by government interference or regulation, and that the freedom of the individual to accumulate unlimited property is absolute.

[8] E. Roy Weintraub's article "Neoclassical Economics" provides an in-depth discussion of the concept at (http://www.econlib.org/library/enc/NeoclassicalEconomics.html).

Limits on an individual's ability to alienate his or her own property, according to the canon, are considered an abrogation of one's freedom (appeals to the rights and safety of others notwithstanding) (Monahan 19), a notion that goes back to Locke (Palmer 1990:832). But if a good is understood to be public rather than private, the relationship between individual and property that is at the heart of the 'privacy' in private property can't exist, according to Monahan (19). He explains that within the context of liberal individualism, the notion of public or common goods is "contrary to individual liberty" (19) and without the vested interest that private property imparts, will be inefficiently managed.[9] Perceived inefficiencies provided the justification for the enclosures of common lands in the fifteenth to eighteenth centuries, in which land previously held in common was privatized by fencing it off and securing title deeds through the courts (May 13). Today, enclosure of the public domain of knowledge, particularly genetic information and scientific knowledge is likewise occurring as new technologies make knowledge "resources" available for exploitation and commodification, a process that is given legitimacy through a discourse centered on the individual romantic author. As May points out, the enclosure process neither recognizes nor accepts that "knowledge can be used without depleting its intrinsic value to society as a whole" (49). The organization of capital is inextricably tied to the recognition of property rights, and so those areas of social life that capitalists want to profit from need to be converted to alienable property. Heilbronner views enclosure as an element of the "expansionary dynamic of capitalism itself" (quoted from May 13).

Intellectual property rights describe the legal benefits accruing to owners, including the right to charge rent (generally through licensing agreements), the right to be compensated for any losses through infringement, and the right to collect payment for sale or transfer of ownership (May 7). At the root of conflicts over intellectual property is the "metaphorical" treatment of intangible goods as material objects (May 42) particularly with respect to scarcity. There are fundamental differences between possession of a physical object, which derives either from first possession or a transfer of rights, and possession of intellectual "goods." Property is generally conceived to be a bundle of rights, enforceable within limits, and tied to the use or benefits derivable from a physical resource that can be possessed but is scarce. "Property ...embodies the right to include

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[9] The reality is that there are many publicly owned properties and institutions that are efficiently managed, despite protestations to the contrary.

some beneficiaries and exclude others, where the ability to exclude is paramount" (Granstrand 24). Appropriation and use of physical property deprives others of its simultaneous possession and use.

But the same cannot be said of intellectual property where one person's use of an idea does not preclude its concurrent use by an infinite number of others. An essential feature of intellectual goods is this non-rivalrous character in the sense that once dispersed or disclosed, it is impossible to fully retrieve exclusive possession and control of those goods (24). Furthermore, in order to derive any benefit from the value of the idea or information, it must be sold, which entails disclosure. In market terms, this presents a significant public goods problem; intellectual goods are often expensive to create or generate, cheap to copy, and scarcity is difficult to enforce. Underproduction results, according to economic theory. Inherent differences between physical and intellectual objects, therefore, make possession as a basis for deriving intellectual property rights problematic (24) and necessitate government intervention in the marketplace to establish and enforce those rights. As May points out, the low-to- non-existent marginal cost of reproduction of knowledge and its treatment as scarce property describes a fundamental contradiction inherent in the commodification of knowledge. He calls the scarcity of knowledge objects a myth "perpetuated through the use of powerful justifications drawn from the history of material property" (42-43).

The immediate question, then, is how well do the justificatory schemata for material property apply to intellectual property? The instrumental justification for intellectual property rights maintains the individual's right to profit from his or her labour and suggests that new ideas and innovations will only be produced if there are intellectual property rights to provide an incentive. Richards states that this view is based on the notion that ideas exist in an immaterial commons, becoming effective only when mixed with individual labour (41). The essential flaw in this argument is the assumption that ideas are the consequence of individual labour. Ideas are the result of social rather than individual creation. They must necessarily utilize previously existing ideas that are themselves the result of a social process (Richards 41, May 51). Furthermore, there is no commons of pre-existing ideas just waiting to be discovered by individuals. And if ideas are social creations with a history of incremental contributions by a succession of individuals, deciding who gets the reward for labour presents a level of complexity that

the instrumental schema does not appear to be equipped to deal with (May 63). If only the most recent innovative aspect is accorded full property rights, the reward could be disproportionate to the effort. This is one way in which the enclosure of genetic knowledge takes place using biotechnology, as I will discuss later. The question also arises as to reward for intellectual endeavours – is property the only adequate reward for those scientists, inventors and creators who typically engage in it? The assumption that the creator/inventor is motivated only by the prospect of high returns ignores a long history of gift economies and creativity and inventiveness for their own sake in many societies. Many people take a large amount of satisfaction from the creative process and "find ultimate reward in discovery and creation" (Richards 42). Richards also examines the "Lockean proviso" to leave "enough and is good" for others to avoid the waste that would result from an over-accumulation of property. On the surface, this would seem to apply to intellectual property very well given the non-rival character of intellectual goods, since one person's use would not deprive another of concurrent use of a particular good. However, the very purpose of intellectual property rights is to prevent free access to these goods, making this argument somewhat specious (Richards 42). The Lockean proviso would clearly be violated, for instance, in the case of private control over a new drug that would rid the world of the AIDS virus or malaria but is only affordable for the wealthy.

The self-development justification maintains that property is a fundamental right to which individuals are entitled if they are to be recognized as free and full participants in the community. In this schema, property is usually seen as the rights of individuals to property in their creations, including the right to dispose of their possessions and creations as they see fit.[10] Again, the cumulative nature of knowledge mitigates against the alienability of intellectual property. Alternatively, if creativity is a fundamental aspect of personality development, the concept of recognition and moral rights does seem to suggest that Hegel's theory could apply to intellectual goods. But the overriding assumption is that monetary payment is the appropriate and sufficient means of providing recognition. Richards notes that it is difficult to understand how this kind of monopoly exploitation can help the individual be accepted into an ethical community, "particularly as the uninhibited use of such property in no way deprives the creator of the

[10] For Marx, it was exactly the wage labourers' lack of property in their creations that alienated them from productive processes (May 92)

same use" (46). He argues that there are many instances in which the free dissemination of ideas provides opportunities for personality development of both creators and those exposed to their creations.

Ultimately, justificatory theories appeal to essentially utilitarian arguments, that is, the argument that incentives are necessary to encourage optimal creative activity, which will in turn benefit society at large (Richards, 2004, Thompson, 2007). This is the most commonly encountered version of the utilitarian argument – private property rights and their economic exploitation provide a necessary incentive for the production of socially useful knowledge. In this model intellectual goods are not differentiated from any other form of capitalist production. The assumption is that the creator/inventor is motivated by the prospect of high returns and in their absence will remove his or her talents and energy to a more profitable economic pursuit. The prospects for high returns are assumed to be dependent on the existence of established and respected intellectual property rights (Richards 47-51). Richards points out a "formidable and obvious logical difficulty" with the utilitarian justification (47). The goal of utility maximization (in this context, the promotion of innovation) is "best served by the widest possible dissemination of new knowledge and the products and services derived from that knowledge" (47). But it is the express purpose of intellectual property rights to limit this dissemination to those willing to pay fees or economic rent (49). May also notes this paradoxical logic: "limiting the diffusion of intellectual property is regarded as a method for increasing the quantity of intellectual property available for diffusion" (49). Richards contends that no intellectual property system can adequately answer the question of what is the minimum level of reward necessary to ensure maximum dissemination of new and useful knowledge. Moreover, there is no guarantee that private profit-seeking firms taking advantage of IP protection to produce and market intellectual property goods will respond to human needs that are not represented by purchasing power in the marketplace (47). This hardly seems likely to promote the maximization of social welfare in a world where income and wealth disparities are so great.

According to James Boyle, there is another problem. Liberal political theory maintains that free access to and transmission of information is the lifeblood of the public sphere. Yet in the private sphere of commerce, property rights must be attached to the products of intellectual endeavour in order to provide incentives to create, according to the liberal

view (1996:57). How can property rights in intellectual products be given while still maintaining the inventiveness and free flow of information that liberal political theory demands? (53). How can contradictions be overcome?

1.2 The Romantic Author Paradigm

Boyle maintains that the discourse of authorship[11] seemed to solve the problems inherent in commodifying intellectual products by proposing a limited monopoly, premised on a transformative originality attributed to the individual author/creator/inventor (1996:98). It provides a conceptual basis in the idea/expression division that allows the author to retain *some* property rights in the work, those that relate to original contribution (56). The *manifestation* of the particular genius is given protection from unauthorized reproduction, while the *ideas* are returned to the public realm through disclosure. Return of intellectual property to the public domain is in fact one of its defining features according to Boyle (2003:40). The idea/expression divide provides a moral and philosophical justification for granting a limited monopoly for an invention or creation that inevitably draws on the resources of the public domain of knowledge, yet also incorporates an element of individual inspiration and genius. Underlying this justification there is a utilitarian rationale that speaks to the needs of capitalist economies, just as there is for material property. According to this rationale intellectual property rights are a matter of convention, an agreed upon set of public rules which provide security and incentives for investment for individual owners by way of a limited monopoly, while at the same time providing for the interests of the public through disclosure. The widest social utility is thus anticipated. The underlying imperative of intellectual property law is to mediate the tensions inherent in the contradictory public policy goals of providing an incentive for intellectual endeavors that would enrich society as a whole (new novels, software programs, drugs, for instance) and facilitate the diffusion of knowledge throughout society to provide the basis for further innovation and creativity (Boyle 1996: 53-58). The prospect of a limited monopoly ensures that creators and inventors are provided with sufficient incentive to create. Finally, the idea/expression division limits the scope of a labour theory of property, wherein property is gained by mixing one's labour with an object, to an "attractively circumscribed domain" where

[11] Boyle (1996) explains that the organizing concept of romantic authorship can be applied to patent law as well since in both copyright and patent law, it is the manifestation of genius that receives the reward while the "remainder" is designated to the public realm. See note 13, ch. 1

originality is the determining factor for a limited property right (1996:57). However, the authorial function that Boyle describes "couples romantic appeal with an *apparent* efficacy" (xii, my italics). As he points out, and which will become evident in this work, the tendency of a system based on the romantic transformative author is to privilege owners at the expense of sources, audiences and future creators to the extent that it is frequently "colossally unfair" (142).

The set of entitlements created by the doctrine of intellectual property law began their steady and dramatic rise in the seventeenth century when popular and elite culture began to place a high value on the individual author (Fisher n.p.). Prior to that, originality was not considered as important as skill, tradition and connection with the past, at least in the literary and publishing fields. Some writers, like the well-known Alexander Pope, persisted in the view of the writer as "primarily craftsman whose task it is to utilize the tools of his trade for culturally determined ends" (Woodsmansee 427). However, a general repudiation of these ideals in favor of a celebration of artistic genius was precipitated by Enlightenment notions of progress associated with individual capitalist endeavor (Fisher n.p. Part B). In particular, the Lockean notion that a person deserves to own something he or she has produced through their own labour and the Hegelian notion of property as an expression of personality wherein the individual's recognition as author is seen to be intimately tied to the creative act featured largely in public debates about the legitimacy of monopoly rights in products of the intellect.[12]

The concept of the "romantic author" in its modern sense was grounded in the notion of the individual's moral right to benefit from his or her creative endeavors. As Woodsmansee writes, it was born in the 1700's when a group of German writers,[13] seeking to establish the economic viability of writing for an increasingly literate public, set about redefining the nature of writing in an effort to establish legally recognized safeguards for their labours (425). They minimized the element of craftsmanship in favour of the element of inspiration emanating from the individual. At the root of their efforts was the perceived injustice inherent in a system in which authors were obliged to forfeit any rights to profits their work might bring to their publishers in exchange for a minimal flat fee, while the publishers became the owners and would realize as much

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[12] Fisher, 1999. Needless to say, this did not apply to wage labourers and the non-propertied. (n.p. Part B).

[13] The link between the romantic author and intellectual property can also be found in France, England and the United States (Boyle, 1996:229, note 7)

profit as possible. These writers' ideas had a profound impact, especially in Germany, where theorists like Goethe and Kant "shifted them from the periphery to the very center of the theory of the arts" (426). Writers began to assert their professional identity in economic terms, raising the issue of fair compensation for their work. Bettig notes the importance of the printing press in the evolution of authorial rights (15-19). An increasingly literate public created demand for printed works, and publishers began to pay for original works to keep their presses running. Writing became accepted as an individual pursuit carried out for both pecuniary reward and personal recognition. Bettig notes that as literary and artistic works were increasingly commodified, "possessive individualism began to characterize the attitude of writers to their work" (19). The earlier conception of writing as a vehicle of received ideas already in the public domain and therefore reproducible at will was superseded by notions of an activity in which unique products of intellectual labour were produced by the inspired individual competing for the "democratic patronage of the marketplace" (Woodsmansee 432). The problem of a concept of property that would allow for an author's interest in something built from resources in the public domain was solved by the German idealist Fichte who, in recognizing that the uniqueness of personality finds expression in an originality of form, conceived of the idea/expression divide in books (Boyle, 1996:55).

This paper is concerned with patents, a form of IP that applies to knowledge associated with industrial applications. I have included the preceding discussion on authorship in its traditional literary sense because, as Boyle points out, the romantic author figure, the theme of originality and the conceptual distinction between idea and expression are equally important to the shape of patent law as we know it today (1996: 206, note 13, ch 1). The analogous image in the realm of patents is the creative inventor, which, according to Fisher, was grounded in the "Renaissance exaltation of the ordinary human subject as inventive genius" and the Enlightenment elevation of scientific geniuses such as Newton and Descartes (n.p. Part B). As Machlup and Penrose point out, the principle of "first and true inventor" was first laid out in England's Statute of Monopolies in 1623

(2).[14] The Statute was designed to stimulate technical progress at a national level and regulate the privileges accorded to patent owners, and it consciously linked patents to economic policies and invention (Granstrand 33-34). While patents appear to have a much more utilitarian focus than copyright, the tensions between public and private interests are no less evident, and the language of authorship figures prominently in debates. In fact, concerns and controversies over the economic effects of patent monopolies have been a prominent feature of the historical record since the Statute of Monopolies was enacted.

1.3 Patent Protectionism – Controversy and Cartels

According to Machlup and Penrose, patents are "merely one species in the large genus of privileges, charters, franchises, licences and regulations issued by the Crown or by local governments in a mercantilist system" (2). The practice of granting monopoly privileges to inventors was widely followed in fifteenth and sixteenth century England, where they were used as inducements to bring foreign artisans and new inventions into the realm. Privileges of monopoly were also issued by the English Crown to raise funds through patent fees or to secure control over industries of political importance (Palmer, 1989:264). Exclusive rights to the production of certain classes of goods characterized many European states prior to the seventeenth century, and Palmer maintains that there was frequently little concern for the originality of the invention (1989:265). While the notion of a beneficent monarch fostering the growth of industry through the issuing of patents might have a certain appeal in principle, the actual English experience was of monopoly markets in many staple goods such as wine, soap, iron, coal and clothing (Drahos & Braithwaite 34). Patents were issued for rights to practice a particular trade, to supervise commercial enterprises like inns and alehouses and to avoid certain restrictions on imports and exports. Prices were high and availability was limited. Ownership became more concentrated as patents were traded, and eventually, "almost all commodities were in the hands of a favored few" who did not hesitate to oversee and enforce them (34-35), a tendency that has not diminished since. But the monopolies so

[14] This does not mean that protecting an inventor's right in his invention in order to stimulate further inventive activity to benefit society had not been previously recognized. The 1474 patent code of Venice permitted 20-year monopolies for inventors and makes specific reference to preserving the "inventor's honour." See Granstrand p. 32. The Statute of Monopolies was the first expression of a patent system in statute form, however. See Granstrand and Machlup and Penrose for further discussion of the early patent system. Text of the Statute of Monopolies can be found at http://ipmall.info/hosted_resources/lipa/patents/English_Statute1623.pdf

liberally granted by the English Crown impeded trade to such an extent that subsequent parliaments were forced to eliminate or curtail them (36). The system of royal prerogative was eventually supplanted by the Statute of Monopolies in 1623, which set out the underlying rationale and specific form of a patent system. It marked an explicit shift in granting authority from the sovereign ruler to a government bureaucracy (Granstrand 34) and limited patent protection to inventions (Krimsky 2003: 58).

Patent law in the US is rooted in the English system. In 1787 it was written into the US Constitution that Congress had the 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" (from Granstrand 34). By 1790 the United States Congress had adopted patent legislation which differed significantly from those of other countries in that it included a "deliberate and conscious process of promoting open access to the benefits of private property rights in inventions" (Khan, n.p.). All patents were subject to examination to determine their conformity to the laws, including the requirement for novelty and a physical model of the patented invention (Khan, n.p.). Lessig (1999) notes that protecting the public domain was in fact the overriding concern of Thomas Jefferson, who played a key role in the development of the US patent system. In a letter to McPherson in 1813, Jefferson noted that "ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man...," an explicit recognition of the importance of the public domain of knowledge for both economic and social progress (Jefferson quoted in Lessig 2). In 1836, the US Congress passed a statute that set in place the essential structure of the current patent system, including a Patent Office to oversee the patent examination process (Khan n.p.). In order to qualify for the grant of patent and ensure that the grant of monopoly is merited, the idea must be novel (original) in that it cannot already be in the public domain or the subject of a previous patent; it must be non-obvious (involve an inventive step) in that it is not common sense to someone skilled in the particular field; and it must have utility (industrial application), that is, a stated function which has a practical use. In addition, the information behind the innovation must be published. A rigorous and impartial examination according to these criteria should maintain the balance between public and private interests for products of intellectual endeavour. A further constraint is the temporary nature of the monopoly. Generally speaking, only the original creator or first source has the right to commercialize or transfer the rights to his/her invention,

which is where the requirement for novelty arises.[15] As Shulman notes, this requirement rooted the patent system to reality – the standard was that there must be a material result - either a machine or the embodiment of a particular process (6). In fact, it is especially important to point out that a patent right confers the right to exclude others from copying, selling or otherwise profiting from the invention during the term of the patent – it is not the information describing it that is the "property." Once the monopoly lapses, extinguishing the legal rights, the inventions can be freely used by others for commercial gain. However, as will be discussed later in Chapter two, the constitutional directive to protect the public domain has not been able to withstand the play of political forces and the interests of monopoly capital in extending its reach into the knowledge frontier.

Despite the fact that an inventor's moral right to be rewarded for his work was widely recognized, and by the 18th century statutory patent systems were in place in England, the US and France, patents were controversial and not universally supported. Machlup and Penrose point out that historically "the chief opponents of the system have been among the chief proponents of free enterprise" (1). Patents were viewed by free trade advocates as protectionist and an unmerited grant of monopoly. As Palmer reminds us, patent protectionism's historical roots lie in royal privilege, monopoly and censorship (1989:264), and the negative effects of previous Crown monopolies on trade were not easily forgotten. In fact, the one aspect of the American Constitution that Thomas Jefferson had grave misgivings about was the part that gave Congress the power to create monopolies in the copyright and patent clauses (Lessig 4). His fear was not so much the negative effects of monopoly on free trade, but that monopoly would constrain the free flow of ideas, which he viewed as essential to the creative process and therefore the productivity of society (Lessig 4).

The economic benefits of patent protection versus the danger of monopoly gave rise to extensive debate, but it was not until the 19th century, primarily in England and Germany, that the controversy precipitated swings between pro-patent and anti-patent policy. Prior

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[15] The US employs the "first-to-invent" system in which the inventor gets the patent even if he/she filed a patent application later than another party. However, it is often difficult to establish earlier invention, so the first to file is frequently deemed to be first to invent. Most countries use a "first-to-file" principle in which the first to file an application is entitled to the patent even if someone else invented first but filed later. The reason for this is to encourage prompt public disclosure. The US is moving in this direction. For the purposes of this discussion, novelty is established in the first instance, whether first to file or first to invent. See *Crash Course on Patents: who can get a patent* at www.iusmentis.com/patents

to that, as Machlup and Penrose note, economists and writers such as Bentham, J.S. Mill and Adam Smith were more often in favour than critical of the patent system. They accepted the philosophy, expressed in the Statute of Monopolies, that "the temporary monopolies in the exploitation of inventions should be exempt from the general proscription of monopoly because of their special character and function" of promoting inventive activity and rewarding risk and expense (Machlup and Penrose 7). In the mid 1800's patent advocates began to actively agitate for patent reform, seeking laws more favorable to inventors.[16] In a period when the opposition to privilege and monopoly and support for international free trade was high, pro-patent advocates realized they had to separate patent protection as much as possible from these issues. They drew on arguments that, as Machlup and Penrose noted in 1950, were still being used to justify the patent system whenever it was debated. The case for patent protection was presented as "one of natural law and private property, of man's right to live by his work and society's duty to secure him his fair share, and of society's interest in achieving swift industrial progress at the smallest possible cost" (9). The appeal to the issue as one of man's natural, unconstrained right to property in his ideas, after being debated for a period of nearly seventy years, did not survive in legislative form (17). However, "those who started using property in connection with inventions had a very definite purpose in mind: they wanted to substitute a word with a respectable connotation, 'property,' for a word that had an unpleasant ring, 'privilege'" (Machlup and Penrose 16). The association of industrial progress with private property, the bedrock of capitalism and liberal individualism, provided a "powerful form of legitimation for these privileges" (Palmer, 1989:266). Pro-patenting groups from emerging industries and strong patent nations such as the US gradually gained influence, and as the worldwide depression of the 1870s took hold, protectionism prevailed.

The general expansion of international commerce and trade during this period stimulated the demand for governments to recognize and protect the rights of foreign inventors (Sell 11; Granstrand 35). The US eventually began to press for strong international IP cooperation in response to pressure from domestic firms. The Edison Company, for instance, was beginning to achieve significant technological breakthroughs and wanted to retain its competitive advantage in foreign markets (Sell 11). As a consequence of the

[16] Machlup and Penrose, in their article "The Patent Controversy of the Nineteenth century" give a detailed account of the debate between pro-patent and anti-patent advocates at the time.

need for international cooperation in patent matters, the 1883 Paris Convention covering patents, industrial designs and trademarks was adopted.[17] There were three underlying principles: non-discrimination, which provides that there should be no barriers to entry for foreign inventors into member states' domestic markets; national treatment, so that once in a member states' market, inventors are treated no differently than nationals; and right of priority, which affords the rights holder with protection from unauthorized use of their creation/innovation. The Paris Convention "reflected a consensus among member states that was legitimated by domestic laws already in place" (Sell 11) and did not impose new laws on member states. Implicit in the convention was the recognition that countries varied in their level of development and that the scope and duration of protection afforded could reflect individual states' levels of economic development and comparative advantage with respect to innovation or imitation (Sell 11-12). Less developed countries would have the freedom to confer less protection for a shorter duration of time to encourage adoption of new technologies and stimulate economic activity. Intellectual property protection was still strictly a national matter, and the laws providing protection did not extend beyond national borders (Sell 11; Granstrand 35).

In fact the historical record shows that patent use was often driven by a "ruthless trade morality" that saw the rights of foreign patent holders ignored (Drahos & Braithwaite 35). Many states, including the US, used patents as a very effective protectionist measure to keep foreign companies from competing with domestic companies by restricting the movement of goods across their borders. For most of the 19th century, for instance, the US was a net technology importer, and its enforcement of foreign intellectual property was deliberately lax to encourage its own economic development. Patents were routinely granted to those who imported innovations that had been invented abroad by others, and patents on certain categories were not allowed at all (Sell 64).

But the liberal attitude toward the use of patents as an economic incentive in the domestic realm would prove to be controversial in the US, just as it was in England. Following the signing of the Paris Convention and into the early part of the 20th century, the economic power of patents reached its zenith, and the stifling power of monopolies

[17] The full text of the Paris Convention can be found at http://www.wipo.int/treaties/en/ip/paris/

cartels and trusts became a major concern for legislators in the US.[18] As a consequence, the Sherman Anti-trust Act was introduced in 1890, ushering in an era of anti-trust sentiment, which was to last seventy-five years. The Supreme Court was guided in principle by the overriding public policy objective of promoting free competition. Patent rights were once again equated with monopolies, their scope and validity was challenged, and anti-trust enforcement was vigorous (Sell 65-66). Nevertheless, as Drahos & Braithwaite point out, a significant nucleus of corporations representing the key industries in the US (among them DuPont, IBM, General Electric and AT&T) recognized that scientific research laboratories should be an essential arm of their corporate structure, and patents would protect the knowledge they developed (40). The move to the use of patents by US corporations at the beginning of the twentieth century had two effects. The number of patents granted jumped almost ten-fold to over 1 million, and the nature of patent ownership changed. In the nineteenth century the majority of patents were individually held, but by 1930 most were in corporate hands (41). Powerful companies with large patent portfolios had also realized that patents could be very useful in disguising and enforcing cartels because they provided the possibility of constructing much denser thickets of patents and rules that would allow companies to fix prices, control production and divide territories amongst themselves without detection by competition lawyers (51).[19] Companies like DuPont also imposed tough policies restricting the publication of scientific papers by their own scientists and had their patent teams carefully scrutinize the publishing and patenting activity of other companies for weaknesses that could be used in negotiating cross-licensing agreements or overturning patents. Another strategy was to keep back some of the core knowledge related to the

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[18] Cartels occur when individual producers agree to fix the price or limit production of commodities, and in the US during the nineteenth century, cartels were an "omnipresent" part of business life, affecting practically every essential commodity from lumber to footwear (Drahos and Braithwaite 49). Common law restraint-of-trade doctrine prevented cartel members from enforcing their cartels when a member did not abide by the agreement, so cartel members turned to the use of trusts to deal with their enforcement problems. Trusts have a trustee and a structure that allows independent business entities to be centrally managed. But it also allows for central control of prices and production, and the gigantic trusts that emerged (Standard Oil Trust was one notable example) and the power they had to determine economic and social life created a great deal of public outrage. See Drahos & Braithwaite, 49-50

[19] Drahos & Braithwaite provide an in-depth analysis of the strategy and tactics of corporations involved in this "knowledge game" See page 52-57.

invention, drafting the language so as to mask the working of the invention (47).[20] In 1927 E.J. Prindle, one of the influential figures in the development of the corporatized US patent system, noted the power of the patent monopoly to "form trade agreements throughout practically entire industries" and to establish "effective agreements as to prices maintained" (quoted from Drahos and Braithwaite, 44). In Germany, the same conclusion was reached by the writer Hermann Isay in 1923, who observed that "no other industries have at their disposal for cartellizing purposes as effective a device as the manufacturing industries have" in the patent (quoted from Drahos and Braithwaite 44). In fact, the use of intellectual property to structure cartels spread between the two World Wars to such an extent that cartels became "the outstanding characteristic of business" (53).

From this brief history, it is clear that big business was not interested in adhering to the "patent bargain," which provided for a limited period of monopoly in return for disclosure to the public domain; their aim was to commodify as much knowledge as possible and keep it property for as long as possible in order to retain the power to discipline markets. But following World War 2, several factors began to impact the profits enjoyed by those industries which had most benefited from cartels, foremost amongst them the chemical industry. R&D costs were rising and there were fewer commercial products to bring to market. The great profits that DuPont had enjoyed were attracting competitors, such as Dow, Monsanto, and Union Carbide. And there was a greatly increased focus on antitrust actions by the Antitrust Division of the Justice Department, as Sell has also noted, all of which meant that the chemical industry found itself operating in a commodity market (65-67). Commodity markets, where there are few restrictions to entry and the only benefits are to consumers and society because of competitive pricing, removed the prospect for "supra-normal" profits that monopoly capital seeks and were viewed as something to avoid.[21] The pharmaceutical industry was experiencing similar problems

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[20] US industry learned first-hand of the power of German chemical patents as an instrument of business domination when they discovered, after seizing German patents held in the US following the first World War, that the patents were worthless because they could not arrive at the promised result – key knowledge had been withheld. The German chemical industry survived and prospered following the war, and the US subsequently "put its energies into perfecting this instrument." See Drahos & Braithwaite, 55-57.

[21] A commodity market is one in which there is no monopoly position, and therefore no premium can be attached to the price of the good. Once a market becomes a commodity market, knowledge based companies tend to turn their attention elsewhere. Du Pont abandoned the production of polypropolene when the market became too competitive, and IBM vowed to get out of the PC market if it lost its monopoly position. See Drahos & Braithwaite, page 52

with R&D costs and competition from generic markets. Developing countries were learning how to play the patent game. India for instance, was developing its own technological capabilities and had nurtured a thriving pharmaceuticals industry producing cheaper generic drugs (Drahos and Braithwaite 67). Their strategy was to develop a domestic patent system that would only permit patents on pharmaceutical processes, not products, and then only for five to seven years. India and other developing countries also used compulsory licensing[22] to bring down the price of essential imported drugs. The loss of profits and market share hurt US companies like Pfizer, and they began to complain that their intellectual property was not being respected in those countries, even though Western countries had used the same protectionist tactics in the not-so-distant past (67).[23] The position that the patent monopoly needed to be stronger and longer and global to function as an "investment guarantee" rather than an *opportunity* to make profits (43) was becoming more prevalent among patent advocates.

Corporate owners were pushing for other changes to patent law. In order to get a patent, the requirement for inventiveness had to be satisfied, yet according to Drahos & Braithwaite, it was becoming increasingly obvious that for the chemical industry and similar industries, much of the work was "time-consuming and tedious, requiring great resources rather than inventiveness" (43). In the early part of the twentieth century, there had been a concerted campaign by patent lawyers and lobbyists on behalf of the chemical industry to have the principle of isolation/purification accepted by the USPTO. This would mean that naturally occurring substances like the ones found in soil that killed harmful bacteria could be patented if they were isolated and purified, since technically, they no longer existed in nature.[24] By mid-century, the lobbying had its

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[22] A country can issue a license for the production of a patented good to someone other than the patent-holder under special circumstances, for instance during national emergencies, or to correct anti-competitive practices.

[23] The UK, for instance, changed its patent law in 1919 to prevent patents on chemical compounds, although chemical processes remained patentable. This allowed a "free-riding" strategy for the UK industry, which could concentrate on better processes to duplicate superior German dyestuffs. This same strategy was pursued by the Indian pharmaceutical industry and produced cries of piracy. See Drahos and Braithwaite 152.

[24] The antibiotics example is instructive. Penicillin had not been patented, and as a consequence its price fell from US $3955/lb in 1945 to $282/lb in 1950 during the era of wonder drugs following World War 2. But after the USPTO, following the principle of isolation/purification, agreed to patents on broad-spectrum antibiotics, it issued too many patents and pharmaceutical companies still found themselves in a competitive market facing a future of constant patent litigation. So they formed a producers' cartel by swapping patents, and kept the prices of antibiotics like tetracycline constant between 1951 and 1961. See Drahos and Braithwaite 153.

desired effect, and the principle of isolation/purification became widely accepted in the case of chemical patents. Nevertheless, by the early 1970s the number of new chemical entities had fallen significantly as nature imposed the "law of diminishing gains" (154). Many of the key players in the chemical, pharmaceutical and agricultural sectors took a strategic decision to enter the life-sciences business in the 1970s and focus on the emerging biotechnology sector as a means to achieve the kind of market dominance and profits they had experienced earlier in the century. They believed that the breakthroughs in molecular biology offered the possibility of global markets in new products in agriculture, medicines, and chemicals, but in order to exploit this new knowledge frontier, the patent system would need to be changed so that the valuable parts of DNA code could be turned into a proprietary standard. The isolation/purification principle would prove to be invaluable in this campaign.

One of the key goals for a nascent biotechnology industry in the United States and the transnational agro-chemical corporations that assumed control of a large proportion of the industry was to ensure a continuing supply of plant germplasm as the basic "raw material" for agricultural and pharmaceutical research and development and to protect the innovations (and profits) derived from it with a global patent regime. As we will see in the next chapter, the discourse of the paradigmatic author and the rhetoric of piracy figure largely in the campaign to re-engineer patent law to accommodate these goals despite a history of monopoly and cartels, the long-recognized principle of national jurisdiction, and despite a lack of theoretical and empirical evidence to show that stronger intellectual property rights would result in greater rates of innovation and welfare gains for poorer countries. Key players in global knowledge-intensive industries promoted with an "almost messianic intensity" the notion that a system of property rights based on ideas and information is fundamental to economic progress and needed to be globalized and enforced (Drahos and Braithwaite 25). Within a short period of time in the latter half of the 20th century, the US adopted a very author-centred approach to intellectual property rights and led the campaign to implement a more aggressively protectionist trade-based global regime of IPRs that privileges the rights-owner and threatens other nations with sanctions for non-compliance (Sell 13). Monopoly rights, which had once been recognized as an impediment to free trade and were vigorously opposed, were slipped into a world trade agreement that had as its principal goal the promotion of free trade and competition (Drahos and Braithwaite 37).

CHAPTER 2:
RE-ENGINEERING PATENT LAW

2.1 The Seeds of Change

I have so far argued that the traditional justificatory arguments for private property rights apply very weakly, if at all to intellectual property. The romantic author paradigm ostensibly provides a way to mediate the underlying tensions and contradictions in philosophical arguments for intellectual property by proposing a kind of trade-off between the conflicting public policy goals of stimulating innovation and preserving a vibrant public domain. "Balance" is the watchword applied to this trade-off, but it has proven notoriously hard to achieve. The historical record shows that the author paradigm has been exploited as a rhetorical tool to privilege monopoly rights for corporate owners over compelling social interests, a trend that has only accelerated in recent decades as technological advances allow for commodification of formerly public goods. Transnational corporations, particularly in the pharmaceutical, chemical and agricultural sectors are the overwhelming owners of patents, not individual innovators. Corporate owners of large patent portfolios are not disposed to recognize the disclosure requirement of the patent bargain nor to concern themselves with the social costs their monopolies and cartels impose. As May states, their private interests in market dominance and profit maximization don't accord with the social interest in disclosure of scientific knowledge (111). Boyle agrees, cautioning that an author-centred regime has a tendency to favour the protection of private property rights over the public interest. This is particularly so within the context of a "renewed" neo-liberalism in the late 20th century.[25]

Agriculture is one of the areas where we should be particularly concerned about the extent of intellectual property's reach into the public domain because of the fundamental importance of plant genetic resources for food and agriculture to human welfare. While

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[25] Richards differentiates between the 19th century understanding of neoliberal as competition among atomistic firms and the contemporary understanding in terms of removal of obstacles to the free circulation of capital. See page 129.

the concept of a public domain of unimproved plant genetic resources is not universally accepted, nor is the western, mainstream version of individualized intellectual property, these notions have been imposed on every signatory nation through the TRIPS Agreement of the WTO. It is interesting to note that most countries have at one time or another during the twentieth century attempted to make agriculture an exception to the rules of free trade because, it was argued, leaving a country's food supply open to the uncertainties of international markets was too risky. Richards argues that although this argument has a great deal of populist appeal, the reason for the exceptionalism in developed countries can be attributed to the fact that large agribusiness exercised a disproportionate amount of power, which they used to secure protection and support (169). But the exceptionalism of agricultural products, not only to free trade but to patentability (and the restrictive requirements of standard patent law), would come under increasing pressure as seed producers and biotechnology firms sought to protect their transgenic "innovations" with intellectual property rights that would have global reach. The story of agriculture during the twentieth century is, like other knowledge-intensive sectors, one of increasing privatization facilitated by the adoption of a "technological path that privileges the accumulation of capital" (Richards 192). As May notes, intellectual property is not a particularly new institution, but the technologies that have allowed knowledge to take on international commodity status are (81). Agriculture has been subsumed into a new global regime of capital accumulation governed by the TRIPS Agreement. This agreement is one of a number of supranational institutions that have emerged to facilitate the internationalization of capital (Richards 113).[26]

For centuries plant materials have been transferred from centres of biodiversity in the south to biodiversity-poor countries of the north, and it was not generally a contentious activity.[27] Plant materials were generally treated either as free, open-access public resources or as the property of colonial governments (Zerner and Kennedy 97). These diverse biological resources have made immense contributions to crop development worldwide. By 1900, North America and Europe had appropriated sufficient germplasm to allow them to become "breadbaskets of the globe" despite their relative genetic

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[26] Another is the agreement on trade-related investment measures, or TRIMS.

[27] There are notable exceptions. For example, seeds from rubber trees, native to the Amazon region in Brazil, were smuggled out of the country during the 1800's. Within decades rubber plantations in the British colonies in Malaysia had completely decimated the rubber-tree based Amazonian economy. See http://www.amazonlink.org/biopiracy/biopiracy_history.htm for other examples.

poverty (Kloppenburg and Kleinman, 1988:6). At the time it was a central mandate of the US Department of Agriculture to freely distribute new seeds and plants to the nation's farmers. Public sector crop development was also a mainstay of Canadian agriculture, particularly in cereals, pulses and grains. Farmers have traditionally saved a portion of their crops, whether to sell, trade, or set aside for replanting since the beginning of agriculture. It is a practice that is at the heart of farming worldwide. Farmers' rights to save, sell, trade and replant reflect the reality that farmers play a significant role in the development of new varieties and in maintaining the genetic diversity of the crops they grow. This practice also encourages trade in less popular varieties, which provides added protection for a nation's crops against diseases such as rusts and viral and fungal infections that occasionally devastate commonly utilized varieties.

Associated with farmers' rights is a long-held social convention that the seller of seeds or plants cannot control how growers use those goods – they have no control over future harvests and cannot prevent farmers from planting seeds from crops they harvest (Shulman 85). In an environment where publicly funded breeding programs were the mainstay of agriculture in the North[28] throughout most of the twentieth century, these conventions were acceptable practice and both depended on and contributed to a vibrant public domain of crop germplasm. New varieties constantly under development in public research centers helped to ensure the continuing viability and stability of crops. However, the genetic makeup of crops was narrowed as agriculture took on an increasingly industrial mode of production utilizing elite varieties planted in monocultures. The popularization of elite varieties and the elimination of older varieties occurred, not through competition, but through increasing concentration of ownership of seed companies and control over the varieties that were for sale. Increased genetic uniformity in turn increased the vulnerability of agricultural crops to pests and diseases, which are also constantly adapting and evolving. Because new genes must be continually incorporated into elite cultivars in order to maintain productivity, germplasm collection efforts on the part of the North continued to be a necessity throughout the 20th century. Genetically diverse landraces[29] originating in the biodiversity-rich South are vital

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[28] I use this term to refer to developed countries that are generally advanced industrial democracies, and generally located in the Northern Hemisphere (Europe, North America, Japan, with the exception of Australia and New Zealand). By contrast, countries of the South are developing countries in terms of technical capacity, economic development, and political institutions.

[29] A landrace is an early cultivated variety evolved from a wild ancestor

contributors to the germplasm collections that have been established since World War II to supplement and maintain increasingly vulnerable crops (Kloppenburg and Kleinman 6). Representative collections were established in a global network of international agricultural research centers (IARCs) affiliated with the CGIAR (Consultative Group on International Agricultural Research).[30] A universal right of access ensured that institutions and governments could access collections to benefit their plant breeding programs (Frankel 29). This uncompensated extraction had been predicated on the notion of germplasm as the "common heritage of mankind" (Kloppenburg and Kleinman 173) and thus a part of the global public domain. In other words, there were no proprietary rights attached, and local people were typically eager to share knowledge of their most important crops. The IARC collections were intended to provide a conservation base to counter a growing problem of genetic erosion around the world.[31]

At the same time, however, seed companies were interested in establishing private collections to provide a source of raw material for their own breeding programs, and they sought proprietary rights for the varieties they developed. The extension of patents to plants began in 1930 when the US Congress passed the Plant Patents Act. This act extended the definition of patentable material to varieties of asexually reproduced plants propagated by grafting, budding and cuttings, but specifically excluded plants found in an uncultivated state (35 U.S.C. 161). Supporting documentation from that decision revealed that the US Congress made no distinction between a chemist producing new compositions of matter and a plant breeder producing a new varietal through grafting (Krimsky 64). However, despite lobbying by the American Seed Traders Association, patents were restricted to asexually reproducing plants because, according to Drahos and Braithwaite, the US Congress was not prepared to open the door to monopolies in seed markets at the time (159). Richards maintains that sexually reproducing plants were explicitly excluded because they "tend to genetic instability and drift," which would present problems of patent enforcement (176). Neither consideration would deter the extension of patents to this category of plants in 1985. In any case, the large commodity market grain crops such as wheat and corn were initially kept out of the reach of patents (Drahos and Braithwaite 159). The 1930 Plant Patents Act was different from standard

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[30] Established in 1971 by the Ford and Rockefeller Foundations, the CGIAR was comprised of both public and private interests. See Richards 187 – 190.

[31] By the late 1990s, there would be increasing pressure, particularly from the US, to change the role of the IARCs. This will be discussed in Chapter three.

patent law in an important way - novel varieties did not have to pass a utility test as would be required of an industrial invention. Furthermore, the description requirement, a basic requirement of the grant of patent, was relaxed because plants do not follow the dictates of patent descriptions when they reproduce (they may not always be an exact replication). The new plant had to demonstrate novelty only in a particular characteristic and did not have to be superior to an existing variety. This lower requirement would set an important precedent for future consideration of patents on plants (Richards 176).

In the decades following passage of the Plant Patent Act, seed companies intensified their R&D efforts with a view to developing high-yield hybrid varieties of corn.[32] Hybridization could solve two immediate problems for seed producers: it would break down the biological barrier seeds presented to "capital penetration" and it would eliminate the farmers' ability to save seed for subsequent plantings. Subsequent generations of hybrid seed suffer a dramatic reduction in fertility because they do not breed true and differ from the first generation (Kloppenberg 134). Farmers are forced to return to seed sellers to buy hybrids. Hybrids are thus fully commoditized, and in the process the farmer loses control over an important part of the social production process (Richards 176). Nevertheless, adoption of hybrid corn by farmers was dramatic; from 1933 to 1945, the percentage of hybrids in total planted corn acreage in the US jumped from one half of one percent to ninety percent (Seabrook 66). One notable consequence of this major shift in agricultural production was that farmers no longer had an incentive to save seed. In addition, during the 1950s seed companies successfully supplanted public agencies as the principal developers and marketers of commercial varieties, thereby removing them as a source of competition. This was especially important inasmuch as their practice was to distribute seed to farmers for free (176). The function of these public agencies as guardians of the public interest in crop germplasm was gradually being eroded.

As private seed markets grew and matured in the North, seed companies sought global markets and international recognition of Plant Breeders Rights (PBRs) for the varieties they developed. By 1970, both Europe and the United States had negotiated plant variety protection. The International Union for the Protection of new Plant Varieties

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[32] It should be noted that many traditional non-hybrid varieties have yields equivalent to the "high-yield" hybrids. Some achieve this without massive applications of chemicals and water, which hybrids require.

(UPOV) came into force in Europe in 1968, and two years later, the US established a similar Plant Variety Protection Act which extended protection to sexually reproducing plants (except hybrids). The criteria for protection under the UPOV were that the new variety "exhibits a novel characteristic that *differentiates* the variety from existing varieties and that the novel characteristic is uniform and commercially acceptable" (Richards 177, my italics). Once again it is commercial considerations, not improvement that is the determining factor for protection. Plant breeders got rights over commercial propagation for varieties they developed, but there were two important exceptions to these exclusionary privileges. A research exemption allowed plant scientists to reproduce the protected variety for research purposes, and the "farmers' privilege" allowed farmers to save seed for future use, including planting and resale. While these exemptions would appear to significantly circumscribe the monopoly potential provided to commercial seed producers by UPOV 1970, seed technology involving hybridization continued to evolve, ensuring the further commodification of agriculture and its domination by transnational capital (178).

In fact, American-developed hybrid seeds, particularly rice, wheat and corn, were sent around the world during what was known as the "Green Revolution." While this "vast agronomic program" resulted in dramatically increased harvests, feeding almost a billion people who might otherwise have starved (Seabrook 66), it also bankrupted many farmers and increased the numbers of people needing to be fed. The germplasm used in the development of these high-yield varieties originated in the IARC research centers in those same poor nations that would be the purchasers of these new varieties (Richards 185). Hybrids provided a kind of biological patent that ensured that purchased seed displaced traditional farming practices of saving and selling seed. Just as the American farmers had before them, many farmers from Mexico and Asia lost the incentive for saving seed (67). It wasn't just seeds that were exported; these new hybrids introduced American style "agrarian capitalism" where crops were grown for export, often in huge industrial monocultures. Furthermore, they required costly inputs – fertilizers, water, pesticides and herbicides – in order to achieve the high yields (Seabrook 67, Richards 184). Many farmers did not possess the knowledge or the resources to be successful in the industrial farming business, and when prices for their crops declined as a result of increased production, they were often driven off their farms. Those independent farmers who were able to afford the hybrid seed along with the associated package of chemical

and machine-intensive inputs were transformed into dependent subcontractors whose production was "radically narrowed and specialized" for export markets. Dependency, vulnerability and even greater disparities in income and wealth were often the consequence (Richards 184-187). But another consequence was an awakening realization by some observers that these high-yield hybrids, planted in monocultures, contained a "narrower spectrum of genes" and were displacing genetically diverse traditional landraces (Seabrook 67). The raw material that made plant breeders' work possible was being eliminated.[33]

With the introduction of Plant Breeders' Rights, seeds and small seed companies became hot commodities, and bigger players began to buy up chunks of the seed industry in Europe and the US. A wave of mergers and acquisitions began which saw virtually every independent seed company of any consequence in Europe and North America bought out or taken over by the mid 1980s by the "world's industrial elite," most of whom were transnational petrochemical and pharmaceutical companies with substantial agrochemical interests, such as Monsanto, Shell, Pfizer, Upjohn, and Ciba-Geigy (Kloppenburg and Kleinman 9). During the 1970s these influential companies began to pursue the global extension of a uniform legal framework to facilitate the creation of a world market for seed through the World Intellectual Property Organization (WIPO), the United Nations organization set up to administer the Paris Convention and promote international cooperation on intellectual property rights.

Consolidation of the seed industry and the pursuit of a global regime governing the trade in seed were prompted by another significant development. It was also in the 1970's that the commercial potential of genetic engineering, or recombinant DNA techniques, began to be touted around the world as the technology of the future and even the source of a new industrial revolution. Advances in genetic marking and transfer technologies enable new and sometimes dramatic changes in life forms in relatively short periods of time (Swanson 3). One of the primary technical advantages they impart is that desirable characteristics from one organism can be isolated and directly introduced into another unrelated organism, resulting in a third that is the first of its species to display the desired trait (Richards 186). The range of potential genetically modified organisms from

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[33] Seabrook notes that the trend to monocultures and high-yield varieties has produced a significant degree of genetic vulnerability in the major crops in the US. In 1972, for instance, 70% of the US corn crop consisted of just six varieties. See page 67 for more examples.

recombinant techniques is significantly greater than conventional breeding methods, and a GMO takes less time to develop. But the greater implication from the point of view of capital was the potential to develop a wide range of new agricultural commodities protected by patent rights.

Stanley Cohen and Herbert Boyer's groundbreaking discovery in 1973 of a DNA manipulation (or cut-and-paste) technique allowed genes to be inserted into different biological species than those from which they were taken. Ananda Chakrabarty subsequently inserted a novel gene into a bacterium, and in the famous 1980 Diamond v. Chakrabarty case in the US Supreme Court, he was granted a patent on the genetically manipulated "invention" on the basis that the bacterium was eligible as a novel manufacture or composition of matter. In its decision, the Supreme Court examined the 1952 re-codification of the patent statutes in which the definition of invention under section 101 of the Patent Act was extended to "machine or manufacture, which may include anything under the sun made by man" (Krimsky, 2003: 63). This is the phrasing that is said to have convinced the Court that living things qualified as inventions, although Pollack points out that the use of "may" and not "shall" in this sentence was intended by Congress in 1952 to be a limitation on patentability, not an extension (513). The Court invited Congress to restate its intentions regarding patents on life forms if the justices had erred in this interpretation, but it did not (Krimsky 64). In *Chakrabarty*, the Court had relied on one of the central principles in patent law and regulation with respect to chemical compositions of matter, namely that they "are patentable if through human ingenuity they are put into a form in which they do not exist in nature" (Krimsky 60). As I noted earlier, the principle of isolation/purification had become widely accepted in the case of chemical patents by mid-century in the US after extensive lobbying by the chemical industry. In establishing that genes could be patented as isolated and *modified* chemicals, the Court affirmed that patents on life-forms could be possible, although it implicitly reaffirmed its prior precedent that products of nature could not be patented. Krimsky maintains that the decision reveals the Court's intention to "construct the patent law in favour of the emerging biotechnology industry" because it provided a far more liberal interpretation of "product of manufacture" than the normal meaning in allowing the insertion or deletion of a gene from a micro-organism to qualify as novel and non-obvious (64). As he explains, by the court's logic, a "bacterium with 5,000 innate genes and one strategically inserted into its genome (a .02 percent

change)" qualifies as a "product of manufacture" (64). This decision provides some insight into the extent to which the Courts and Congress were willing to stretch the bounds of "normative thinking" with respect to the distinction between discovery and manufacture, the patenting of entities versus the patenting of knowledge, and the significance and meaning of the criteria for patent (64). Krimsky also notes another important qualification that disappeared with this decision. The patent of a strain of yeast in 1873 awarded to Louis Pasteur, the first of several early patents on life forms, involved the organism within a process and did not involve monopoly control over the organism "independently of how it was used in an invention" (62). The Chakrabarty patent involved a claim for both the method of producing a bacterium and the bacterium as a patentable entity. The development of a process for inserting foreign or synthetic genes directly into a bacterium, and the prospect of patent protection for both the technical process and the end product provided the scientific and juridical basis for the creation and commodification of new transgenic life-forms.

The Chakrabarty decision was heralded by economic analysts as a "scientific godsend, the long awaited replacement for a dying industrial order"[34] in the US despite the fact that the decision was narrowly construed.[35] The air of legitimacy lent the biotechnology industry by the Chakrabarty decision was reaffirmed by subsequent decisions by the US Patent and Trademark Office (USPTO). In 1985 the Board of Patent Appeals and Interferences ruled that genetically altered plants could be covered by the standard or utility patent (rather than the less restrictive plant patent).[36] Utility patents on plants impose the same patenting criteria as would apply to any other invention, with one very

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[34] Generally this refers to the decline of the traditional manufacturing base in which the economy was dominated by national firms engaged in assembly-line, hierarchically-based production of tangible goods, where a company's assets were primarily physical property and inventory. US industry had been in decline because of "aggressive import competition from low-wage labour sites" off-shore and an inability to compete in global markets because of high inflation in the 1970s (Sell 35-36). A revolution in communications technologies and the globalization of financial markets were key in enabling multinational corporations to operate largely free of nation-state control, to shift to computer-mediated production with "just-in-time" delivery from plants located in countries where labour is cheap, and to shift their corporate asset base to IP, knowledge and expertise. It is commonly known as post-fordist or post-modern capitalist production (Sell, 35-38. See also Mittelman, *The Globalization Syndrome*).

[35] All of the justices felt that the decision was not meant to open up the larger social issues around the genetic engineering of life – it was an "orthodox interpretation of existing patent law" in which the relevant distinction was not between living and inanimate things but whether or not the microbe was a "human-made" invention. The concerns around the social issues, they argued, should be addressed by Congress (Jeremy Rifkin *The Biotech Century*, p 43). See also Sheldon Krimsky, *Science in the Private Interest* (61-66) for a detailed examination of the issue of whether US patent law reveals a Congressional intent to award patents for living things. Krimsky notes that since the Chakrabarty decision, Congress has never taken an explicit vote on the patenting of living entities (63)

[36] See Hibberd, 227 U.S.P.Q 443, 447 (Bd. Patent. App. And Interferences, 1985)

notable and significant exception – they allow specimen deposit to "substitute for statutorily mandated enabling written description" (Pollack 501). Pollack argues that this major change in public policy was never actually decided by Congress. She states that "[e]ach time Congress actively considered full utility patent protection of such societal basics, it failed to enact this level of private control" (512). The Court relied on the legislative history of the 1952 Patent Act in its decision in *assuming* the availability of utility patents on plants because of the "anything under the sun" language incorporated into the 1952 decision.[37] However, in addition to its intentional use of "may" to indicate a limitation on patentability in its 1952 recodification of patent law, Congress had also added that no invention is patentable unless it fulfills *all* the other criteria for patentability under 35 U.S.C. – which must include enabling written description. Provision of a basic enabling description ensures that the public is able to gain "practical use of the invention after the patent term expires" (523). Furthermore, release of the information underlying an invention is a fundamental element of the 'patent bargain' which mandates a public interest exception for the public of users in exchange for a monopoly right. This exception provides for the opportunity for examination of the technology by those interested in the art, including competitors who may wish to invent around the patent (523) and those conducting independent risk assessment. Specimen deposit can hardly be said to constitute release of information in the normal understanding of the written description requirement. Pollack points out that it was the PTO (and not Congress) that "gutted the stringent description requirement" and in so doing, effectively handed over unprecedented patent power to agribusiness (519). Moreover, she states that the PTO lacked the authority to implement this change (532.). Pollack concludes that, as a consequence, many utility patents on plants, if not on most biotechnology, are legally suspect and could be challenged (501). The implication of utility patents for farmers is that they do not provide for a seed-saving exemption and thereby turn farmers into repeat customers (Drahos and Braithwaite 160). A plant breeder's options for protection were also increased since they could combine a utility patent with a plant patent or plant variety protection – they were not mutually exclusive. Furthermore, since there is only a very limited research exemption under utility patents, agribusiness has the ability to shut

[37] Pollack refutes the Court's determination that plants had always been included in section 101 of the Patent Act, and that it was only in the 1980s that science provided the language that would allow for the crafting of enabling written description. In fact, by allowing specimen deposit to substitute for the written description requirements in section 112(1), the Court of the Federal Circuit later undercut the "fiction" that Congress had legislated utility patents on plants. This undermines, if not effectively eliminates, the requirement for public disclosure in these cases.

down much of the independent research on basic food crops (Pollack 502). Moreover, if the enabling description is missing, one of the fundamental tests of scientific validation, peer review, cannot take place.

A second decision of the USPTO in 1987 affirmed that "all genetically engineered multi-cellular living organisms" (in other words higher life-forms) can be patentable (Rifkin 44). Harvard University subsequently patented its famous oncomouse, which was genetically engineered to be susceptible to cancer.[38] Then in 1988, the European Patent Office (EPO), USPTO, and the Japan Patent Office jointly stated that isolated genes (purified natural products) were eligible for patenting. In applying the isolation/purification principle from chemicals to genetic material, these countries entrenched the ability to obtain patents (and therefore monopoly rights) over living systems. This decision meant that "unknown" naturally occurring substances (in other words products of nature) could be patented through this process, providing the biotechnology industry with even greater ability to appropriate the world's biological wealth.

The commercial possibilities of the new biotechnologies for the chemical, agricultural and pharmaceutical sectors and the advantages of patent monopolies to protect these developments were not lost on the private sector and government; in fact this appears to be an industrial strategy unfolding according to plan in the US. A flood of patent applications for genetically modified biological material ensued, and the biotechnology industry has "flourished" since, according to the website of US based BIO (Biotechnology Industry Organization).[39]

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[38] In contrast, the Canadian Supreme Court blocked the patent on the mouse in 2002 because it decided that the Canadian Patent Act did not extend to higher organisms, although it accepted the notion of patents on engineered micro-organisms. In their decision, the justices stated that "the patentability of higher life forms is a highly contentious matter raising serious practical, ethical and environmental concerns not contemplated by the [Canadian Patent] Act" (Harvard Coll. *v* Canada (Commissioner of Patents), [2002] S.C.R. 45).

[39] http://www.bio.org/. BIO considers its role to be educating policymakers, opinion leaders and the public about the "value of biotechnology." Given the paucity of successful genetically modified products, "flourish" can only refer to the research, merger and investment activity precipitated by the new biotechnology techniques, particularly in agriculture. For instance, herbicide tolerance has been the primary application of crop genetic engineering; approximately 76% of genetically modified crops contain the trait, and glyphosate (the herbicide) sales "account for the greater portion of agrobiotechnology profits" (Boyd, qtd. in McAfee, 2003:37). Herbicide tolerance was expressly developed as a "vehicle" through which to continue to sell profitable herbicides once the patents expired. (Phillips 143).

There were other policy changes that benefited the emerging biotechnology industry in the US[40] and precipitated a sharp acceleration of private investment in biotechnology. Financial deregulation[41] in the 1980's provided a large pool of capital seeking investment opportunities, and the newly emerging biotechnology sector, with its highly touted potential for profits, became a focal point for that investment. In 1980, the US passed the Bayh-Dole Act, which was intended to encourage universities and other public sector institutions to transfer their research to the marketplace more quickly by seeking patent protection and then licensing their inventions (Bollier 2004). In the five years following the introduction of this Act, patent applications in the human biological area increased by 300% (Drahos and Braithwaite 163). Interestingly, Mowery et al argue against the prevailing notion that the US economy's performance has been boosted by the wealth of innovative ideas that flow from academic research centers to industry as a result of implementation of the Bayh-Dole Act. They argue that the rise in university biomedical and biotechnology research and related inventions predate Bayh-Dole and would have happened without the Act because court rulings and changes in federal policy made it easier to patent the research findings in these areas (Mowery et al 2). What the Act did was to essentially harmonize federal policy rather than introduce revolutionary changes.

The argument is also made that technology transfer removes universities as a source of new ideas freely available to the public even though the research was paid for from public funds. In fact, biotechnology is "profoundly dependent" on public science, which explains why corporations are anxious to create alliances with universities. By 2000 in the US, at least 70% of scientific papers cited in biotechnology patents originated in solely public science institutions, while the private sector contributed only 16.5% (Drahos and Braithwaite 165). If the intent of patents is to stimulate innovation, it certainly does not seem to be doing it in the private sector in biotechnology. Corporations might argue that they pay taxes too and thus should benefit from the knowledge universities generate, but besides the loss of wide diffusion of basic scientific information that occurs as a result of exclusive licensing agreements, profits from those monopolies look more like a reward for development and marketing, not innovation. Entrepreneurial academic

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[40] For an account of the influence of neoliberalism on the policy changes favouring the biotechnology industry in Canada and the parallels with the policy changes in the US, see Devlin Kuyek's *The Real Board of Directors* and *Stolen Seeds*

[41] Relaxation of the regulatory framework governing capital flows meant that huge amounts of capital could quickly shift across national borders to take advantage of favourable labour and market conditions.

science risks the diversion of scientific research from basic research into those areas that serve corporate needs, that is, the pursuit of products that give them the greatest market reach, not necessarily addressing the greatest social need. Herbicide tolerant crops, for instance, only became marketable after Monsanto and other agro-chemical companies persuaded the US Environmental Protection Agency to raise the allowable levels of herbicide residues on crops and processed foods. There is little doubt, however, that the Bayh-Dole Act gave impetus to the increase in university patenting and "significantly increase(d) the marketing activities of many US universities" (Mowery et al 4).

There was also a change in attitude in the Antitrust Division of the US Department of Justice in the early 1980s. Patents had been considered to be monopolies rather than incentives for innovation for most of the 20th century, and the Supreme Court subordinated patent rights to the dominant anti-trust policy during this period (Sell 66, Granstrand 38-39). The consumer electronics industry was particularly affected by this anti-patent environment. US firms had pioneered technologies such as the integrated circuit and video cassette recorder, yet other countries, particularly Japan, had successfully commercialized them (Sell 66-67). In *Dawson Chem. Co. v. Rohm & Haas Co.* 1980 the Supreme Court reflected the Department of Justice's new attitude towards patents. Citing the public policy objective of stimulating invention that underlies patent system, this decision was the first since 1917 to place patent rights "on an equal footing with the public policy of supporting free competition" (Sell 67). The anti-trust era was effectively ended with the Court's statement that IP owners were "increasingly likely" to contribute to the US Government's objectives of economic development and competitiveness (67).

Many observers agree that one of the most significant changes in federal policy was the creation of the Federal Court of Appeals in 1982 specifically to hear patent appeals (Granstrand 38, Sell 36). Sell notes that there had been mounting pressures from inside pro-patent circles in law and industry to establish a specialized court of appeals because the growing complexities in patent disputes and the uneven application of patent law in circuit courts were believed to be eroding the full economic value of patents (Sell 68). However, when the Court of Appeals for the Federal Circuit (CAFC) was finally

established, the magnitude of the changes it brought was largely unanticipated.[42] It began to act in a decidedly pro-patent manner, a marked departure from decisions taken previously by the US courts (Granstrand 38). Patent validity was upheld far more often, as if they were "born valid" and damages for infringement were significantly increased (Sell 69, Drahos and Braithwaite 162).

The juridical and policy changes described above represent some of the more important ways in which the patent system in the US was re-engineered to meet the needs of an emerging biotech industry, in particular its agricultural sector. These changes contributed to and coincided with a fundamental shift in the overall economic system to one in which the economic value and power of patents was dramatically increased and "intellectual capital" became the key business asset (Granstrand 40). The underlying assumption was that patents would play a key role in promoting technical progress. Technology was seen as the answer to regaining international competitiveness in the US, especially after the prolonged anti-patent environment from the early 1900s until the early 1980s.[43] The 1980s saw a general movement in the US to preserve its industrial competitiveness amid perceptions that Japan and the newly industrialized Asian countries were "free-riding" on US technological developments and dominating its domestic markets, particularly in information and communications technologies (Granstrand 40). Biotechnology emerged as one of the primary areas of strategic investment in the US during this decade. It would provide a technological lead that could be exploited because there were no immediate competitors capable of clearing the legal and financial barriers to market entry (Sell 94). But in order to preserve that lead, the lack of adequate IP rights in other countries, which the US considered to be an unfair trade barrier and a major contributor to its balance of trade deficits, had to be addressed. Ironically, pressure to amend the international IP system had originated with the Group of 77 underdeveloped states during the 1960's and 1970's (May 83). These states believed

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[42] Sell provides a detailed account of the establishment of the CAFC in *Private Power, Public Law*, pages 67-72.

[43] Sell, 2003. In the period of laissez-faire economics at the end of the nineteenth century and into the early part of the twentieth century, the economic power of patents was undisputed, but short-lived. An era of anti-trust dominance which was to last until 1982 was ushered in with the passage of the Sherman Anti-trust Act in 1890. The Supreme Court was guided by the overriding public policy objective of promoting free competition. Patent rights were equated with monopolies, their scope and validity was challenged, and anti-trust enforcement was vigorous.

patent protection was giving rise to import monopolies[44] and that patent abuse was preventing them from developing their own technological capabilities. The technology gap between developed and underdeveloped states was thus being maintained, contributing to developing nations' problems of economic development. For these states, the purpose of patent protection was to contribute to economic development and the narrowing of the technology gap. For industrialized states, the purpose of patent protection was ostensibly to protect the rights of owners and the sanctity of private property. In the end it was these powerful states who, in the realization of the increasingly high stakes attached to IP-related sectors of the economy, sought to strengthen rather than weaken international conventions governing IP in the 1980s and 1990s (May 83).

A uniform global IP regime incorporating the expansive standards of the US as the minimum standard for other countries would provide the protection that would ensure that the technological lead was maintained and satisfy the powerful entertainment and high technology lobbies who were seeking to protect their domestic markets and dominate global markets. These industries were actively campaigning for change. The message these corporate interests brought to the corridors of power was that the theft of intellectual property was a form of piracy and that the economic well-being of the country was at stake. The rhetoric of piracy focuses on two stories: the moral imperative to protect the rights of the creative genius, and the utilitarian "hook" which claims that unless these creators of public goods are protected, there will be inadequate incentives and innovation will be inhibited (Boyle 1996:123).

2.2 Globalization, Neoliberalism and the New Economy

The promotion of the biotechnology industry as an economic powerhouse and the campaign for increased protection under a uniform global IP regime must be seen in the context of the broader global political economy at the time. Following the Second World War, through the Bretton Woods agreements which created the IMF and the World Bank, and then the GATT treaties, the US worked to establish a framework for an integrated global system of production, investment and exchange. (Richards 103).

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[44] An import monopoly would occur when one corporation or entity would have an exclusive right to import a particular product into a country. Without competition, the importer is free to set his/her price to maximize profit.

These supranational organizations were designed to promote the internationalization of capital, and it was the US dollar that became the currency of world trade. US banks expanded into overseas markets, initiating the era of multinational banking, and knowledge-intensive industries such as the chemical, pharmaceutical and electronics industries expanded into overseas production facilities. The US was able to shape the character of the world trading system to its advantage, using its voting power in the IMF and the World Bank and its ability to influence the negotiating agenda in the GATT. It also gained an unparalleled advantage over other countries through its use of unilateral trade policy, dictating the conditions of international exchange (Richards 103). By the 1960s, the list of the world's largest industrial enterprises began to be dominated by US companies (Drahos and Braithwaite 62).

Contemporary globalization was facilitated by a revolution in technology and communications and propelled by structural changes to the global economy. Beginning in the 1970s a number of emergent factors in the world economy would precipitate a dramatic change in the world trading system, key among them the crisis of confidence in the US dollar and the perception in the US of a nation in decline, losing competitiveness and economic power; the process of de-industrialization in the UK as its manufacturing power declined despite its commitment to free trade; and the emergence of new competitors in the global market such as Japan (Drahos and Braithwaite 62). The post-war commitment to Keynesian welfare policies and multilateralism gave way to a monetarist neoliberalism, alternatively termed "hyper-competition" (Mittelman 19) or "hyper-liberalism," (Cox) a form of extreme globalization that endorses an "almost Darwinian conception of global economic competition" (Cox, qtd. in Sell 17). Competition between nations, regions, firms and individuals will, it was asserted, allocate all resources with the greatest possible efficiency,[45] and a strong regime of private property rights would be essential. At the same time there was a resurgence of neo-classical economics in academic and policy circles, and a radical free market agenda favouring finance capital and mobile factors of production was aggressively pursued, particularly in the US and Britain (Sell 2003; Mittelman 2000; Cohen 2001; George 1999). The ideology of market neoliberalism combined with the structural reforms known as structural adjustment (lower taxes, deregulation, reduced social services, dismantled

[45] Neo-liberal rhetoric conveniently ignores the large number of subsidies, grants, loans, favorable legislation and regulatory policies that favor business.

labour unions) were advanced by US President Reagan and Britain's Prime Minister Thatcher and imposed by the IMF and World Bank as the means for achieving the conditions for stable economic growth. Market mechanisms, under the neoliberal rubric, should be the sole factor directing the fate of human beings and their natural environment. Advocates of economic globalization promise that all persons participating in the global marketplace will see their standard of living rise, and job losses and declining industries are explained away as problems of economic transition (Cohen 15). This system has been made to seem as if it is the natural and normal condition, the only option available for social and economic order and the only alternative to economic stagnation and retrogression, even for the poor countries (Richards 104, George n.p. 1999). It was as much an ideological conversion as it was a structural transformation. As Richards notes, by the mid 1980s "neoliberalism had become hegemonic...an integral part of the knowledge structure of the body of policy makers, international consultants, international financial managers, and other opinion makers exerting their influence in all parts of the expanding global system" (105).

As Sell describes it, the shift to neoliberalism was marked by a shift in international monetary governance from a system of "state intervention to maintain stability" to a "market-based system to promote efficiency" in which private, corporate power exerted growing influence (18). Responding to the 1970s crisis of confidence in the American dollar, President Nixon severed the connection between the dollar and gold, inaugurating the era of the floating dollar and unleashing "an array of structural forces" which were to render the world economy much more difficult for states to control (18). Private firms began to enjoy not only more unrestricted transnational financial freedom, but increasing influence in the corridors of power, and they lobbied heavily for financial deregulation. Accelerated cross-border growth and integration of capital markets soon followed. Sell characterizes these changes as a "changing balance of public and private authority" whereby private economic interests exercise influence in policy decision making and governance according to their structural power and organizational capacity (19). Susan Strange says "the US preoccupation with competitiveness strengthened the hand of firms in shaping government policy" (qted in Sell, 81). The turn to neoliberalism represented not just a change in policy, but a "conscious effort to change ideas and expectations about the appropriate role of government, the importance of private enterprise, and the virtues of markets" (Gill and Law, qtd in Sell 19).

2.3 Changing the Rules of the Game – the IPC and the Rhetoric of Piracy

The WTO, emerging in 1994 out of the Final Act of the Uruguay Round of the GATT, is embedded in these broader trends in the global political economy and is at the heart of the new economic globalization process (Sell 7; George n.p.). It is arguably the most powerful of the international institutions currently supervising the global economy, and its powers usurp to a significant degree individual states' authority in matters deemed to impact on trade. The US occupied a seemingly privileged position in this institution building because it took a leadership position as "vanguard of the neo-liberal orthodoxy" (Richards 139). However, as Richards points out, neoliberalism "serves a universal rather than a particular (national) interest", and it is the "internationalization of capital that has provoked the requisite construction of global institutions" (139). Cohen agrees, stating that the supranational institutions regulating trade represent corporate hegemonic power (15) rather than state competitiveness. The US can be identified as the hegemonic state because it had the ability to impose the necessary discipline and shape the infrastructure of the WTO (and the TRIPS Agreement) in the interests of transnational corporate interests, of which a disproportionate share were American (Richards 103).

The firms who wielded the most influence belonged to transnational firms in knowledge-intensive sectors such as pharmaceuticals, chemicals, computers and software. Not only did they play an influential role in bringing about the changes to the US patent system, they sought to "globalize their preferred conception of control" through a global regime of strict intellectual property rights (Sell 19) administered through the GATT. In fact, the successful campaign to get intellectual property on the agenda at the GATT and the development of the TRIPS Agreement exemplify the influence private interests were able to exert in the policy arena.

During the 1970s and early 1980s, there had been increasing frustration with a growing US trade deficit and increasing pressure on the US to be globally competitive (Sell 80-81). Of particular concern for knowledge-intensive industries was the lax patent protection environment in the US which had allowed, for example, the Japanese to successfully commercialize US inventions such as the transistor, the video cassette recorder and the integrated circuit (Sell 67). In the 1970s industry lobbyists in the

pharmaceutical and high-technology sectors began to push the message that other countries were designing laws allowing US inventions and knowledge to be legally stolen (Drahos and Braithwaite 61, Pratt n.p.). They decided they had to become more vocal in letting government know when "international regulations were unfairly tilted against us" and more active on the policy front (Pratt). The pharmaceutical multinational Pfizer took a lead role in this campaign and in 1982 publicly aired its concerns about IP piracy in an editorial by Chairman and CEO Edmund Pratt[46] called "Stealing from the Mind," published in the *New York Times*. This editorial essentially accused foreign governments of stealing from the minds of US inventors by denying them patent protection. It seemed to crystallize the sentiments of many in business and government. In the editorial, the World Intellectual Property Organization (WIPO)[47] was also accused of being complicit in the pursuit of international treaty revisions that would invalidate patents and attempting to secure high-technology inventions for underdeveloped countries (Drahos and Braithwaite 61). The positive reaction to the editorial in the policy and business community convinced Pfizer that a proposal to move the standard-setting power of IP away from WIPO and link it to the trade regime would have support in US policy circles (Drahos and Braithwaite 62).

There were a number of reasons why the international patent convention administered by WIPO was considered inadequate by those in the high technology sector. Firstly, WIPO recognized the sovereign right of any member country to determine its own level of intellectual property protection, a right consistent with IP agreements since the Paris Convention was first signed (Richards 114). Signatory countries are required only to apply their national standard in a non-discriminatory manner to the IP that originates in other member countries, which in effect establishes a level playing field for international competitors. However, the US considered this to be an impediment to defending patents and was therefore a major problem (Richards 116). Another major limitation of the convention cited by its critics was its treatment of compulsory licensing, which provides member nations with the ability to compel patent holders to issue a license in situations where an abuse of a patent monopoly is threatened. Such circumstances would include

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[46] Edmund Pratt Jr., Chairman and CEO of Pfizer Inc. was an instrumental member of the private sector's campaign for almost thirty years. Pratt was Chairman of Pfizer from 1972 - 1992, and CEO from 1972 – 2001. He attended many GATT negotiations, several in the capacity of official advisor to the US Trade Representative (USTR). See Pratt, 1995 for his personal summary of what he considers was achieved.

[47] WIPO is a specialized agency of the United Nations which promotes the protection of intellectual property amongst countries around the world. See http://www.wipo.int/about-wipo/en/what/

restriction of output to push prices high above production costs to generate surplus profit or failure to work the patent at all, thus contributing nothing in terms of employment or technology transfer. From the patent-holders' perspective, they had the right to maximize profit, and that might involve limitations on where the patent was worked (116).[48] The convention was also criticized for its neglect of process patents. The legitimacy of process patents is recognized by most developed countries, but the same cannot be said for developing countries, many of whom "lack the legal discovery procedures that would force patent infringers to reveal sufficient information on their production methods necessary to bring a complaint" (116). In addition to these perceived shortcomings, WIPO was largely self-financing as a consequence of its role as a clearing house for those wishing to establish a patent in multiple countries. Decision making is not related to country contributions, but is dispersed over its membership, the majority of which are peripheral and semi-peripheral countries. WIPO is therefore not easily manipulated by hegemonic power (117).

The industry campaign, with Pfizer executives in a lead role, succeeded in redefining inadequate IP protection in other countries as a barrier to legitimate trade. According to Drahos and Braithwaite,[49] Pfizer's strategy was risky; it involved engaging groups who developed ideas and theories as part of the public policy process, in particular a number of prominent, mostly conservative think-tanks like the Heritage Foundation, the Hoover Institute and the American Enterprise Institute (70). These groups were generally committed to principles of free trade, and patents are by nature protectionist. Corporate patents have a history associated with monopoly and cartelism. The frame of reference Pfizer adopted in its campaign was a familiar one; it was made up of fundamental liberal values such as the individual right to private property, the right to reward for labour, and fairness. As Drahos and Braithwaite describe the argument, the "embattled innovators of America" were being robbed of their just due, and "rapacious" developing countries were not playing by fundamental rules of fair play in business (70). The industry argument was designed to be both morally and economically persuasive given the role of private property and individualism embedded in neoliberal orthodoxy. It also had a great deal of

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[48] Compulsory licensing is also invoked for both products and production processes that "serve some necessary and immediate social welfare purpose" such as medicines and technologies to deal with epidemics or environmental disasters (See Richards page 116).

[49] Drahos and Braithwaite conducted extensive interviews with about half of the key industry and government individuals who were responsible for TRIPS.

nationalist appeal, especially the promise that the high-technology sector could solve America's trade problems if IP protection was linked to trade (Sell 95).

The importance of trade, IP protection and investment integration slowly but surely became a part of official discourse. In 1984 the US Congress passed Section 301 of the Trade and Tariff Act, which authorized the US government to investigate countries judged to give inadequate IP protection (Granstrand 53; Sell 75). Pfizer Chair and CEO Edmund Pratt also carried his message to the US Executive through the Advisory Committee on Trade Negotiations (ACTN), of which he became Chair in 1981. Under his leadership, ACTN focused on IP issues and sent the message that the sectors most in need of protection in the US were those with huge patent portfolios, such as the pharmaceutical, semiconductor and entertainment industries (Drahos and Braithwaite 72). IP was linked to high technology, and high technology was linked to national and military security, key concerns for the US administration. In 1988 Congress passed amendments to Section 301(known as "Special" 301) in the Omnibus Trade and Competitiveness Act. These amendments were "designed to pry open markets and secure higher standards of protection for US-held intellectual property" (Sell 93). In addition to the earlier authority to determine if the actions of foreign governments were unfair, the 1988 Act specifically authorized retaliatory action, and transferred substantial authority over trade from the president to the US Trade Representative (USTR), thus insulating trade retaliation from other politically sensitive issues like foreign policy and defense (92).

The Section 301 legislation effectively recast IP rights as equivalent to general property rights and placed them under the "normative umbrella" of trade policy (Sell 45). Formerly legitimate behaviours such as reverse engineering or imitation were redefined as "piracy" and deemed unfair. Although Special 301 was essentially an instrument of economic coercion, there was nevertheless a requirement for evidence to support an allegation of piracy. The USTR had to examine a country's IP policies and practices and determine what effect they might have on US trade. This placed an enormous administrative burden on the office of the USTR, and it came to rely heavily on industry calculations (Drahos and Braithwaite 95-97). But the figures for projected losses

certainly deserved more scrutiny.[50] As Drahos and Braithwaite point out, it was difficult to assess the extent of losses due to IP piracy in any situation, let alone in another country – does every unauthorized copy of a cd represent a lost sale, for instance? Similarly, as the Italian government argued, every illegal video cassette does not amount to an unsold theatre ticket (97). There were incentives to inflate estimates of losses, since big losses would merit faster attention from the USTR for Special 301 actions, and there was no one to contradict or challenge the numbers (97). As one trade representative stated "trade organizations have a varying degree of commitment to accuracy" (Drahos and Braithwaite 98). May asserts that the figures for piracy were "most certainly inflated" (152). Boyle (1996:121) says that "both the figures for projected losses and the rhetoric of condemnation are surprising to the neophyte." But the figures were good for public consumption and helped confirm the status of other countries as IP pirates (Drahos and Braithwaite 93). Using the 301 legislation, the US invoked the threat of trade sanctions to pressure countries to sign bilateral treaties that committed them to higher levels of IP protection. IP was achieving a spot "at the heart of the legislative provisions that guarded US commerce" (Drahos and Braithwaite 89).

With IP now clearly linked to trade policy in the US, the campaign for a global IP regime, begun in the early 1970s, was shifted from the WIPO to the GATT in anticipation of the Uruguay Round in 1986 against the objections of developing countries. The GATT provided a forum for knowledge-intensive corporations who were of major importance to the US economy to move their agenda forward. Their interests were represented by the Intellectual Property Committeee (IPC), an industry lobby group co-founded by Pfizer and IBM that also included twelve major US corporations representing the pharmaceutical, biotechnology, entertainment and software industries.[51] They argued that IP should be covered by the GATT because more and more trade is in IP, and more and more capital investment is in intellectual capital. They claimed that the exercise of their intellectual property rights was being hampered by local laws and regulations that

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[50] This is quite aside from the counter argument that US companies were implicated in the theft of knowledge from the minds of indigenous peoples from some of the very countries it accused of theft. Many of the medicines and the majority of the food crops in the industrial world originated in germplasm from the developing world (Seabrook 68, Burrows, *Conquest by Patents*, n.p.) and was obtained for free as a consequence of its being considered a part of the public domain, the "heritage of mankind." But developing countries were then expected to pay for the patented seeds and products derived from this knowledge. This unequal exchange is discussed in chapter three.

[51] Among them were chemical and pharmaceutical firms Merck, Johnson& Johnson, Dupont, Bristol-Myers and Monsanto; Warner Communications from the entertainment industry; and the computer firm Hewlett-Packard.

limited market access and their ability to repatriate profits (Shiva, 1997:82). They wanted to achieve a high level of security for their expensively developed products and processes, which new technologies made vastly easier and cheaper to replicate and disseminate. They called for expanding the term, subject matter, and scope of IP and for relaxing patent requirements and compulsory licensing. One of their primary concerns was the practice of parallel importation, which occurs when a country imports goods from a third country where the IP owner has released them more cheaply (Drahos and Braithwaite 36), or when those goods have been imported from a firm that produces a generic version under conditions involving alleged IPR violations (Richards 124). From the US perspective, GATT held the answer to the problems posed by WIPO's shortcomings. It not only has an effective enforcement and dispute settlement mechanism that could be influenced to favour US interests, it has a requirement that all signatory countries must abide by all of the provisions of the GATT – they cannot pick and choose amongst them according to their own national interests if they want the benefit of the protections and advantages of the agreement as a whole (Richards 118). The IPC not only lobbied Congress to convince legislators of the importance of strengthening patent protection around the world, they were actively involved in helping the USTR formulate policy and articulate its negotiating strategy (Richards 121). Above all, inclusion in the GATT was part of an overall strategy to transform the existing global IPR regime from a "mere statement of ideals into an effective legal infrastructure complete with powers of enforcement" (Richards 118).

At the suggestion of the USTR, three private organizations – the IPC, the Union of Industrial and Employers Confederations (UNICE), and Keidanren – joined forces to "draft intellectual property standards that would be supported by dispute resolution and enforcement mechanisms" (Pratt n.p.) Keidanren is a federation of economic organizations in Japan, and UNICE represented the interests of European business and industry. As Pfizer Chair and CEO Edmund Pratt stated, "government asked the private sector to provide specific proposals for an agreement and to form an international private sector consensus to achieve it" (Pratt n.p). There were no Third World representatives involved and no civil society representation. The IPC spearheaded the campaign, packaging its reforms as being not only beneficial for the US, but also for the health of the global trading system, a tactic that resonated with the GATT (Sell 46).

From the outset, the goal of the IPC had been to develop and achieve agreement on a set of fundamental principles of IP protection (Drahos and Braithwaite 123, May 82). The IPC realized that the negotiations at the Uruguay Round would be a contestation of principles because of the different legal traditions and the variety of approaches to regulation of knowledge. But the committee believed that a set of fundamental principles representing the international business community and proposed by the GATT would be hard for any state to oppose, and for developing countries, it would seem a more attractive option to unrelenting bilateral pressures from the US and from the European Community, which had enacted its own form of 301 legislation (Drahos and Braithwaite 121). In 1988, after nearly two years of work by the IPC-led private sector coalition to raise cooperation in the "Big Three", the US, the European Community and Japan, the Basic Framework of GATT Provisions on Intellectual Property emerged as the seminal document of the TRIPS negotiations (123). As Drahos and Braithwaite put it, the senior members of three distinct corporate cultures prescribed the fundamental principles that would structure the domestic regulation of knowledge and information by all states who were a party to the GATT. Furthermore, there was a "morality of investment in information" implicit in the framework document that placed corporate private property interests in knowledge at the very centre of interests protected by society (123), a morality that lies at the heart of neoliberal doctrine. It meant that states would have to eliminate piracy, criminalize infringement, set severe limits on public interest exceptions, and agree to become subject to meaningful enforcement procedures if they wanted to participate in the new global information economy. Furthermore, the principles of IP protection and the expanded definition of patentable goods incorporated into the Framework Agreement were "drafted to match the business goals of the companies that had been enrolled to support it" according to Drahos and Braithwaite (125).

However, while it is made to appear as though there was a unified voice on increasing patent protection, the US was by far the dominant voice advocating for the TRIPS Agreement (Richards 112, Drahos and Braithwaite 127). Initially, there were significant differences of opinion regarding the usefulness of a multilateral initiative on IP even among other developed nations, and outright opposition from developing countries, who felt that the GATT did not have the competency to negotiate a comprehensive agreement on intellectual property (Drahos and Braithwaite 127, 144-145, Sell 111). Developing countries also believed that the existing intellectual property regime was

already tilted excessively in favour of developed country interests (Drahos and Braithwaite 121). And there were major differences of opinion on some of the principles themselves, which delayed a final consensus. One of the key areas of contention was patents on biological products and processes. The US wanted the agreement to reflect the position endorsed by its Supreme Court that "anything under the sun made by man" is patentable (Drahos and Braithwaite 144, Sell 111). The expansion of patentable subject matter to include the patentability of animals, plants, microorganisms, genes and plant varieties would be a boon to the booming biotechnology business in the US, and opposition was viewed as a direct challenge to the industry (Sell 111). These interests felt that it was essential to include a principle of patentability stating that a "patent shall be granted for ...products and processes without discrimination as to subject matter" (Drahos and Braithwaite 124). The European Community and developing countries' proposals wanted exceptions for "inventions that would be contrary to public policy and health, plant or animal varieties or the biological processes for their production" (Sell 111). The European Community was concerned about the problems that no exceptions would present for the European Patent Convention, which expressly prohibited patents on plants and animals and inventions that contravened morality. There was also disquiet among some of its member countries about the reach of patents over living organisms (Drahos and Braithwaite 144-145). The patenting of life-forms also raised controversial questions about the patent criteria for novelty and invention and the suitability of patenting products of nature (Sell 112). These concerns were front and centre for developing countries, whose biological resources would be open to commercial exploitation under the new agreement. Canada also voiced opposition to plant and animal patents. Without inner circle consensus, the US was forced to settle for somewhat more flexible language in Article 27.3(b), which outlines the exceptions to patentability in the area of biotechnology and plant breeding. This language generally adheres to the European Patent Convention of 1973 where higher life-forms are not protected (Sell 112), but nonetheless represented a significant victory for the US and its biotechnology industry because of the extent to which genetic material was included.

Despite this concession, the record shows that the negotiation process was set up to deliver the result that was desired by the IPC. The Big Three, once they agreed on basic principles, moved on to negotiations with other countries in a process that was characterized by a strategy of developing ever expanding circles of consensus until the

goals of the innermost circle had been met (Drahos and Braithwaite 137). Developing countries, which provided the most resistance, were relegated to the outermost circle and were typically last to be included (137). In fact, negotiations in informal groups were where the real deals were made and where the US wielded its negotiating strength. IP was a new subject for most trade negotiators, and the US operated from a position of strength, sending delegations of experts in the various areas of IP, including private sector experts who were present during the negotiations and who offered advice on issues of concern to them (141). The authority derived from juristic and technical expertise allowed the US and other industrialized countries to subject developing countries to the "disciplining effect of expert knowledge" (Drahos 1995 qtd in Sell 111). These multiple levels of consensus turned developing countries into outsiders when it mattered, placing them under immense pressure to acquiesce to the proposed agreement. Recalcitrant countries soon learned that opposing the US at GATT negotiations would mean facing a Special 301 action. India and Brazil, two hardline resistors, found themselves on the priority watch list of the US and eventually caved in to the overwhelming pressure, but not before the US acted on its threats and subjected Brazil to tariffs on goods destined for the US (Drahos and Braithwaite 134). By 1989, the opposition of developing countries had been minimized and the concerns of others had been largely overcome. Developing countries had been led to believe that their cooperation on TRIPS would not only ease the escalating and aggressive US bilateralism, but would lead to concessions on issues that would have short-to medium-term impact such as access to markets in the US for agricultural and textile products (Purdue, 1995:96; Correa, 2003: 211-12). A further reason for developing country capitulation is noted by Sen (2001). The debt crisis at the time of negotiations had put many countries into receivership, including some of the more powerful developing countries. As a part of the structural adjustment "conditionalities" that formed the strategy for recovery, many of these countries were advised by the IMF and the World Bank to "participate constructively" in the Uruguay Round (Sen 8-9). It is clear that inequality of resources and expertise, exclusion from the process, lack of transparency and outright coercion often characterized the negotiations process for developing countries. The overall process was a combination of "hegemonic consensus seeking" and "coercive bilateralism" depending on the level of resistance to the proposed agreement (Richards 123, 125).

Sen points out that the debt crisis faced by many developing countries, and the institutional response, also "reflected the intellectual ascendancy of the neo-liberal model..." (8-9). This is a model that posits that unrestrained, unregulated markets best serve the common good.[52] Countries were advised that if they didn't introduce the necessary institutional and juridical reforms and sign on to TRIPS, they would fall further behind in terms of technical capacity and economic productivity. According to Richards, this contributed to an "air of historical necessity and inevitability" that made opposition seem pointless (122).

At the end of 1991, a final draft of the TRIPS Agreement (the "Dunkel Draft") was presented as an indivisible package for member states to either accept or reject. By this point, negotiating fatigue had set in and Dunkel was forceful in achieving consensus on the remaining issues, although it took until December of 1993 for the the Uruguay Round of the GATT to conclude (Drahos and Braithwaite 147-9). The TRIPS (Trade Related Intellectual Property) Agreement is Annex 1C of the Marrakesh Agreement establishing the World Trade Organization, which was signed on April 15, 1994 in Marrakesh, Morocco. It entered into force on January 1, 1995 and is part of the common institutional framework established under the WTO. It is obligatory for all states that wish to join. TRIPS approximates the high levels of protection found in the US for all IP rights, including patents, copyright, trademarks and trade secrets (Richards 120). The IPC was able to achieve "95%" of what it was seeking in terms of strengthened and broadened IP standards with the exception of transition periods for developing countries (Sell 115). Viewed within the larger context of the Uruguay Round, which sought to institutionalize the global trend toward deregulation and trade liberalization, the TRIPS agreement is notable for its move to privilege protectionism and exclusion over competition and diffusion, despite rhetoric to the contrary. In fact, the conviction that the absence of IP is an impediment to free trade is one of the important rhetorical victories of TRIPS (Drahos and Braithwaite 36).[53] While the overall political and economic forces in play at the time

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[52] States, particularly developing states, were encouraged (if not coerced) to reduce protectionist barriers, privatize state-owned enterprises, reduce government spending and debt, make labour markets more flexible, eliminate restrictions on foreign investment and movement of capital. See Richards, 121-22. He notes that these structural adjustment policies have made poor countries less able to pursue their own development strategies, including policies to alleviate poverty. In fact, his research shows that they have in many cases directly led to an "increase in absolute and relative poverty" (92).

[53] As should be evident by now, the global trend to deregulation and trade liberalization is more aptly described as a euphemism for a corporate agenda of controls and rules that protect their global markets – a capturing of national and international institutions of governance. See Mittelman, 2000 for discussions of the role of TNCs in globalization and of the state as "courtesan" to capital.

were of key importance in redefining IP as a trade issue, it was the appeal of the author-centred discourse of intellectual property that lent an air of legitimacy to industry demands for strengthened global IP standards. As we have seen, the "rhetoric of intellectual property theft ... permeated the negotiations which led to the agreement" (May 71). It was used in conjunction with the argument that stronger intellectual property rights are a prerequisite for international development and are good for global welfare because they bring increased levels of innovation and investment to all participating countries.

This view belongs to what Boyle (2004) calls the "maximalist rights culture" in the contemporary rhetoric about IP and social utility. The rhetoric maintains that promoting intellectual property is the same as promoting innovation, and therefore, "the more rights the better" (2004:2). The appeals are to the rights of the individual creative genius and a conception of social utility that privileges individual rights over the rapid social diffusion of knowledge. These are views, which, I argue, appeal directly to neoliberal ideology, which is firmly rooted in individual property rights and faith in the distributive efficiency of the marketplace. Notions of the public domain have no place in this paradigm other than as a site of exploitation rather than inspiration, despite the concept of balance central to the romantic author paradigm, and despite the diversity a rich public domain represents. Carla Hills, the former US Trade Representative, epitomizes the maximalist point of view. She is on record as saying that "the higher the protection, the more I think it benefits developing countries, who thereby then attract the transfer technology, investment and creative endeavour...The more you protect intellectual property those established firms are willing to pour more into research and development to try to address mankind's problems..." (quoted in Boyle, 1996:124). A closer examination reveals the fault lines between the rhetoric and the reality of a strengthened global regime of intellectual property rights in the realm of agriculture – in terms of encouraging innovation, achieving a wide social utility, and preserving the public domain of knowledge, from which much innovation springs.

CHAPTER 3:
THE NEW GLOBAL TRADE REGIME FOR INTELLECTUAL PROPERTY

3.1 IP and Economic Development

As Carla Hill's remarks indicate, one of the prevailing beliefs about IP is that in the absence of exclusive rights to exploit the products of intellectual endeavour, the rates of scientific discovery and innovation will fall, resulting in negative social welfare consequences. Because economists generally like to call upon evidence presented by positivist economic science[54] to support their point of view, Richards undertook a careful examination of the existing theoretical literature and empirical evidence to see what could be concluded about the impacts of IP on economic development, particularly in developing countries. Given the rhetoric surrounding IP and the TRIPS Agreement, one might expect to see that intellectual property rights result in market expansion and net welfare gains for less developed countries. However, both the theoretical literature and the empirical evidence tell a different story. In his review of the theoretical literature on the economic impacts of IPRs, Richards notes a number of "welfare ambiguities" attached to strengthening IPRs (Richards 59). These ambiguities suggest that there is good reason to believe that the interests of the poorer importing or imitating nations conflict with the wealthy innovation-producing nations.[55] He also examined a number of testable hypotheses that economists consider important to the discussion of IPRs and economic development to see if the empirical evidence supports the conclusions suggested by the theoretical analysis. Three important questions were examined: the impact of IPRs on trade flows between developing and developed countries; the relationship between the strength of a country's IPR regime and its ability to attract direct

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[54] Richards describes positivist economic science this way: " a research tradition based on (1) a strict separation between the investigator as subject and the object of investigation; (2) a commitment to the search for evidence in support of universally valid laws and generalizations; (3) a preference for methodological abstraction as revealed, for example, in the construction and use of theoretical models; (4) reliance on quantitative measures for key variables..." page 55.

[55] Richards looks at a number of theoretical studies examining how knowledge diffusion between technology exporting and importing countries would be impacted in different circumstances such as oligopolistic pricing power, productivity level of R&D, importance of dynamic benefits of innovation, indigenous R&D capacity and others. See pages 57-61.

foreign investment (DFI); and the impact of stronger IPRs on the potential for economic growth. Overall, Richards noted a "paucity" of empirical literature on the subject, most of which was found to be inconclusive. In the area of trade flows, for instance, he found that for patent sensitive industries "the market power effect of stronger patent protection across countries dominates the market expansion effect and vice-versa for patent insensitive industries."[56] Characteristics of nations such as size, level of development, and likelihood of imitation of patent-protected goods and processes are all determinants of the market expansion versus market power effects of patents, yet the TRIPs Agreement does not differentiate between countries with different levels of development. In fact, Richards concludes that TRIPs appears to be an "inefficient instrument for promoting trade" (67). He suggests that if the goal of the TRIPs Agreement is to expand international trade, the agreement ought only to apply to those industries that are patent-*in*sensitive. Ironically, pressure for greater levels of protection comes precisely from those industries that are patent-sensitive (67) like biotechnology, communications and entertainment, and pharmaceuticals.

With respect to the relationship between strength of IPR regime and flows of US DFI, Richards found that there was a demonstrated lack of robustness between the variables and concludes that there can be no presumption that adoption of TRIPs would result in increased flows of DFI from the US to less developed countries. Far more important determinants of these flows are prior stock of DFI and the quality of the importing country's infrastructure. Even if there were a positive relationship between these variables, he notes, there is no empirical evidence to suggest that the welfare benefits in terms of transfer of technology or productive efficiency would be any greater than those achieved through imitation in the absence of patent protection (71-72).

Richards concludes that advocates' claims that a regime of stronger harmonized IPRs promotes the efficient allocation of resources, which in turn promotes growth, more innovation, technology transfer and technological spill-over do not hold up under examination. He found that the most significant result from examination of the data was that there is a distinct *lack* of a positive relationship between economic growth and

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[56] The "market expansion" effect occurs when stronger patent rights reduce the cost of exports of knowledge-based goods and services, while the "market power" effect occurs when corporations use the monopoly power that patents confer to create scarcity, thereby driving up prices to maximize profits. See Richards page 66-67

stronger IPRs, and he emphasizes that no compelling case can be made that these countries should support the TRIPS Agreement (74-76). May has reached similar conclusions. He notes that "the links that can be established between IPR protection and growth are negative rather than positive and indicate that in all likelihood the protection of IPRs will stifle indigenous innovation while rewarding those innovators already embedded in well-established innovation systems" such as those in industrialized countries (117-118). A closer examination of the conditions imposed by the TRIPS Agreement lends weight to these conclusions.

The TRIPS agreement[57] extends high levels of protection for a period of twenty years, which Sell asserts is inappropriate as a universal standard for all countries and all industries and flies in the face of both historical experience and economic analysis (13). It incorporates a "one size fits all" approach to intellectual property, advancing universal standards of IP rights protection that are expected to operate on a non-discriminatory, most-favored nation (MFN) basis for all WTO members. It challenges domestic policymaking discretion with respect to intellectual property, sharply reducing states' autonomy to determine levels of IP protection appropriate to their capacity for domestic R&D and their economic circumstances (Sell 13). Richards agrees, stating that this will preclude countries from enacting IP protection in favor of domestic producers, which might be a more welfare-inducing alternative for developing countries. He says that the MFN requirement will likely have the effect of shifting knowledge-based production to those countries that already have a comparative advantage in technology (63). The TRIPs Agreement also requires that countries provide adequate and effective enforcement mechanisms that will require both civil and criminal penalties as well as border measures. Despite the initial five-year grace period extended to developing countries, the costs to bring their national law into compliance and develop the necessary legal and administrative infrastructure are significant. It could cost tens of millions of dollars, and for countries whose legal systems currently cannot afford basic protections against violence for its citizens this seems a monumentally skewed priority (Drahos and Braithwaite 147). Correa and Musungu agree that there is little doubt that in the short term, the costs of administration, enforcement and rent transfer (the costs of licensing patented technologies) will be extremely burdensome (2002:22). In fact, a World Bank study estimates that TRIPS represents at least a $20 billion transfer of

[57] Text of the TRIPS Agreement can be found at http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm

wealth from technology-importing countries, mostly developing countries but developed countries as well, to the advanced industrialized nations such as the US, Germany and France (Dutfield 3).[58] Compulsory licensing and parallel importation, which were major concerns of the IPC, have been severely curtailed under TRIPS. This will hinder access to key technologies and products for those countries who can least afford to pay for them (May 117). Poor countries no longer have the option of pursuing economic development through imitation, a strategy that was successfully utilized by China, South Korea, Indonesia and Singapore (and for that matter, the United States early in its evolution) until they developed a "more balanced" R&D path (117). This once legal behavior is rendered illegal by TRIPS, and criminal penalties are imposed for infringement. The conditions set out in the TRIPS Agreement will "limit the potential dynamic benefits associated with technology transfer, knowledge spillovers and other externalities" (Richards 62). Dynamic benefits will be further limited by the stipulation that local production of goods and processes is not required under TRIPS (May 115). As a result the technology gap that already exists will be reinforced, compromising the developmental capacity and potential of the poorer states. By itself, the lengthened duration of patent protection to a minimum of 20 years in an era of rapid technological evolution delays diffusion to such a degree that the technological gap is progressively widened (May 163). Finally, the TRIPS Agreement also provides for recourse to the WTO's Dispute Settlement Body to address conflicts between states, a forum where developing countries are at a distinct disadvantage given their limited levels of expertise and resources. The WTO is empowered to monitor compliance and authorize retaliatory trade sanctions if defendant states fail to carry out their obligations under the agreement within what it deems to be a "reasonable" time.

In light of the discussion so far, the likelihood that developing countries will experience the promised benefits of economic growth, technology transfer, foreign direct investment and increased innovation as a result of signing on to the TRIPS Agreement must be considered negligible. As Richards notes, the agreement was successfully established in the "absence of demonstrable evidence of its necessity to the promotion of the world's welfare" (112-113). Although IP is justified on the basis of a wide social utility, the analysis of the economic impacts of a stronger and more homogenous IPR regime,

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[58] See the 2002 World Bank's *Global Economic Prospects and the Developing Countries* report at http://www-wds.worldbank.org.

particularly on developing states, indicates that the benefits will accrue disproportionately to a narrow range of high-technology industries, the majority of whom are headquartered in the industrialized countries, and whose assets are primarily intellectual property. Fully 97% of the world's patents are held by the developed world, and since they are above all a method of extracting rent from users, patents represent a transfer of wealth from poor countries to rich countries (Cayford 2). The TRIPs Agreement provides a mechanism to force open markets in the developing world to patented products. There can be little doubt that one of the central purposes of the agreement was to discipline developing countries and bring them into compliance with a strong regime of global, harmonized intellectual property rights that would preserve the technological superiority and market dominance of entrenched commercial interests, particularly those represented by the Intellectual Property Committee (IPC).

3.2 Enclosing the Genetic Commons

The TRIPs Agreement does not just circumscribe the range of acceptable practice for all member countries. It specifies obligations regarding scope, subject matter and protection that did not formerly exist. It obliges member countries to further expand the reach of IP into the area of bio-resources and to reward those involved in their development into marketable form (Richards 180). These obligations further reveal the fault lines between the legal settlement and the justificatory arguments for IP. In the realm of plant genetic resources for food and agriculture (PGRFA), they manifest as issues of distributive inequality and injustice, genetic erosion, unwarranted monopoly, and stifled innovation.

One of the key areas of debate and concern in TRIPS is the section on patents. Article 27.1 states that "patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application." Furthermore, "patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced." Member states no longer have the right to exclude categories of technology or products from patentability as a matter of national policy except under very narrowly construed exceptions, as Purdue points out (1995: 97). The stipulations about the patentability of genetic

resources in Article 27.3(b),[59] a contentious issue in the negotiations, are of particular relevance to agriculture. The possible exceptions to patentability in the area of biotechnology and plant breeding are: "plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes." These objects and processes *may* be excluded, but they are not required to be outside of allowable patentable material. This qualification puts all plant genetic material (including isolated genes as purified natural products) at risk for genetic modification and patentability and thus monopoly control because of the propensity of developed countries to pursue bilateral "TRIPS-plus" agreements.[60] Plants and animals as such *can* be excluded under national legislation, but member countries must provide for the protection of plant varieties either by patents or by an effective *sui generis* (unique in its own right) IPR system or by any combination thereof. Significantly, there are no requirements that there be prior informed consent from originating communities or countries and no requirement for disclosing the origins of the germplasm from which an innovation is derived. There is also no stipulation that benefits be shared with the sources or originating communities.

The UPOV Convention deserves mention alongside TRIPS because it was revised again in 1991 to be almost indistinguishable from TRIPS standards of protection. According to Oguamanam (2006), the primary reason for the revision was to add the novelty requirement so that novel engineered varieties made possible by advances in biotechnology could be protected (169). UPOV-91[61] is the only *sui generis* system for plant varieties recognized in international law, and it is being aggressively promoted by developed countries as the model *sui generis* system for developing countries to fulfill their obligation under TRIPS, although it is not the only permissible approach (Dutfield

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[59] While the agreement states that the provisions of this subparagraph were to be reviewed four years after the date that the WTO Agreement entered into force, this review has not yet taken place.

[60] These are agreements that institute IP rules even stronger than those required under TRIPS. In fact, there has been a proliferation of bilateral "TRIPS-plus" agreements on trade and investment in recent years which narrow the options to model IP systems to respond to varying socio-economic situations in different countries, particularly with respect to the implementation of sui generis systems of plant variety protection. This tendency is a testament to the continuing efforts of the US and the EU to "ratchet up ... IP standards" (Sell 146). TRIPS-plus agreements have become the key instrument used to move toward international harmonization of patent law to ensure security, predictability and freedom of movement for transnational corporations (GRAIN 2003, 9; Dutfield 5). A list of developing countries who have signed TRIPS-plus agreements can be found on the GRAIN website at http://www.grain.org/rights/tripsplus.cfm?id=68.

[61] The text of the UPOV-91 Agreement can be found at http://www.upov.int/en/publications/conventions/1991/act1991.htm

10; Sell 143). UPOV provides for Plant Breeders' Rights, which are monopoly rights to market and sell particular varieties. Utility patents are much more extensive, permitting monopoly rights over a variety, the variety's plant parts including its seeds, fruits and germplasm, and even the variety's characteristics, all in one multiple claim (Shiva 1997:54).[62] Together, these agreements greatly circumscribe the traditional farmers' right to save and re-plant, cross-breed, sell or trade the seeds from their crops, which has to be considered one of the primary goals of these agreements. There are no farmers' rights under utility patent regimes. Under the UPOV-91, farmers' rights are restricted to the right to save seeds to replant on their own holdings (they can no longer share or sell them). Although it is left to individual nations to make the practice explicitly legal as long as breeders' rights are not impinged upon (Article 15 (2)), it seems likely that this exception too would be vulnerable under the pressure of bilateral negotiations with more powerful countries. Furthermore, the revised UPOV Convention removed the prohibition on protection of the same botanical genus or species under both plant breeders' rights (PBRs) and patents that existed in UPOV-78. This further circumscribes farmers' rights, since the limited exceptions under UPOV-91 would be rendered meaningless by concurrent patent coverage.

Like TRIPS, UPOV-91 extends protection to a minimum of twenty years to all commercial plant varieties, without exception, as well as expanding the scope of breeders' rights to encompass the *products* of the protected variety if permission to grow a protected variety was not properly obtained (Article 14(3)). Important food and medicinal plants can no longer be excluded (Dutfield 10; Cosbey 11). Furthermore, the UPOV-91 extended PBRs to 'essentially derived" varieties (Article 14). According to Purdue this means breeders can claim royalties on subsequently developed varieties that share key characteristics with the varieties they own, including those characteristics derived from a local landrace (1995). To be eligible for protection under UPOV-91, plant varieties must be novel, distinct, stable and uniform (Articles 6 – 9). However, the concept of novelty is narrowed to commercial varieties, thus excluding landraces and communally developed varieties from protection. A further requirement of the UPOV system, like patent systems, is that the innovation must be reproduceable – in the

[62] For instance, Sungene was granted a patent in the US for a sunflower variety with very high oleic acid content. The patent granted was for the characteristic. The company subsequently advised other breeders that any variety developed with a high oleic acid content would be considered an infringement of its patent. See Shiva, 1997, page 55.

context of seeds, it means that a protected seed must be stable and homogenous, able to consistently reproduce the same variety (Article 9). In contrast, landraces are genetically diverse forms of cultivated plants, and as such are the "primary breeding material in crop improvement programs" (Brush:1994, 3). They naturally produce mutations in a way that the products of formal innovation do not and are thus deemed "chaotic" and primitive, requiring improvement, (Shiva, 1997: 54), even though they are the legacy of hundreds of generations of farmers and may be more hardy and adaptable than modern cultivars (Brush,1994: 4). Fully 80% of biological diversity is in developing countries of the tropics (Straus 2000:142). However, the contributions of these genetic resources to modern agriculture and to the global economy and the wealth of many developed nations remain largely unacknowledged by the North by any measure and certainly in terms of compensation to the host countries of these resources.

The narrow criteria for protection under the TRIPS Agreement and UPOV-91 effectively consign virtually all forms of plant biological resources in their putative natural state to a global "public domain," while the genetic material and the products derived from these resources can be closely held by those with the requisite technological expertise, largely corporate interests, as intellectual property. TRIPS can be seen as a negation of the assertions of national sovereignty over genetic resources in the 1992 Convention on Biological Diversity (CBD),[63] re-imposing the virtually unfettered access to genetic resources that prevailed under the previous "heritage of mankind" designation. National sovereignty had been introduced at the insistence of developing countries, who noted the contradiction in designating their genetic resources as "common heritage," while agrochemical companies' commercial varieties and products, derived in large part from landraces and knowledge from the Global South, are accorded the status of "private property" and available only by purchase (Kloppenburg and Kleinman 10). Genetic engineering introduces a new dynamic into plant breeding and reproduction by altering the genetic code of living organisms through the insertion of novel genes into cells (Oguamanam 2007:261). Genes associated with specific traits are targeted, isolated and manipulated; their use, expression and suppression is controlled so that the desired

[63] The CBD is a framework agreement intended primarily to facilitate the conservation and sustainable use of biodiversity, while at the same time recognizing the rights of indigenous cultures to preserve their knowledge and resources. The agreement's efficacy is a matter of debate because of the concessions it makes to intellectual property. It will be discussed in detail later in this section.

result is achieved (261). This technology provides the prospect of a huge number of genetically modified varieties with exchange value in the marketplace.

Chander and Sunder observe that just as the romantic author paradigm reinforces the property claims of the powerful, so too does the public domain, because "[w]here genius cannot justify the property rights claims of corporations because the knowledge pre-exists any ownership claims, the public domain can" (1335-1336). The biotechnology industry is profoundly dependent on a global public domain of plant genetic resources from which to draw, so much so that the term "bioprospecting" has become a commonplace way to describe the search for these resources. Gene hunters travel the world looking for plants with traits that might prove commercially valuable, and they typically rely on local and traditional knowledge to identify these plants. The consigning of plant genetic resources in their natural state to the global public domain has exacerbated what Jerry Cayford, a philosopher and public policy researcher, describes as the "angry impasse" in the debate between critics and advocates of patents on genetic material and the biotechnologies that make them possible (4). This impasse is most visible in (but not limited to) the continued objections of critics from the Global South to the unequal exchange that characterizes the "trade" in plant genetic resources with industrialized countries and the transnational corporations based there. Under the mantle of public domain, knowledge and associated plant material and/or seed is taken by researchers to their laboratories where the active ingredients are isolated and patented, as are the derived products or processes, and sold for profit, often back to the originating communities (Sell 140). Originating communities often retain no rights in this patent-and-return-as-product pattern of genetic resource exploitation. This practice was labeled "biopiracy" by RAFI (now the ETC Group) in the early 1990s, a term adopted by a wide spectrum of developing countries, NGOs, activists, civil society groups and indigenous communities. Those protesting biopiracy assert that indigenous and communally developed resources were already subject to ownership claims of a different order than the western model of ownership based on the individual as the primary source of intellectual endeavour. However "western scientific standards of validation" incorporated into patent law (Oguamanam 156) have become the standard against which traditional knowledge is measured. An essential point about requirements for protection under TRIPS and PBRs is this: plant genetic resources which have been

carefully developed and improved through informal innovation[64] where there is no identifiable individual innovator would not qualify for protection under conventional patent or plant breeding rights, should indigenous and local communities wish to protect their intellectual endeavours in this manner.

The lack of recognition of this kind of innovative activity also extends to establishing *prior art*, which is one of the most important of these western standards of validation for traditional knowledge. Prior art in the US refers to the "complete body of knowledge that is available to the public before a patent application is filed or, if a priority date is claimed, before that priority date" (Ruiz, 2002: 5). Establishing prior art will disqualify an application for patent on the basis that it does not fulfill the novelty requirement. In a global trade regime that is designed to open up all genetic resources to bioprospecting activities and private ownership, it is argued that the practice of biopiracy is made manifestly easier, if not encouraged, by interpretations of prior art across legal regimes that recognize as novel only the unique contributions of individual "inventors" expressed according to narrowly defined rules for novelty, stability, inventive step, and reproduceability. As Ruiz points out, traditional knowledge[65] is "rarely...considered as part of the prior art during examination of patent applications" (2002:iv). There is no specific requirement to review traditional knowledge under the international search guidelines of the Patent Cooperation Treaty (PCT)[66], nor do designated search authorities in the US, Japan or the European Patent Office (EPO) make it a part of their normal practice (2002:v).[67] Despite the fact that there is traditional knowledge being widely utilized and despite the existence of databases, journals, publications and other means of making traditional knowledge available to the public, patent examiners seldom undertake exhaustive reviews of traditional knowledge sources and do not generally

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[64] By informal innovation I mean without the intervention of formal scientific methodologies and technologies.

[65] Ruiz (2002) defines traditional knowledge as "the intellectual effort and its results, generated by indigenous peoples and local communities, which has enabled them to adapt to and live in relative harmony with their natural environments throughout the centuries and contribute to modern society..." (3)

[66] The PCT is an international agreement signed by more than 100 countries. It provides an international system for uniform processing of patent of applications. However, formal granting of patents remains under the authority of national patent offices. For more information see the WIPO site at: http://www.wipo.int/pct/en/texts/articles/atoc.htm

[67] Ruiz (2002) provides definitions of prior art in the US, Japan and under the European Patent Convention. The Japan and EPC definitions are somewhat broader than that of the US, stressing availability and accessibility, including through "telecommunications lines" in the case of Japan, and including oral description in the EPC, compared to the US requirement for written documentation. (Ruiz 7).

recognize it as forming part of the state of the art (Ruiz 6). Yet, as Oguamanam notes, "when the same knowledge is presented 'scientifically,' it ceases to reside in the public domain and becomes entitled to protection" (2006:161).

Nijar agrees, observing that "contemporary jurisprudence" differentiates between tradition-based, communally developed innovations and the innovations of individual and corporate interests with respect to what qualifies as prior art (Nijar 1999). From the point of view of traditional knowledge holders, it is particularly important to establish prior art because novelty under TRIPs and UPOV-91 extends to the isolated and purified form of naturally-occurring substances. This means, for instance, that a gene responsible for a trait developed by farmers in a local or traditional community could be isolated and purified by researchers working for a multinational seed company in the US and subsequently patented. The trait would be no different in the "new" variety developed in the lab, but because of the way prior art is assessed, and the way novelty is established under the isolation and purification principle, it would qualify for patent. This is of particular concern under Section 102 of the US Patent Act, which has not been amended since the Patent Act of 1836 when a geographic qualification was added that *excluded* all foreign knowledge, use or invention from prior art (Kadidal 385). Section 102 states that an invention is novel "if it was not used, known, or sold in the United States or previously patented or described in a printed publication in the United States or a foreign territory one year prior to the date of a patent application" (USPTO). According to Kadidal this means that almost all prior domestic knowledge, use or invention can be used against a later US patent, while similar foreign activity cannot. Prior foreign activity will only defeat a domestic (US) patent if it is contained in a tangible, accessible form such as a description in a published document or if contained in a foreign patent. Unless documented in this manner, prior foreign knowledge, use and invention are all excluded from the prior art designation for a US patent application. Conforto also notes this weakness in assessing prior art under US patent law. He says it means that US patent law does not require "absolute novelty" in order to obtain a patent, and this effectively "waters down" the novelty requirement (Conforto 364). This gap in the recognition of foreign activity allows US patents on foreign traditional knowledge if it is not recorded according to that very narrow rule-bound definition, even if it is widely known and practiced outside of the US (Kadidal 378-380), and despite the fact that the US itself

allows specimen deposit to substitute for enabling written description for utility patents on plants.

One of many biopiracy cases that have been documented is that of Thaumatin, described by Zoundjihekpon (2003). Thaumatin is a natural sweetener extracted from the fruit of *Thaumatococcus daniellii* from West African forests. It has been used for centuries by local communities. After the protein, which is 2000 times sweeter than sugar, was discovered by a researcher in Ife University in Nigeria, the fruit was marketed abroad for years by the British sugar producer, Tate and Lyle, since the plant yields fruit only in its natural surroundings. Because of the value of the low-calorie sweetener market in the US alone, estimated to be US$900 million/year, the potential for huge profits from this plant was recognized by researchers in the biotech industry, who were able to isolate the gene responsible, and it was successfully cloned in yeast. Researchers of the Lucky Biotech Corporation and the University of California filed a patent in the US on *all* transgenic fruits, seeds and vegetables containing the gene that produces thaumatin. The fruits from West Africa will no longer be needed, since thaumatin can now be manufactured in production facilities in the industrialized countries where the largest markets exist (Zoundjihekpon 109-116). Not only has the knowledge been appropriated without compensation, the livelihoods of those producing the fruit are at risk.

The definitions of prior art attached to the grant of patent permit these putative "public goods" to be captured as private property, thereby facilitating the misappropriation of traditional knowledge. It is the transformative act, typically by scientists and researchers in distant labs, and typically mediated by technology, that constitutes innovation and merits the intellectual property right. However, biotechnology is not always implicated in the misappropriation of traditional knowledge or knowledge from the public domain, as the case of the Enola bean demonstrates.[68] Larry Proctor, the owner of an American seed company, Podners, planted some yellow beans that were purchased in Sonora, Mexico in 1994. After allowing them to self-pollinate until a crop of distinctly yellow beans was achieved, he was granted a patent on the bean variety in the US in 1999. When another company subsequently imported Mexican yellow beans into the US, Proctor

[68] For further discussion of this case see G. Rattray, *The Enola Bean Patent Controversy: Biopiracy, Novelty and Fish and Chips* Duke Law and Technology Review, 2002 Duke L. and Tech. Rev. 0008 at http://www.law.duke.edu/journals/dltr/articles/2002dltr0008.html

sued for patent infringement (Conforto 365). Even though indigenous populations in Mexico had cultivated yellow bean varieties for centuries (azufrado and mayocoba) and Mexican seed companies had for years been selling the same variety into the US that Proctor had patented, Proctor was deemed to be the "inventor" of a novel variety, with the attendant monopoly rights that a patent confers (Conforto 366). It was believed that unless some documented information on the Enola bean could be found, as is required to establish prior art under US patent law, this patent would not be successfully challenged. However, in April of 2008 the USPTO finally overturned this patent after concerted lobbying by the Consultative Group on International Agricultural Research (CGIAR) and one of its centres, the Columbia-based International Centre for Tropical Agriculture (CIAT), with the added support of the FAO and the ETC Group. The patent was challenged on the basis that it lacked novelty and because it violated the CGIAR's own 1994 Trust agreement, which stipulated that it was a designated germplasm that was to be kept in the public domain (ETC Group, April 2008). The irony is that the company was able to exploit its patent for ten years while the case languished in the courts. Patent litigation is notoriously expensive and slow in most countries and is a significant obstacle to challenging patents which, although granted, would not stand up in court. The filing costs for re-examination of a patent in the US are between $10,000 and $100,000, and litigation costs are estimated to be between $1 and $3 million per case (Nuffield Council 18). It can take a number of years before a decision is made, and during that time the patentee can reap the benefits of the monopoly even while the patent is under dispute.

These examples demonstrate that patents need not involve any new knowledge at all – they can "simply refer to the enclosure and transfer of knowledge from one cultural context to another" (Purdue, 2000:23). Boyle alludes to this when he says that one of the consequences of the author paradigm of intellectual property rights is that certain contributions (those of the individual creative genius) are validated while others (those that a given community develops) are rendered invisible (1996:130). Scientists are deemed to be "authors" who transform nature, while the contributions of farmers are too easily consigned to the public sphere of knowledge and targeted by the individual creative genius (130).

There are, however, two responses to assertions that the public domain is implicated in the profound distributional inequities that define the trade in plant genetic resources between North and South. Firstly, the treatment of biological resources and associated knowledge of traditional or indigenous peoples[69] as global public domain misrepresents both the communal and innovative nature of this knowledge (Oguamanam, Chander and Sunder, Brown 2003, Burrows, Ruiz). As Oguamanam points out, communal ownership is not synonymous with the public domain, as there are customary regimes for the protection of knowledge in virtually every culture, many involving distinct "layers of rights regarding use and access" (2006:161). Furthermore, it is argued that the innovative nature of the activities within those cultures is no less deserving of recognition than the modern plant breeder who manipulates genes in a distant lab. Oguamanam explains that at the centre of many of the disputes about the misappropriation of traditional knowledge and associated genetic resources is the "conceptual and epistemic schism" between indigenous knowledge systems and the western industrial model of intellectual property (2006:156). Traditional and local communities incorporate a world view in which their knowledge cannot be extricated from a complex socio-cultural context and "subjected to an economic scale of values" (Oguamanam 157). The individualistic constructs of property at the root of the capitalist orientation of western intellectual property rights are foreign to indigenous ideals, as is the notion of a broad intellectual commons or public domain crossing all epistemic traditions. Traditional knowledge[70] is the knowledge developed by a people in a given community based on generations of accumulated experience and adaptation to local conditions. It is typically holistic and integrative, and is "founded on a sociocultural milieu that sustains a belief in complex spiritual and social relations among all life forms" (Oguamanam, 2006:16-17). It is used to sustain the community and its culture and it is central to maintaining the genetic resources, including landraces, which are vital for the continued survival of the community. It is frequently maintained and transmitted orally through "specific cultural and traditional information exchange mechanisms" (Hanson and Van Fleet 4). It can

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[69] Indigenous and traditional are used interchangeably in this work, after Oguamanam (2006:20), and Ruiz (2002:3). Local communities might not necessarily be indigenous, and could include for instance small organic farmers in developed countries.

[70] Oguamanam provides a useful comparison between the features of traditional knowledge and Western science on pages 16-17, *International Law and Indigenous Knowledge*, 2006. He points out that even though the "tendency to lump indigenous cultures and Western cultures and knowledge systems into uniform but separate categories" does not reflect the plurality of ways of knowing in both western and non-western cultures, there is an epistemic divide between the western scientific paradigm and traditional knowledge systems (13)

include mental inventories of biological resources, practices and technologies such as seed treatment and storage, harvesting methods and planting information, and seed selection and breeding methods. Traditional agricultural practice is essentially an "ecological as well as a cultural practice," an epistemological domain that sharply contrasts with the reductionist agro-scientific model that is sustained by intellectual property rights.[71] Intellectual property regimes such as TRIPS advance commercial interests over cultural ideals, lionize and reward the individual as the locus of creativity and innovation, and impose strict tests of patentability that delegitimize an alternate cultural account of science and communal regulation of knowledge (Oguamanam 2006:158).

Secondly, misrepresentation as global public domain notwithstanding, it can be argued that it is the current interpretation and application of the technical criteria for the grant of patent that promotes the misappropriation of traditional knowledge and associated plant genetic resources from the public domain and leads to inequities in the exchange and use of plant genetic resources. The degree to which patent criteria permit this varies among patent regimes around the world, but the US is especially implicated because of the low threshold it applies in assessing patent claims. Normally, anything in the public domain is beyond the reach of patent. Patents should only issue for innovations which incorporate new knowledge or improvements on existing knowledge as long as the contribution is considered substantive and can meet all of the criteria for patent; such is the cumulative nature of knowledge and innovation recognized in western IP regimes. However, in addition to the problems with assessment of prior art, it is the ease with which plant genetic resources are converted from goods in the public domain into proprietary goods which is also at issue. It is the erosion of the protective mechanisms in patent law, particularly in assessing novelty, not the public domain designation that results in an unprecedented level of monopoly rights over the genetic resources

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[71] In fact, anthropologists believe that 'western' scientific knowledge originated in the "18- and 19th-century reconstitution and absorption of preexisting European folk knowledge and practices." See Oguamanam, 2007:261. For further discussion on the origins of western science see Carolyn Merchant's *Death of Nature: Women, Ecology and the Scientific Revolution*, HarperCollins, 1989; *Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology* by Vandana Shiva (Zed Books, 1993); and *Staying Alive; Women, Ecology and Development* also by Shiva (Zed Books, 1989).

essential to the well-being of humanity in terms of food security and self-sufficiency, cultural integrity, and biodiversity conservation.[72]

3.2.1 Farmers' Rights

Misappropriation of traditional knowledge through the privatization of the associated genetic material is not the only issue arising out the epistemic schism between traditional models of managing, preserving and disseminating agricultural knowledge, and the formal scientific model of knowledge generation and innovation. The agro-scientific model involves technology-mediated isolation, manipulation, and exploitation of "molecular lots and bundles" of genetic information over which proprietary rights are asserted (Oguamanam, 2007:261). From the point of view of agribusiness, because biotechnologies allow for much more restrictive monopoly rights in plant genetic material, they address a problem that has "plagued" the industry for decades – the problem of farmers' rights (Swanson 3). The increasing restrictions on farmers' rights incorporated into the TRIPS agreement and the UPOV-91 are symptomatic of an intellectual property system that privileges the monopolist rights holder (who is typically *not* the paradigmatic inventive genius) over other legitimate interests. Farmers' rights have been the backbone of innovation in agriculture for centuries precisely because their activities involve the wide dissemination of socially valuable knowledge. As Brush notes, "crop diversity does not persist as an incidental characteristic of farming systems but because farmers choose to maintain different crops and crop varieties" (1994:4). Crop diversity is not evenly spread over the planet. The places where it is most abundant are called Vavilov Centres after the Russian biologist and plant breeder who identified eight centres of diversity located primarily in the geopolitical South (Seabrook 4). The vast majority of the population in developing countries of the geopolitical south belongs to farm families, most of them poor. Most poor farmers employ informal conservation and crop improvement techniques. These improvements become part of the stock of common genetic resources available for further innovation; once planted, seeds can be harvested and replanted, or selected for certain characteristics and crossed with other varieties to produce new seed. These diverse agricultural genetic resources are typically

[72] I will discuss the erosion of these protective mechanisms in greater detail in Chapter 4. The preceding discussion of prior art shows how traditional knowledge is delegitimized and consigned *to* the global public domain; the discussion of the erosion of the technical criteria will speak to how this same information/knowledge is subsequently re-configured as commodity and removed *from* the public domain.

shared and /or traded widely and are recognized as being crucial for the continued development of new varieties in both developed and developing countries (Dutfield 11, Brush:1994, 4). And in the context of climate change and rapid species extinction, crop diversity may be "the most precious natural resource we have" (Seabrook 62).

Seed saving and sharing are also vital to the food security of a large percentage of the world's subsistence farmers. It is estimated that more than 80% of seeds in developing countries currently stay outside of the formal seed trade (Purdue, 2000: 3-6). This represents a huge and lucrative potential market as well as a valuable source of new genetic material for the development of proprietary seed.[73] As agro-chemical companies move to capture the global seed market with their proprietary varieties, their desire to limit as much as possible farmers' rights to save, breed, share or trade patented seed should come as no surprise. Farmers' rights are considered to be one of the three obstacles to profitability in the seed industry (the other two being public sector research and other seed companies). Furthermore, eliminating or greatly circumscribing farmers' rights to sell, exchange and replant harvested seed removes the farm as a site of informal innovation. It also amounts to the creation of an "artificial"[74] scarcity, driving up the price of proprietary seed in order to maximize profits.

Paradoxically, the requirements for protection under the TRIPS and UPOV regimes actually discourage diversity by encouraging the cultivation of a narrow range of genetically uniform crops, which increases the vulnerability of crops to disease, drought and pests.[75] Monopolists tend to rely on single products to capture maximum market share, and GM crops are an ideal product with which to achieve market dominance because of their non-rival status. But the costs of developing a new and marketable GM variety run into the hundreds of millions of dollars (Richards 168). Investments of this

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[73] 80% may seem like a lot, but we should not be too complacent. Crop biodiversity can disappear quickly. According the the FAO, over 10,000 crops species have been used by humans since the dawn of agriculture, but today just 150 crops feed most of humanity, and just 12 crops provide 80% of food energy (FAO Newsroom, 2004). Most of the decline in commercial crop diversity occurred in the last century.

[74] However, the scarcity is no longer "artificial" when the traditional varieties and knowledge of how to grow and use them disappears

[75] The consequences of genetic vulnerability as a result of industrial agriculture are well-established. In the southwest US, a type of corn blight invaded the crops in 1970, and in some areas up to half of the crop was destroyed. A later report released by the National Academy of Sciences found that 70% of the corn crop in the US was found to consist of just six varieties. Between 1903 and 1983, the nation's agricultural diversity had virtually disappeared as new commercial hybrids displaced a wide spectrum of traditional varieties (Seabrook 67).

magnitude are not likely to be made without the prospect of capturing large market share with that product, a process which inevitably reduces genetic diversity (See Richards 168 and 173, and Seabrook, 69). Just as plant breeders' efforts had during the Green Revolution, geneticists' artificial manipulations and the monopoly power exercised by transnational seed companies jeopardize the raw material that makes their work possible. As the use of less commercially attractive but more diverse varieties is discouraged and eventually displaced by proprietary seed, fewer farmers will be engaging in their traditional farming methods, putting the world's crop biodiversity into a "continuing state of decline" (Conforto 361). Advocates of biotechnology may claim that modern genetic modification techniques can introduce needed genetic diversity much quicker than conventional breeding methods. Brush, however, states that even though geneticists can replicate and accelerate processes of genetic recombination, mutation and hybridization, they cannot replicate the amount of natural diversity in field conditions (6), and furthermore, they will still require a continually evolving base of diverse genetic resources from which to draw for their novel varieties.

Even if modern biotechnology techniques could replicate natural diversity, the social, agronomic and ecological costs are high, and it is hard to believe that desirable results could be achieved under the current IP regimes. As Richards and Oguamanam have observed, the biotechnology revolution in agriculture was undertaken largely as an industrial strategy to capture profits from a resource that was previously not alienable (Oguamanam 2007:263-4, Richards 187).[76] Farmers are typically required to sign technology-use agreements that forbid re-use of patented seed and to pay an additional per-acre technology fee.[77] Despite the restrictive conditions and the additional costs imposed by these contracts, farmers are attracted by promises of higher yields (Roush, 2002). But these novel crops typically require expensive inputs and "tailored agronomic practices" to preserve the integrity (and the value) of the product (Phillips 146). In a market based as opposed to traditional system, farmers have to come up with the

[76] Agrochemical companies saw the advantage of partnering their agrochemicals divisions with seed and biotechnology units in that whoever could develop a variety resistant to their own patented herbicides would have a "vehicle" through which to continue to sell the profitable herbicide once the patent expired. (Phillips 143). Herbicide tolerance has been the primary application of crop genetic engineering; approximately 71% of genetically modified crops contain the trait, and sales of Monsanto's herbicide glyphosate "account for the greater portion of agro-biotechnology profits" (Boyd, qtd. in McAfee, 2003:37).

[77] For instance, where a reference public variety in Canada would cost $1.60 per lb., AgrEvo's Liberty-Link variety was priced at $2.51 per lb., and the farmer had to purchase the patented Liberty herbicide at $198 per 10 litre, pushing the cost of the package per acre to $40 (Phillips and Khachatourians 144)

money ahead of time to purchase the proprietary seed and associated inputs and wait until the end of harvest to realize any income. They have to be familiar with and have the resources to put those tailored agronomic practices (correct concentrations of and intervals between herbicide applications, for instance) into place. They risk bankruptcy in a bad year. These risks are magnified for poor farmers in developing countries accustomed to traditional agricultural practices and unaccustomed to the concept and dictates of western intellectual property. A significant risk derives from the simple fact that GM seed is not readily distinguishable from conventional seed. Farmers may be unaware that the seed obtained through informal exchange or trade requires those "tailored agronomic practices" in order to get expected yields, and that the yields decline substantially with subsequent plantings of saved seed. The consequences could be disastrous for the farmer's food self-sufficiency.

Furthermore, production for export markets rather than for consumption displaces local food production. Food for local consumption becomes scarce and expensive. Argentina is now faced with local food shortages because so much acreage is planted in GM soy for export markets (Branford, 2004, Brown, 2004). Industrialized, export-oriented agriculture requires economies of scale that drive the transition to larger mechanized farms, forcing small-scale farmers who formerly practiced sustainable agriculture off of their land. Patents on seed promote an industrial system of costly, high-input agriculture in which capital is more important than labour, monocultures replace local varieties, and local farmers and their sustainable practices are expendable.[78] Farmers' rights, instead of being viewed as practices indispensable to maintaining crop diversity and self-sufficiency, are viewed as an encroachment on monopoly rights even though the farmers themselves may have made significant contributions to the proprietary varieties that they often have no choice but to continue using once they have been adopted. There simply may not be any other option available to them, since eliminating choice and creating scarcity is a deliberate strategy of monopoly corporations.

These issues are of particular concern for centres of biodiversity in the global South, where the farming practices that contribute to genetic diversity are most prevalent and

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[78] See the *Seeds of Suicide* series by P. Sainath on the India Together website at http://www.indiatogether.org/opinions/psainath/suiseries.htm for an account of how the move from food crops to cash crops, many of them gm crops, has had disastrous consequences for thousands of Indian farmers.

where farmers are more vulnerable to economic and political instability, which could interfere with the supply of purchased seed. Because biological diversity and sustainable ecological practices are central to the lived reality of indigenous communities and rural populations, these groups are recognized as being crucial to biodiversity conservation (Oguamanam 2006: 7). Once gone, these genetic resources can never be recovered. To add to the imperative for *in situ* conservation, *ex situ* collections of traditional varieties in seed banks around the world are jeopardized by insufficient and shrinking funding, a point which both Brush (37) and Seabrook (64) emphasize. Current funding for seed conservation is "far below their current contribution to the world economy and far below the level necessary to ensure their availability to future generations" (Brush 1994:37). Of the estimated 6.5 million seed samples currently in seed banks around the world, less than one third are "unique" (meaning they are not replicated) according to the ETC Group (February 2008). Furthermore, approximately half of the unique collections contained in seed banks in developing nations are believed to be at risk, according to Fowler (quoted in Seabrook 64). These seeds will represent a diminishing share of the total seed actually grown on farms world-wide as GM seed use increases and collections of traditional varieties lose their capacity for regeneration. Hence there is a desperate need for a focus on *in situ* conservation efforts and preservation of farmers' rights to encourage the productive activities in the field that result in genetic diversity.

The disappearance of traditional varieties from the field in favor of GM varieties is aptly illustrated by what happened in Iraq following the US-led invasion (Seabrook 70). Even though Iraq's traditional varieties had been preserved in a seed bank, the US encouraged the use of seeds provided by American companies and distributed by the military. Many were genetically modified seed not bred for local soil and weather conditions. In 2004 Paul Bremer, the head of the Coalition Provisional Authority, prohibited Iraqi farmers from re-planting saved seed to ensure a supply of food after the next harvest, forcing them to purchase licenses from corporate owners in order to receive new seed each year (71). This example also illustrates the perversity of the US strategy of using gm seed as emergency food relief for countries like the Sudan, Ethiopia, and Iraq, since the inevitable consequence will be increased flows of "rent" from the poorest countries of the world to the richest, with little prospect of achieving the promised yields.

While proponents of property rights in biological material argue that monopoly rights are a necessary incentive for innovation and capital investment to support the development of new drugs, therapies, and crops, claims that agricultural biotechnology can alleviate world hunger by developing crops that consistently and reliably provide increased yields and that withstand pests, drought, and other unpredictable forces have not been substantiated. In fact the opposite is becoming more and more evident. The 2007 Friends of the Earth report *Who Benefits from GM Crops?: the Rise in Pesticide Use*, shows that *not one* of the GM crops successfully commercialized thus far has been modified for enhanced nutrition, increased yield potential, drought-tolerance or any of the beneficial traits touted by the biotech industry. This is evident in figures from the ISAAA (International Service for the Acquisition for Agri-biotech Applications), a prominent lobby group for agricultural biotechnology. Virtually all of the gm seed planted around the world (80 million hectares) is in four crops: soy (58%), maize (25%), cotton (13%) and canola (5%) (ISAAA Brief 35-2006). These crops have been modified for only two traits: glyphosate resistance (71%) which Monsanto's Round-up ready herbicide utilizes, and insect resistance (18%) using an insecticidal protein from the soil bacterium Bacillus thuringiensis or Bt. The remaining 11% is made up of 'stacked' varieties of corn and cotton than contain both traits (Villar, Freese, Bebbe, Bassey, N. Amendola, Ferreira, 2007). Most of these crops are either grown in or exported to rich countries, chiefly for animal feed, but also for a growing biofuels industry. Moreover, there is now evidence showing that many of these crops do not produce the high yields in the field that they might in highly controlled laboratory or test situations, nor do they yield as much as conventional varieties (Benbrook, 2004), a fact that both the US Department of Agriculture (Fernandez-Cornejo and Caswell, 2006) and Agriculture and Agri-Food Canada (AAFC) (Beckie et al, 2006) also acknowledge. Despite a booming agribusiness industry and (until very recently) world food surpluses, food insecurity and hunger have remained a persistent global problem (Hurt 29, Villar et al). Furthermore, evidence increasingly shows that glyphosate resistance has spawned an "epidemic" of superweeds and a subsequent rise in use of other chemical applications (Villar et al). Meanwhile, the ISAAA proudly proclaims a 13% growth in global biotech acreage in 2006, with a value of over $6.8 billion, and predicts that gm acreage will double by 2015.[79] The number of farmers worldwide planting these crops grew from 8.5 million to

[79] It should be noted that the ISAAA figures for gm crop area have been criticized as "grossly inflated," suggesting that the success of the gm crop revolution is questionable. See the Institute of Science in

over 10 million over the 2006 year. More than 90% of these farmers are small resource poor farmers in developing countries; in fact the growth rate in developing countries (21%) was substantially higher than in developed countries (9%) (ISAAA Brief 35-2006), indicating where agri-biotech firms see the greatest potential for market growth. Given the disparity between the hype and the reality regarding the performance, ecological impact, and distributional consequences of gm crops, the prospects for farming communities where they are adopted should be cause for alarm.

In fact, agribusiness insists that the remaining limited rights of farmers to save seed, particularly those still entrenched in UPOV-78, which many countries are still signatory to, is little more than a means of disguising "improper use" of registered seeds (Swanson, 2002:6). Furthermore, Swanson asserts that many states, particularly developing countries, are unwilling to enforce plant breeders rights because of the disparity between the nationality of those who hold the rights (most of whom are large transnationals based primarily in the US and Europe) and the nationality of those who are users (7). Enforcement of these rights by developing countries would not benefit their own citizens, nor would allocation of scarce resources to monitoring farmers to protect the legal rights of foreigners be a high priority. Some countries, such as India, have chosen to interpret and enforce PBRs in their own interests. India passed Farmers' Rights legislation that entitles the farmer to save, share or resell seed even if it is a protected variety (Sahai, 2001).[80]

In economic terms, this non-compliance presents a significant public goods problem for transnational seed companies. They insist that the illegal sale of their proprietary varieties introduces competitors who can reproduce the plant variety identically and in large quantities into the same market (although how they would manage this to the degree that it would represent a significant threat to powerful seed companies remains unexplained). Seed producers claim inadequate protection is a significant disincentive for the private sector to invest in research and development of new crop varietals to combat the persistent problems of pest resistance and yield decline that attach to the

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Society Global GM Crops Area Exaggerated at http://www.i-sis.org.uk/GlobalGMCropsAreaExaggerated.php.

[80] Although it set an important precedent, implementation of the legislation has been problematical because of a number of complex and contentious issues, including defining exactly what farmers' rights are. *See Farmers' Rights in India: a case study* at http://www.fni.no/doc&pdf/FNI-R0606.pdf

widespread use of a small number of plant varieties in modern agriculture (Swanson 8) despite the obvious observation that it is IP protection itself, since monopolies prefer a single product that captures the largest market share, that has largely contributed to the lack of diversity we now have in commercial food crops. Because of the self-reproducing nature of the seed, which necessarily involves a form of biological "copying," enforcement of IP rights takes on added importance in the realm of agriculture. Scarcity must be artificially created in order to preserve and expand market demand.

3.2.2 GURTS (Genetic Use Restriction Technologies)

The "problematic" enforcement of plant breeders' rights presented by farmers' rights and the lack of enforcement of PBRs, particularly in developing countries, encouraged the plant breeding industry to pursue a technological rather than a legal solution to this problem, as Swanson explains (7). Biotechnology made possible one of the most contentious genetic engineering developments yet in genetic use restriction technologies (GURTs), otherwise known as terminator technology.[81] According to Swanson, an agricultural economist, GURTs are the "logical intersection" of three distinct processes: agricultural, legal and technological (Swanson 8). They provide a solution for the enforcement problem by adapting the successful methods of appropriation used in hybrid varieties to genetically modified crops (13). It is accomplished by incorporating a mechanism to turn previously introduced genes on or off in the seed using external stimuli such as chemicals or other physical stimuli. The two main categories of GURTs are trait-related or T-GURTs, which control for traits such as nutrient production, stress tolerance, or insect resistance; and variety-related or V-GURTs, which control

[81] Concerns over the economic, ecological and social consequences of introducing this technology led to the *de facto* moratorium on commercial development of terminator seeds adopted by the UN Convention on Biological Diversity (CBD) in 1999. Monsanto subsequently pledged that it would not commercialize GURTs. However, Monsanto's pledge does not rule out future development of the technology. It is worthy of note that the Canadian government openly supported the cause of terminator seeds. At a meeting of the CBD and the Subsidiary Body on Scientific, Technical, and Technological Advice in Bangkok in early 2005, Canadian officials pressed for the lifting of the moratorium on this controversial technology, criticized an external report critical of terminator that was presented at the conference, and tried to have wording hostile to the moratorium included in a draft text on terminator seeds. This has given rise to speculation that the US, which is not a party to the CBD but is a holder of three terminator patents, prevailed upon Canada to champion their position and the position of the seed industry (Azpiri 10). The de facto moratorium is still in place at the time of writing, but there is little doubt this issue will come back to the negotiating table.

reproductive processes that result in seed sterility.[82] Plants that are genetically engineered to produce sterile seeds at maturity will not germinate if saved and planted. If farmers want to make use of the improved variety, they must buy the seed every season. GURTs, therefore, are the ideal mechanism to deal with the problem of farmers' rights, providing perfectly enforced intellectual property rights because the innovation (the protected trait) remains protected indefinitely. It is not reproducible using conventional breeding technologies. Enforcement problems that arise out of the asymmetry between the nationalities of investors and users would disappear, and the potential for increased profitability would increase dramatically (Swanson 8). It would also render inconsequential the opposition to proposed changes in seed laws of countries like Canada, which still retains a farmer's right to save and re-use seed under UPOV 78.[83]

Swanson believes that, in the abstract, and providing that all other things are equal, the "enhanced appropriability of the benefits from innovation can only represent a social advance" (9). Swanson appears to be a champion of the maximalist point of view that stronger IP rights will necessarily have wide social utility, a point of view which this work finds problematic. However, he emphasizes what I have noted earlier in this work: there are great disparities between developed and developing nations in terms of technological capacity, populations of the extremely poor, and government resources. This means that the distribution of benefits from enhanced appropriability will be similarly "highly skewed," as will the potential for disastrous results and the capacity to deal with them (9). Swanson aims his analysis at the *actual* effects that the adoption of GURTs is likely to have as a result of these existing disparities, rather than stating any principled objection to the concept of GURTs or the notion of patent rights on crop genetic material. Nevertheless, his argument is a useful one to summon in opposition to an IP-dependent technology which removes the last barrier to complete domination of agriculture by multinational agrochemical corporations: the self-reproducing nature of the seed. Those who argue that GURTs will be a beneficial development for farmer and consumer alike because transnational firms are "uniquely situated" to provide communication and

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[82] For further discussion of GURTs, see also the Commission on Genetic Resources for Food and Agriculture (CGRFA) background paper *Potential Impacts of Genetic Use Restriction Technologies (GURTs) on Agrobiodiversity and Agricultural Production Systems* at ftp://ftp.fao.org/ag/cgrfa/BSP/bsp3E.pdf

[83] See for instance "Nine things farmers need to know about the seed sector review" on the National Farmers' Union website at http://www.nfu.ca/seedsaver.html

transfer of technology across national borders ignore forty years of experience with diffusion of hybrid varieties, which demonstrated that it was rent appropriations rather than diffusion rates that increased substantially (20). In fact, Swanson claims that the diffusion of hybrids to developing countries occurred at slower rates than conventional varieties and notes that "it is the brute nature of use restriction technologies to inhibit the free flow of information" (18). The current configuration of the industry and the tendency of IP regimes to emphasize protection rather than diffusion of new technological developments means that the primary impacts of GURTs will likewise be distributional, as Swanson concedes. He estimates that the annual purchase of inputs using GURTs would increase rent appropriation by a factor of six to eight, which is a striking increase in profit potential and represents an equally striking threat to the self-sufficiency of small-scale farmers in the developing world, most of whom are subsistence farmers (Swanson 15). Given that the small-scale resource-poor (in terms of cash and credit) farmer is responsible for the vast majority of the agricultural production in developing countries and is therefore the key to food security there, any increase in costs and disruption in production methods imposed by GURTs would be nothing short of disastrous. Furthermore, if the plant breeding industry introduced new traits only into GURTs varieties, the public sector could be completely displaced from breeding activities because of the cost of licences and restrictive material exchanges (Swanson 255).[84] Any remaining public control over the direction and diffusion of agricultural R&D would be lost and corporate-dominated R&D would be directed to crops and pests with the largest market share rather than to indigenous crops and pests. Clearly the imposition of an industrial strategy that eliminates farmers' rights completely in order to reshape the distribution of access and benefits to the greater advantage of private interests will have significant negative social and ecological impacts, locally, nationally and internationally (9-10).

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[84] The only way to access the trait would be to purchase the trait for a single restricted use. Swanson contends that in the past new traits in plant varieties have diffused into general use in agriculture over time partly because of the ability to undertake breeding activity making use of them, much of it done by public institutions. GURTs would preclude this breeding activity (254). The public sector could focus on non-GURT varieties, but new conventional varieties typically take 20 years to develop versus approximately 5 years using genetic engineering. If valuable traits are developed first through genetic engineering and only embedded in GURTs varieties there would be pressure to pay the cost of licensing rather than wait for conventional breeding to produce an equally valuable trait. Swanson believes that given enough time, the varieties developed by public institutions would become inferior, and the suppliers of viable seed reduced. Under these conditions, there would be much-increased prices for GURTs varieties (254-255).

3.2.3 Genetic Pollution

GURTs are also highly controversial for another reason. This technology is being promoted as a biological tool to prevent genetic pollution (the contamination of non-transgenic crops by their genetically modified counterparts through cross-pollination) by its developers, which include the US Department of Agriculture in partnership with seed company Delta and Pine Land (since purchased by Monsanto) and Monsanto, the world's largest seed and agribusiness company. In light of the distributional benefits that would derive from GURTs for these rights holders, this seems a specious argument, employed to justify a wholesale restructuring of industrial agriculture and public policy for the benefit of a small range of private interests. In fact, there is evidence to show that GURTs technology entails a significant risk in that sterility could be passed on to non-GURTs crops, effectively destroying the potential for future harvests from traditional seed (GeneWatch 1-2, Thompson 235).

Genetic pollution is, in fact, another "pivotal" source of tension between proponents of genetically engineered crops and advocates of traditional approaches to agriculture (Oguamanam 2007:260). It poses significant threats to the integrity of indigenous and local crops and thus to the economic survival of traditional and small-scale farmers in developing countries, as well as their counterparts in industrialized countries who eschew the industrial, monoculture paradigm of agricultural production. Moreover, even conventional farmers growing monocultures of non-gm crops are upset by genetic pollution because it is eroding their markets in Europe, Japan and New Zealand, for instance, where there is wide public resistance to gm crops. The adoption of gm soya in Argentina provides a text-book example of the genetic pollution caused by the glyphosate-resistant Roundup Ready variety and the risk posed to the country's agricultural sector (see Branford, 2004 and Brown, 2004). The case of Canadian Percy Schmeiser hints at what may be in store for farmers in developing countries who may inadvertently fun afoul of multinational seed corporations through adventitious (accidental) genetic contamination. Schmeiser, a canola farmer and seed breeder in rural Saskatchewan, had for over forty years sowed his crops from seed he saved from the previous year.[85] In fact, his business was seed development. Monsanto's glyphosate-resistance gene, which it markets as Roundup Ready canola, somehow

[85] See Monsanto Canada Inc. *v.* Schmeiser, [2004] 1.S.C.R. 902, 2004SCC 204

made it into one of his fields, likely from gm-seed blown from a neighbouring farm or passing truck. Schmeiser had saved and replanted the seed from his crop the following year, as was his normal practice, knowing that some of the seed came from volunteer gm canola. Short of purchasing new seed at substantial cost, Schmeiser had little choice but to replant, since his livelihood was at stake. Even then, there would have been no guarantee that subsequent crops would not have been similarly contaminated. Monsanto sued for patent infringement and won in a closely decided 5-4 decision at the Supreme Court of Canada. There are several unsettling aspects to this case, not least of which is that intellectual property rights were deemed to have priority over the conventional right of a farmer to the crop in his field. This case demonstrates that the "standard of liability for patent infringement [is] a strict one" (Oguamanam. 2007:266). Although Monsanto admitted that Schmeiser did not obtain the patented seed illegally, the corporation argued that this fact was immaterial to the case of infringement, and the court agreed. In addition, the defendant's knowledge or lack thereof of the presence of a patented gene in his crop was not material to the finding of infringement. These facts only contributed to a reduction in the damages awarded to Monsanto. In fact, Schmeiser never profited from his "use" of the gm seed since he did not spray with Round-up. The fact that "the Court affirms an extremely liberal interpretation of "use" of a patented object to include mere possession" (and not commercial benefit) should be of broad concern to farming communities (Oguamanam, 2007:266). Furthermore, there is a fundamental inadequacy and inequity in the law if agricultural biotech corporations are protected from liability for genetic contamination while the farmer is held responsible for patent infringement through "adventitious possession." It is also significant that the Supreme Court did not consider the distinction it made between lower and higher life forms in its earlier *Harvard Mouse* decision (Oguamanam 2007:266). In that case the Court decided that the genetically engineered mouse did not qualify for a patent because the Canadian Patent Act did not extend to higher organisms, although it accepted the notion of patents on engineered micro-organisms. In *Schmeiser* the Court held that Monsanto's patent effectively extended to the plant in which the engineered gene is found, even if the plants were Schmeiser's canola plants. The ruling effectively states that higher life forms that contain a single patented gene are deemed to be the property of the owner of the gene. The only way to deal with this liability is for farmers to destroy all of their seed, both contaminated and uncontaminated, because there is no way to distinguish between the two without spraying Roundup – and that would kill all

uncontaminated seed. In effect, *Harvard Mouse* may have been "subtly" overruled in this decision, according to Oguamanam (2007:266). Certainly *Schmeiser* contradicts this earlier decision, but only just. Since Monsanto had "specifically disclaimed whole plants in their patent," as they were required to under Canadian patent law, four of the justices argued that patent protection could not logically extend to the plant or its offspring (Clark 3). According to this interpretation, Schmeiser should therefore not be found guilty of infringing by the act of saving and replanting the seed containing the gene. Furthermore, since Monsanto was not awarded legal costs, damages, or any of the value of the crop containing the patented gene, the company's predilection for pursing alleged patent infringers in the courts should be constrained, at least in Canada (1).[86] Clark also points out the Schmeiser decision raises questions about its practical workability in circumstances where contamination by multiple patented genes becomes widespread – who would be the owner of a plant containing more than one patented gene (7)?[87]

This case lends weight to the argument that patent law, which is rooted in concepts designed to protect mechanical inventions, is unable to deal with the problems flowing from proprietary rights over genetic material. Judicial decisions have done little to mitigate the tensions between agricultural biotechnology and alternate forms of agricultural practices. Oguamanam describes the current situation as one in which "traditional or alternative agricultural practices are under siege by agricultural biotechnology" (2007: 266). Clearly, the confluence of intellectual property rights and genetic engineering has had a disruptive and coercive effect in the realm of agriculture. The notion that any kind of wide social utility is derived from the manner in which these technologies and their associated rights have been deployed is a fiction. The benefits accrue to corporate interests and their shareholders, and the costs, which are significant, are borne primarily by small-scale farmers, particularly in developing countries. Patents on plant germplasm have proven to be a very effective tool for achieving market dominance and generating profit, but the protection they afford has not encouraged *in situ* innovation and the spread of valuable knowledge in the field, and has in fact contributed to the genetic vulnerability of the world's major food crops. Patent protection

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[86] Monsanto had taken out writs against the Schmeiser home, farm and business. In the US, where patents on higher life forms are permitted, Monsanto has been awarded over $15 million in infringement cases.

[87] Clark explains that it is "impossible to segregate GM seed from non-GM seed...companies routinely put a disclaimer on every sack" of conventional seed stating that "100% purity" in genetic makeup is "currently not achievable for any agricultural product" (7)

has not led to improvements in basic staple crops and patented seed has not been a factor in alleviating world hunger. What we see instead is the misappropriation of culturally specific knowledge, elimination of traditional farmers' rights, genetic pollution and erosion, and a massive transfer of wealth from the developing world to a handful of transnational corporations based in a few industrialized countries. The world's poor subsistence farmers are at particular risk of losing their self-sufficiency and food security as a consequence of the impact of intellectual property rights over seeds and plant genetic material. The expansion of intellectual property rights to plant genetic material, legitimized through western intellectual property regimes and incorporated into TRIPs and UPOV, more appropriately describes a process of enclosure by corporate interests.

Implicit in the Western scientific episteme and its intellectual property jurisprudence is a "disdain" for traditional knowledge in both its historical and indigenous meanings, which it considers inferior and unworthy of IP protection (Oguamanam, 2007:264). Nevertheless, alternate forms of IPRs are enjoying considerable attention in many quarters, including the UN, as a mechanism for protecting the traditional knowledge of indigenous peoples from misappropriation, providing an appropriate level of reward for their contributions, and for protecting biodiversity.

3.3 "Uncommon Property"[88]

Chander and Sunder note that many progressive scholars in intellectual property have "sharply rebuked" the claim that property is the "ultimate panacea" (1333). These scholars (for example James Boyle and David Bollier) are at the leading edge of a new public domain[89] movement that has emerged in the information age to protect the commons of information from enclosure because of the essential role it has in protecting free speech and facilitating the wide dissemination of socially valuable knowledge. However, Chander and Sunder argue that advocates for the public domain, in insisting that traditional knowledge and genetic information be kept in the global commons, inadvertently aid the cause of corporations and all too often ignore the distributive

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[88] Coined by Chander and Sunder to describe hybrid property and limited commons regimes. See page 1346.

[89] Chander and Sunder define public domain as "resources for which legal rights to access and use for free (or for nominal sums) are held broadly" ("broadly" could refer to the entire population of a village to the entire population of the world). Commons refers to resources shared among a defined group. Group-held resources are labeled "limited commons property" while universally available resources are known as a "global commons" (Chander and Sunder 1338).

consequences of the public domain. They are concerned that the "increasingly binary tenor" of intellectual property debates – choosing either property or the public domain – obscures or ignores "other important interests, options, critiques, and claims for justice that are embedded in many new claims for property rights" (1334). Many of these arise in the global South as a consequence of the unequal exchange that typically defines the relationship between providers of genetic material and industrial users who convert it into proprietary goods. Chander and Sunder maintain that "leaving a resource in the public domain is not enough to satisfy societal ideals. It matters how that public domain is to be structured" (1337). This is certainly one way to view the problem of the public domain in plant genetic resources, which is defined by explicit rules which circumscribe claims of ownership that do not fit the paradigm of the individual innovator and his/her scientific methods.

Oguamanam views it from slightly different perspective. He argues that the historical record of the malleability of conventional intellectual property rights suggests that they could be "tailored to accommodate and protect indigenous knowledge forms" (156). Given the record of changes to IP law to accommodate biotechnology, there is no reason why western IP regimes cannot accommodate traditional knowledge forms. But many of the emerging national and regional legal regimes for implementing the provisions of Article 15 of the CBD (discussed below) focus on the "economic and reward aspects of genetic resource transfer" (Oguamanam 11). As Oguamanam points out, most developing countries are interested in taking advantage of the possible economic benefits of their genetic resources. Anti-biopiracy and anti-patenting campaigns often focus on the financial and material exploitation of local and indigenous groups; the undervaluing of their resources is juxtaposed with the fortunes made by pharmaceutical and agrochemical companies once the genetic material is converted into commercial products. Oguamanam acknowledges that there is some merit to *sui generis* options based on conventional IP rights in the context of the TRIPS Agreement. These rights are imagined as legally enforceable additional rights that either "exclude others from certain protected acts" or that incorporate payment for permitted uses of protected knowledge (216). The appeal of this option derives from the status of TRIPS as one of the key international legal instruments governing IP, and may carry more weight than protection of Traditional Knowledge under the CBD. However, Oguamanam argues that these access regimes tend to foster a "Western IP hegemony" that is

incompatible with local knowledge and emphasizes access over the preservation of cultural integrity and biodiversity (216). These tendencies are evident in the hybrid property forms described below which Chander and Sunder term "uncommon property," each of which purports to address the unequal exploitation of the public domain of knowledge by embedding the "concerns outside of utility and liberty" which normally define the discourse on property (1368).

The Convention on Biological Diversity (CBD)[90] emerged as the primary challenge to issues of unequal exchange between North and South with respect to genetic resources and to growing worldwide concerns about the need for biodiversity conservation. A byproduct of the UN Conference on Environment and Development, the CBD was established in June 1992 at the Earth Summit in Rio de Janeiro. The concept of biodiversity emerged in the 1980s as a way of articulating the growing awareness of the destruction of biological diversity as a consequence of global processes of industrial and agricultural development. The CBD is intended to provide a framework for the conservation and sustainable use of biodiversity and was signed by almost 200 countries.[91] Article 1 of the CBD states these three objectives: (a) the conservation of biological diversity, (b) the sustainable use of its components and (c) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, which would be achieved through appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and through appropriate funding. While the CBD stresses that individual countries have sovereign rights over their biological resources (Article 3), and recognizes the rights of indigenous cultures to preserve their knowledge and resources (Article 8), it also states that the Convention's provisions shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement. In other words, the rights set out in the Convention must be consistent with the intellectual property rights embedded in the TRIPS/UPOV regime. The CBD thus incorporates two goals which appear inherently diametrically opposed – conservation and commercial exploitation of genetic resources.

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[90] The text of the Convention on Biological Diversity (CBD) can be found at http://www.cbd.int/convention/convention.shtml

[91] See http://www.cbd.int/convention/parties/list.shtml for a list of Parties to the Convention.

Furthermore, it can be argued that these goals are not weighted evenly in the distribution of benefits, especially since bilateral access and benefit-sharing agreements (ABS) are the designated mechanism for achieving consistency with IP rights. Just as they are in *sui generis* national statutes for protecting traditional knowledge and genetic resources, ABS agreements are negotiated between nations or their designated communities or public institutions, on the one hand, and private organizations, on the other. As Boisvert and Caron explain, the terms of these contracts are frequently kept secret and are subject to no external arbitration. The benefit-sharing provisions "strongly depend on the respective powers and negotiating skills" of the two parties (156). The likelihood of well-informed, equitable contracts seems remote given that there can be a wide gulf between the two contracting parties on these counts. Bioprospecting contracts also change the relationship between farmers and germplasm collectors, and among farmers and farming communities. Brush (1999) points out that "the contract mode and its ensuing relationships for obtaining biological resources are incongruous with the nature of indigenous knowledge and management of biological resources" (537) typified by collective innovation and management. With the introduction of market contracts, open exchange of varieties among farmers would be curtailed as they compete for contracts or for access to varieties also sought by other industrial users (Brush, 1994 30). This undermines the conservation mandate of the agreement and the dissemination mandate underlying IP theory. ABS agreements also present difficulties in assessing which community or group is eligible for the economic benefit, especially with agricultural genetic resources, which often overlap borders and communities. And because national sovereignty over biological resources is the only form of sovereignty recognized in the CBD, indigenous peoples who utilize commons property systems may find their heritage negotiated away by their national governments without their consent or consultation.[92] These issues suggest that ABS agreements could be very destabilizing for local communities and perpetuate claims of inequity. It is also important to note that the access and benefit provisions of the CBD do not apply to the germplasm collections stored *ex situ* in national seed bank collections prior to the agreement coming into force (Article 15) because determining origins would reputedly prove too difficult. Furthermore, ABS contracts may be futile in the face of a global system in which the commercialization of traditional knowledge and genetic resources occurs far from the

[92] See *The Catch: Perspectives in Benefit Sharing*, edited by Beth Burrows, 2005 for a comprehensive overview of issues arising from benefits sharing agreements from the perspective of NGOs, indigenous peoples and diplomats.

source; transgressions by corporations elsewhere would be difficult and certainly expensive to prosecute (Chander and Sunder 1367).

Many critics feel that the legal framework and other voluntary guidelines of the CBD will do little to prevent the privatization of resources through the use of patents and PBRs (Burrows 2005, Shiva, Etc Group, Richards). And rather than presenting a real framework for global conservation, it is conceivable that the CBD will only accelerate privatization of genetic resources and monopolistic control given the reliance on bilateral benefit sharing with its attendant drawbacks. Furthermore, while Article 6 maintains the right of countries to have access to new biotechnologies such as genetic modification techniques[93] to help in conservation or biological resource exploitation, technology transfer under the agreement has been hampered because the US, which dominates biotechnology research and development, has yet to ratify the agreement. It was unacceptable to the US that restrictions on intellectual property rights or the operation of free markets in genetic resources were appropriate or necessary to encourage technology transfer (Straus 152). In addition, the provisions dealing with technology transfer ("as appropriate" and "in a fair and equitable way") are ambiguous, making it difficult to establish real and attainable targets (Conforto 382).

Establishing inalienability is another way of preventing the unequal exploitation of the intellectual commons. For instance, traditional knowledge databases are being created by a number of countries to document their innovation heritage, China and India being notable examples. Other initiatives are underway in Africa.[94] And the WIPO has set up a Traditional Knowledge Digital Library, which takes advantage of information technology to digitize traditional knowledge. By establishing prior art and making the databases available to patent offices worldwide, the hope is that attempts to patent and sell traditional knowledge will be defeated (Chander and Sunder, Conforto, Ruiz) However, as I pointed out earlier, patent offices do not routinely check for traditional knowledge in their searches for prior art. These databases also carry a significant risk in that they can only prevent the privatization of that which is already in the public domain – not "inventive leaps over the prior art" (Chander and Sunder 1363). As long as a patent

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[93] This presumes that genetic modification techniques have a contribution to make to conservation efforts – certainly the ability of biodiversity and biotechnology to co-exist is suspect in the current political economy landscape.

[94] See the World Bank Group, Database of Indigenous Knowledge and Practices at http://www.worldbank.org/afr/ik/object.htm (last visited December 28, 2007).

applicant can demonstrate such an inventive leap, knowledge in the public domain can be utilized. Traditional Knowledge databases, in collecting indigenous innovation, could offer up a wealth of resources to commercial interests for further exploitation through technological means if they were to be made widely available beyond patent offices and international search authorities for the Patent Cooperation Treaty. Furthermore, there are contentious issues surrounding patents on genetic material that revolve around the criteria used to establish an inventive leap, particularly the novelty requirement.[95] Oguamanam identifies other arguments against this kind of initiative. For instance, collection in a database implies that this knowledge is static rather than dynamic and does not take into account incremental innovations that constantly occur in local communities. Furthermore, some argue that conversion of traditional knowledge to digital form and storage in a database removes that knowledge from its cultural context, diminishing its "unique spiritual and cultural character" (2006: 151).

Another kind of "uncommon property" takes the form of alternative property rules, such as national *sui generis* statutes regulating traditional knowledge and genetic material and international treaties such the International Treaty on Plant Genetic Resources (ITPGR). These statutes and treaties generally declare indigenous knowledge and genetic information to be the property of defined communities, whether local or national (Chander and Sunder 1364). Many countries have implemented national statutes which create limited commons property regimes that make property available for free to those inside the community but charge a fee for outsiders. But their ability to exercise their rights is generally limited to the provisions they are able to negotiate in bilateral access and benefit-sharing agreements (ABS). A well-known example of this method of regulating bioprospecting activities is the 1991 agreement between Costa Rica and the pharmaceutical multinational Merck. INBio, the National Institute of Biodiversity of Costa Rica, provided unrestricted access to its tropical forests in return for US $1 million as well as an undisclosed percentage of royalties from any commercial product derived from samples collected. Activists consider this to be an insignificant sum and stress the potential for profit from these samples (Sharma from Burrows 8). In 1998 Costa Rica declared state ownership over biodiversity and now requires state permission, prior informed consent of the local community, and royalty sharing agreements before access will be granted. This kind of statute is increasingly common, adopted by at least twenty

[95] See Chapter 4

countries such as Panama, Brazil, Portugal and Peru as well as the African Union (Chander and Sunder 1365). However, bilateral benefit-sharing agreements in national statutes are a contentious issue for the same reasons as they are in the CBD.

Oguamanam describes the efforts underway in several fora to devise a *sui generis* system which incorporates the "customary regimes and protocols for the protection of knowledge in indigenous and local communities" (2006:11). He underlines the importance of developing a distinctive *sui generis* option that has "less emphasis on its attachment to the conventional intellectual property system" but will at the same time be internationally relevant (217). In fact, the working group of the governing body of the CBD, the Conference of the Parties (COP), in conjunction with the WIPO's inter-Governmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC-GRTKF) is looking at how article 8(j) of the CBD, which emphasizes the preservation of the cultural integrity of indigenous knowledge, can be implemented. Both of these institutions have recognized the need to investigate customary strategies for protecting knowledge that already exist in various indigenous communities. However, the difficulties in overcoming the dominant influence of the western scientific paradigm and the concept of individualized property rights currently incorporated into global IP regimes should not be underestimated.

It must be acknowledged that, at present, the TRIPS Agreement remains the most authoritative international agreement governing plant genetic resources. In allowing international capital to define the terms of the discourse with respect to access and benefit sharing and to dictate concessions to intellectual property in agreements such as the CBD and *sui-generis* national statutes, Richards maintains that the resistance movement has "conceded what properly ought to be resisted" – the commodification of knowledge (194). He argues that the expansion of the "contract mode" in bilateral ABS agreements is a means for international capital to extend its reach over larger areas of the globe (197). The term "bioprospecting" suggests that genetic resources represent potential exchange values that are "recognized and valued as such by local communities" and furthermore, presumes the acceptance of an "essentially capitalist epistemology" (197). But contract relationships typically run counter to traditional understandings of plant cultivation which incorporate a cultural element that cannot be reduced to monetary considerations. Brush adds that the concept of bioprospecting

emerged during the time when the neoliberal politics of privatization was being embraced and sold as a means of empowering developing countries, as the discussion of the negotiations for the TRIPs Agreement has pointed out. He calls bioprospecting "one of the more fully developed proposals" to transform resources in the public domain into a stream of compensation (1999:538-539). Once these concessions to IP are made, and given the existing economic and technological disparities between developed and developing countries and the typical leverage exercised by developed countries during bilateral negotiations, "unequal exchange in knowledge-based commodities is virtually guaranteed" (Richards 194) even if the neoliberal privatization mantra has lost its lustre. Nevertheless, the CBD framework does offer an "intellectual grounding" for the notion that nations and communities' rights to their genetic resources must be respected (Chander and Sunder 1366).

Richards emphasizes that the stipulations regarding IP rights over agricultural genetic material contained in these global IP agreements reinforce the US position that there should be unrestricted international flows of basic plant genetic resources and strengthened private sector intellectual property rights to reward those involved in their development into marketable form (180). The diminishing recognition of farmers' rights and restrictive interpretations of prior art are key elements in this drive to gain unimpeded access to these resources. The importance the US attaches to unrestricted access to agricultural germplasm is also reflected in its changing attitude toward the function and role of International Agricultural Research Centres (IARCs) and *ex-situ* collections of plant genetic materials. As technological advances have made it possible to convert genetic material formerly in the public domain into proprietary goods protected by patent rights, IARCs have increasingly been relegated to the preservation of genetic material, while the applied R&D, which focuses on producing commercial products, has been assigned to private capital (Richards 188). This is reflected in the history of reduced funding to IARCs and is borne out by statements made by USAID spokespeople who link access to issues of "economic competitiveness in an increasingly globalized trade environment and...US diplomatic and security interests" (qtd. from Richards 189). USAID urges open access for crop genetic resources, and its notion of benefit sharing reflects the extant neo-liberal doctrine: "Even in the current era, where privatization of agricultural varieties and knowledge is prevalent, the case can be made that the inventions that result from this privatized knowledge base ultimately lead to a

greater public good and that, in itself, is an implicit type of compensation" (from Richards, 189). In this scenario, developing countries are relegated to storehouses for a rapidly disappearing global gene pool of plant genetic resources, while developed countries, who expect to have a right of unlimited access, convert the so-called unimproved resources into GMOs whose primary purpose is to produce market share and profits (189).

In 2001 the 1983 International Undertaking on Plant Genetic Resources[96] was renegotiated and renamed the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGR).[97] This agreement is not included in the discussion of the forms of hybrid, or "uncommon property," that Chander and Sunder argue are necessary to counter the unequal exploitation of the public domain, perhaps because it accepts the principle of patents on crop genetic material. It was largely drafted by Cary Fowler,[98] who had been engaged by the FAO to draft a global plan of action for the conservation and sustainable utilization of plant genetic resources, and was intended to be the first step toward a "rational worldwide seed bank management plan" (Seabrook 70). The treaty's underlying principle is that food security and sustainable agriculture depend on a sufficiently wide genetic base to draw from. Its objectives are the "conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security" (ITPGR, 2). Like the CBD, it sets out legally binding rules for facilitated access to and exchange of Plant Genetic Resources for Food and Agriculture (PGRFA), but instead of relying on bilateral agreements, it utilizes a multilateral system and covers both farmers' varieties and patented seeds. It too recognizes the sovereign rights of states over their genetic resources (2).

This agreement was considered crucial because the CBD was designed with other kinds of biodiversity as its primary focus - in particular the kinds of organisms where origins are easier to determine than agricultural biodiversity. Plant genetic resources for food and agriculture (PGRFA) have a long history of trade, domestication and breeding

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[96] The text of the 1983 Agreement can be found at http://www.fao.org/ag/cgrfa/IU.htm

[97] The Treaty can be found at ftp://ftp.fao.org/ag/cgrfa/it/ITPGRe.pdf

[98] Professor Fowler is Executive Director of the Global Crop Diversity Trust. His career in the conservation and use of crop diversity preservation spans thirty years. See http://www.croptrust.org/main/ for more information on the Trust.

activity, often involving farmers of different regions and nations. The complex origins of PGRFA would provide insurmountable difficulties if agricultural biodiversity exchange and access and benefit-sharing agreements had to be managed through the bilateral agreements provided for under the CBD (Borring 1). Access to germplasm in the Treaty's Multilateral System (a communal seed collection that is held both *in situ* and in international seed banks, that currently applies to sixty-four food crops and forages) is only granted on the condition that users will not then claim IPRs that will limit access to seeds from the collection (Article 13). However, if a commercial product is developed through research on the germplasm accessed and is not made available for further research and development, the Treaty calls for payment of an "equitable share" of the profits to a multi-lateral trust fund to be established for the purposes of benefit sharing, conservation and other activities and programs (Article 13.d.ii).

This revised version of the treaty explicitly recognizes farmers' rights to "save, use, exchange and sell" farm-saved seed (Article 9) in direct contrast to the UPOV and TRIPS Agreement. Farmers' rights are, in fact, one of the central pillars of this treaty. It asserts the rights of farmers to participate equitably in benefit sharing, provides guidelines for the protection of farmers' traditional knowledge, and provides for compensation to farmers for their conservation of genetic resources *in situ* (Article 5.d). The treaty thus provides a way of recognizing the contributions farmers make to conserving and enhancing plant genetic resources for food and agriculture. It also addresses the major weakness of *ex situ* conservation, which is that it is unable to maintain the biological processes that generate and select new crop germplasm, especially the "spatial and temporal dimensions of crop evolution" (Brush:1994, 6).[99] If seed is not grown out regularly, germination rates decline. Without the seed-sharing and breeding activity that farmers undertake, crop diversity declines.

The ITPGR is consistent with the view articulated by Brush (originally suggested by Mooney and Fowler in 1990) that "compensation for biological resources is a possible means to incorporate traditional farmers and indigenous people into the world economy while at the same time strengthening local cultural knowledge and resource

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[99] See Stephen Brush, *Providing Farmers' Rights Through In situ Conservation of Crop Genetic Resources*, November 1994, for an in depth assessment of the value of *in situ* conservation of crop germplasm as a means of addressing both equity and conservation concerns. Brush also asserts that even though geneticists can replicate and accelerate processes of genetic recombination, mutation and hybridization, they cannot replicate the amount of natural diversity in field conditions (6).

management..." (1994:12). It asserts that non-market means of financing crop conservation (represented by the multi-lateral trust fund) are desirable and necessary because of the failings of market mechanisms such as IP rights and contracts. Markets restrict open exchange and promote genetic erosion; transaction costs are high; and sovereignty issues (agricultural genetic resources often overlap borders and communities) will confound markets (1994:37). Moreover, as Boyle has pointed out, the market mechanisms promoted by an authorial IP regime render the informal innovation by farmers invisible (1996:125). The focus on rewarding technology-mediated, individual innovation in the current IP regime, reinforced by narrow criteria for protection, has ensured that there is no market for the less genetically uniform crop genetic resources developed by traditional farmers (Brush 23). The ITPGR, because it operates as a multilateral system in which benefit sharing is not defined by bilateral agreements, provides a stronger basis on which to achieve both conservation objectives and recognition of the contributions of farmers in regions of crop diversity, despite the agreement's concession to the principle of patented seed.

However, it is also significant that the agreement makes no mention of farmers' rights over their landraces. Moreover, the efficacy of the ITPGR is further diminished by the fact that the US has not yet ratified this agreement, and in a recent development, signatory governments have been unable to find the $4.9m in funding that would enable the treaty's Secretariat to continue its basic functions (ETC Group, 2007). Funding in support of *in situ* seed conservation and capacity building has also failed to materialize. France, Germany and Australia, whose seed companies are reportedly major beneficiaries, have yet to contribute any funds to the treaty's operations (ETC Group (2007). This abdication of responsibility demonstrates an unacceptable level of ignorance about the need for *in situ* conservation and the role of farmers' rights in preserving vital plant genetic resources.

The perceived need to maintain the US competitive advantage in the global trading system has translated *inter alia* into a focus on rendering the products and processes from biotechnology techniques into property, which was justified on the basis of upholding the rights of individual knowledge innovators. This priority has prompted juridical and legislative changes which have made it manifestly easier to obtain patents on genes, which yield effective control over plants and their characteristics in the US

(and evidently in Canada too), facilitating the capture of resources from the wider public domain and from local and traditional communities.

This public domain is likely to be exploited asymmetrically to the benefit of developed countries for a number of reasons cited by Chander and Sunder (1351). Limited consumer purchasing power in poor countries will provide limited local opportunities for commercialization; developing countries generally lack extensive government-funded research programs at universities and research institutes and the technology transfer policies that often accompany them; the large capital-intensive investment required to develop and bring a patented product to market is difficult to undertake, especially because of high interest rates typically found in these countries; and lack of familiarity with the patenting process disadvantages local claimants relative to western corporations (1351-2). The result is an intellectual property system "sharply tilted in favor of the developed world" (1353).

CHAPTER 4:
LOWERING THE PATENT THRESHOLD

Chander and Sunder find fault with the public domain movement's binary framework of property vs. public domain, in which, they state, the public domain exists as a "bulwark" against private property. In their view, the public domain ought to be seen as being essential to private property because it "offers a sphere of free works upon which capitalists can draw without either seeking consent or drawing liability" (1343). Neither of these positions captures the essence of the problem in my view. It is true that one of the pillars of IP theory is that innovation depends on the existence of a rich public domain – but the quid pro quo for a limited monopoly right is the disclosure of the information underlying the innovation. The real bulwark against unwarranted incursion into the public domain resides in the limits and constraints set out in the criteria for the grant of patent.

Although the TRIPS Agreement incorporates the traditional patenting criteria of novelty, utility, and inventive step as well as the requirement for disclosure through publication, serious concerns have been raised about the effectiveness of these criteria in consideration of patents on genetic material, particularly in the US, where it is generally acknowledged that there is a lower threshold (Nuffield, Cripps, Oguamanam 2007:265) These concerns point to an increasingly constricted view of the social worth of knowledge as the economic value of information and knowledge increases (May 163). I agree with Boyle, who, I believe, captures the essential issue. Contemporary patent law embraces a "maximalist rights culture" in which it is assumed that "to promote intellectual property is automatically to promote innovation...and therefore the more rights the better" (Boyle, 2004:2). Boyle asserts that these assumptions are "categorically false;" even in those areas where IP is the best way to promote innovation (and he maintains that there are many areas where it is not), the correct balance between the rights of innovators and the rights of the public is essential (2004:2). We have already seen that strengthened IP rights have in fact hampered prospects of innovation in developing countries and raised a number of significant equity and conservation concerns. There are also widespread concerns that the prevailing maximalist rights culture has led to the

adoption of loose criteria for establishing novelty, excessive flexibility in assessing inventive step and other deficiencies in the examination procedure for patents on plant genetic material. Cripps maintains that biotechnology is the only technology which has led directly to changes in patent law and practice, and these changes have fundamentally altered how the traditional tenets of patent law are applied. She describes the traditional tests or standards for patentability dropping to "alarmingly low levels" and in some instances being "ignored in all but name" (Cripps 4). Distorted and lax standards have made it too easy to obtain too many patent rights over bio-resources.

One of the central questions raised about contemporary patent law is, in fact, whether the application of the patent system to DNA sequences[100] fulfills the requirements of the original patent bargain: the stimulation of innovation through disclosure of the information underlying inventions in return for the limited monopoly rights that patents confer. According to the Nuffield Council report, these patents should be, at the very least, the exception rather than the norm (13). In their discussion paper entitled *The Ethics of Patenting DNA*, the Nuffield Council is primarily concerned with the effect of patents on human genetic material. However, the terms of reference refer to both biological and medical research and include discussion of DNA sequences as research tools (xi), a common application in plant biotechnologies. Cripps (2002) also addresses her concerns to patents on medical developments involving human genetic material. In considering whether or not technical criteria for inventive step, novelty or utility are satisfied in these patents, it would seem to me that a distinction between biomedical and agricultural applications should be immaterial. Ethical arguments based on implications for biomedical research involving human genetic material generally carry more weight and are of more immediate public concern. They are, therefore, viewed as more pressing in terms of public policy than those based on agriculture, but questions of technical merit and the downstream effects of inhibiting innovation and unwarranted monopoly should be viewed as equally pertinent.

Like the Nuffield Council, Eisenberg and Cripps believe that patents asserting rights over DNA sequences are problematic (Eisenberg 2002, Cripps 2002). One of the primary concerns is that computational techniques are replacing cloning as the main route to

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[100] DNA or deoxyribonucleic acid forms the famous double helix chain comprised of four different simple molecules called bases. The sequence of these molecules determines the information contained in DNA. A gene is a discrete sequence of DNA that encodes for a protein.

identifying genes, lowering the threshold for inventive step. The earliest patent claims on DNA sequences typically involved cloned genes that enabled proteins to be produced through recombinant DNA technology. Eisenberg explains that the patents on the genes and recombinant materials provided for exclusive rights over the protein expressed and "seemed analogous to patents on new chemical entities" (3). Prior cases involving chemicals provided a clear starting point for patent offices in analyzing legal issues concerning these claims. While patents are not allowed on DNA sequences in a naturally occurring form where there has been no human intervention, patents have been issued on isolated and purified DNA sequences separate from the chromosomes in which they are found in nature, or on sequences spliced into recombinant vectors or introduced into recombinant cells (3). This followed the long-established practice of issuing patents on chemical products which have been isolated and purified through human intervention and made available in a form that is of benefit to society (Eisenberg 3), although one could certainly dispute the benefits of many of the toxic chemicals found in the environment today.

The extension of patent eligibility to DNA sequences occurred when isolated genes (purified natural products) were deemed eligible for patenting in 1988. Isolation and purification of DNA sequences has become, as Eisenberg notes, a "persuasive response" to the notion that patents require human invention (4). However, as the Nuffield Council report points out, the early days of pioneering experiments using positional cloning techniques to discover information encoded in a DNA sequence are long gone, and patents on DNA sequences should be re-examined in light of the patent system's requirement for inventive step. The report states that it is a common occurrence in patenting that at some point protection may no longer be appropriate for a particular invention, and in the case of DNA sequencing, the process of isolating a gene is now a "routine, industrialized process" (Nuffield 69). As computerized techniques for identifying genes have advanced and become widespread, the eligibility of DNA sequences for patenting on the basis of inventive step should therefore have diminished (36). Moreover, it has become increasingly clear that, like the chemical industry before it, much of the work in finding new and useful entities in the biotechnology field is laborious, expensive, and time-consuming - but it is not innovative (Drahos & Braithwaite 43). After the discovery of the DNA molecule and the early technology related to recombinant

DNA, most of what was subsequently done in the field was "pretty well obvious" even according to some patent attorney agents (43).

The utility requirement has also been diminished by the granting of patents on biological material. Many patent applications have been filed involving fragments of DNA, such as expressed sequence tags (ESTs), whose functions are unclear.[101] This has engendered considerable debate about whether DNA sequences meet the test for utility, which in the US requires an invention to show "specific and substantial utility that is credible."[102] The Nuffield Council argues that where "credibility" means no more than theoretical possibility, the threshold for utility has been set too low (31). A September 2005 decision by the Court of Appeals for the Federal Circuit (CAFC), which hears disputes regarding patents, may have a significant impact on the patentability of certain DNA fragments in the US (Fritz, 2005). In *re Fisher* (Fed. Cir. 2005)(04–1465), one of the first cases where the CAFC applied the specific and substantial utility standard to genetic technologies, the court ruled that because the ESTs were being claimed as a research tool without identified specific uses, the standard for utility had not been met. Researchers for the applicant, Monsanto, had isolated and purified DNA from the maize plant during its flowering phase with the intention of using it as a tool for obtaining further gene and protein data. Unless DNA sequence fragments specifically encode for a protein, they do not entail an entire gene. Relatively long chains (polymers) of nucleotides, the building blocks of DNA, make up genes, which when expressed enable the cell to produce various proteins. But the DNA sequence fragments that the researchers isolated were relatively short ESTs and did not encode for a protein. Furthermore, the applicants did not know what genes contained the ESTs or why they might be important (Fritz). While this decision will likely render hundreds of pending patent applications worthless, it does not preclude the patenting of EST's that do meet the test for utility, including identifiable biological function. In addition to the fact that practical utility in the usual sense applies to an invented product, as opposed to a biological function, this decision does little to address the fundamental issue of how isolation and purification of DNA constructs, including genes, can merit protection given that the test for inventive step is so problematic. As the Nuffield report points out, the eligibility of DNA sequences should by

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[101] An expressed sequence tag is a tiny portion of an entire gene that can be used to help identify unknown genes and to map their positions within a genome (see NCBI *A Science Primer*).

[102] See the USPTO Guidelines for Examination of Applications for Compliance with the Utility Requirement at http://www.uspto.gov/web/offices/pac/mpep/documents/2100_2107.htm#sect2107

now have diminished because the process used is a routine and industrialized process of discovery (69). It is worth noting that the USPTO guidelines for applying this standard were only finalized in 2001 after many years of assessing and granting patents on DNA sequences (Fritz), and it remains to be seen whether the guidelines will be respected.[103]

Just as the thresholds for inventive step and utility have been lowered by patents on DNA sequences, so too has the threshold for the novelty requirement. As noted earlier in this work, claims of biopiracy arise when products containing traits obtained through the isolation and purification process in DNA sequencing negate claims of prior art if that knowledge is not published or previously patented. When genes associated with characteristics and functions that are previously known and in use in other patent jurisdictions are isolated, purified, and patented, the novelty requirement can hardly be said to be fulfilled (quite aside from the problems already noted with meeting the requirements for inventive step in DNA sequencing), yet this practice is allowed under US patent law. The strategy of establishing prior art by publishing traditional knowledge or recording it in databases still poses a risk that patent rights will be subsequently granted over the isolated and purified DNA sequences that code for the traits or characteristics at issue because, as I noted, there is no requirement that traditional knowledge databases be searched under the Patent Cooperation Treaty. If traditional knowledge associated with plant germplasm is not already published or protected by patent in the jurisdiction where the traditional knowledge originated, the genetic material is deemed to be a product of nature and in the larger public domain. The prohibition against patenting products of nature is then overcome by the act of human intervention, mediated by modern biotechnology, in the production of an entity whose essential function and expression is the same as it has been for generations, whether in nature or in farmers' fields (Eisenberg 4).

Straus notes that some WTO member countries have introduced legislation that excludes from patentability "materials pre-existing in nature and their replications" on the basis that the subtle distinction between patentable inventions and unpatentable discoveries is not clearly made in the TRIPs Agreement (Straus 154). He refers

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[103] In the mid-1960's, the Supreme Court reversed a trend to weakening of utility patents for chemicals, stating that the "basic quid quo pro" for grant of patent monopoly was that it must provide a "specific and defined benefit to the public" (Drahos 158). By the mid-1990's utility was no longer much of a hurdle: "You get utility if you can spell it" (US patent attorney qtd. in Drahos and Braithwaite 158).

specifically to Article 6.b of Decision 344 of the Andean Group, Article 6.g of the Argentine patent law, and Brazilian patent law. Straus argues that the lack of such a distinction should not jeopardize the patentability of naturally occurring substances such as DNA sequences. He maintains that the mandatory protection of microorganisms as set out in Article 27.3 (b) extends to naturally occurring biochemical substances such as DNA sequences, and therefore the information embodied in genetic resources cannot be excluded from protection except under the very limited exceptions set out in Article 27 (2) and (3). Eisenberg explains the very real problem with this approach. With the advent of high-throughput sequencing, DNA sequences "look less like new chemical entities than they do scientific information," especially when they relate to a basic biological function (Eisenberg 4). This poses the patent eligibility question from a different perspective, one which the courts have so far failed to look carefully at despite the underlying premise of patents, which calls for the release of the information underlying innovations in order to enrich the public sphere of knowledge. As a consequence, there is "profound uncertainty concerning the meaning of the doctrinal tools" that the patent system employs to determine patentability and to maintain the balance between the rights of inventors and the rights of the public (4). Cripps agrees, pointing out that the patent system was "designed to provide incentives for the production of inventions rather than the discovery of natural elements or forces" (2). Krimsky also affirms this position, stating that there are problems establishing a "clear demarcation between patenting entities and patenting knowledge" in gene patenting (61). Consider too that genes essentially embody information, the genetic blueprint for a living entity. Is a patent on a gene a patent on an entity or on information? There is no question that genomics is far more information intensive than most research and development fields. Krimsky points out that the critical piece of information with respect to genes is the location of the DNA sequence and the coding of nucleotides – decoding genetic sequences yields information critical to developing commercial applications. He does not dispute that there is a distinction between the gene as an entity and information about the gene; in fact he acknowledges that genetic sequences have chemical structure in terms of base pairs, but points out that novelty resides in the sequence of base pairs (Krimsky 66). It is the information about the sequenced DNA that is a critical piece in developing commercial applications. Boyle agrees, stating that "gene sequence patents come very close to being rights over a particular discovered arrangement of data" (2003:39). Clearly there are problematic connections between the informational value of DNA sequences and

their status as patentable entities, making a clear demarcation between the two virtually impossible.

Eisenberg reveals another related issue that the courts have yet to grapple with (5). Although the previously sanctioned practice in patent claims has been to claim these sequences as tangible molecules, a new strategy of claiming exclusionary rights in the informational value itself, if stored in a computer readable medium, has emerged. A patent was filed by Human Genome Sciences (HGS) in 1995 in the USPTO on the complete nucleotide sequence of the *Haemophilus influenzae* Rd genome (Eisenberg 5). The application includes a claim for the sequence information "stored on computer readable media, and computer-based systems and methods which facilitate its use" (USPTO, Patent application #08/487,429). One of the motivations for this patent application is likely the fact that the tangible value of the exclusive rights in the DNA sequence is exceeded, at least initially, by the informational value of the sequence (Eisenberg 5). Although this patent has not been granted in any patent jurisdiction at this point in time, such patent rights, should they be granted, could be infringed by mere storage, retrieval and analysis of what is essentially information rather than the making using and selling of a tangible molecule. Concerns that the court could move in this direction seem justified in view of the trend to more expansive interpretation of patentable subject matter by the court of the Federal Circuit in order to make it more "responsive" to the needs of "society" (Eisenberg 6). The language in section 101 of the Patent Act defines patentable matter as "any process, machine, manufacture or composition of matter." It is interpreted by the court as providing a "limitless expanse" of patentable matter with the exception of only three categories of unpatentable subject matter: laws of nature, natural phenomena and abstract ideas (7). In the court's view society appears to be best served by the conversion of public goods, including information, into private property without regard for the concept of balance that underpins the patent system, a perspective that has a familiar neo-liberal ring.

The difficulties in making a clear demarcation between patentable entity and informational value in DNA sequences present obvious problems for the disclosure requirement of patent law. According to US patent law, patent applicants must include sufficient disclosure at the outset of the patent term to allow someone skilled in the art to reproduce the invention or discovery (35 U.S.C., 111, 112). This is an important element

of peer review in science. If exclusionary rights are being claimed over the informational value of a DNA sequence, where does this leave the disclosure requirement? Robertson (2002) asserts that this issue has in fact become a non-issue with respect to the human genome and the genomes of many other organisms, such as the fruit fly, because they have become a part of an open data policy (22). Most biomedical sequence information is already in the public domain, and intellectual property rights are not now needed in order to spur new sequence discoveries. He argues that the overriding consideration in granting patents on DNA sequences is whether or not patents in sequence information bring the benefits of innovation and commercialization (23), not whether they facilitate the spread of knowledge. However, it is not the case in agriculture that most sequence information is in the public domain. Moreover, it seems obvious that the driving force behind a policy of open access is precisely because intellectual property rights stifle further research and innovation and compromise access to sequence information. Furthermore, to this point in time, the benefits of genetic engineering in agriculture appear to be primarily enhanced profitability, and fall largely to multinational agro-chemical corporations who aggressively protect their intellectual property rights over genetic material, as we have seen with the Schmeiser case.

It should not be forgotten that the exclusion of information from patent eligibility is one of the founding principles of the patent system. In fact, as Boyle points out, in the US there is a "constitutional dimension" to the public domain of information (2003:57). More than forty years ago the Supreme Court provided an authoritative interpretation of the enabling article of the constitution regarding patents in *Graham vs John Deere Company*:

> The clause is both a grant of power and a limitation...(T)he Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit granted thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available. Innovation, advancement and things which may add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must "promote the Progress of...useful Arts." This is the *standard* (Court's emphasis) expressed in the Constitution and it may not be ignored." (Graham vs. John Deere Co., 383 U.S., 1, 5-6 1966)

The stated constitutional purpose was to encourage innovation and, at the same time, protect the public's interest through wide dissemination of valuable information to stimulate further innovation. Patents on DNA sequences in the agricultural domain appear to be an exception to a standard that speaks to the necessity for balance between the rights of inventors and the public domain of knowledge, since, it can be argued, basic information is being captured by such patents. When information becomes subject to monopoly rights, the basic premise underlying patent law has been compromised, raising an impediment to future research (9).

Eisenberg raises another significant point: patent law is "particularly ill-suited" to the protection of information because there are so few safety valves built into the system. It does not have the equivalent of copyright's fair use provision, which allows "socially valuable" uses without a license (Eisenberg 9). Instead, researchers are forced to "invent around" a naturally occurring patented gene sequence. In addition, the research exemption under US patent law is "truly narrow" and "offers no protection from infringement liability for research activities that are commercially threatening to the patent holder" (9). Similarly, there is no defence against a charge of infringement for reverse engineering or for independent creation. It is the disclosure requirement that provides for the competing interests of the public, as distinguished from the rights of the patent holder in the tangible invention itself (9).

Patents on DNA sequences can also be problematic in terms of the scope of the patent rights granted. Patent scope refers to the range of products or processes which would fall under the monopoly held in a particular patent, and it is a key factor in the economic power of the patent. Pioneering inventions are considered to be deserving of wider scope than are more mundane inventions. Patent applicants routinely apply for the widest possible scope in order to maximize the number of future inventions that fall under that patent. Broad patent rights over DNA sequences would extend to all new uses of the genetic sequences, even if not anticipated or predicted by the patent owner, and owe more to the talents of patent drafting attorneys than to inventiveness or credible utility. Because there are often different patents that can relate to the same gene, overlapping claims are common, giving rise to the term "patent thicket" to describe the tangle of patents that must be negotiated in order to commercialize an innovation that

incorporates a previously patented DNA sequence (Shapiro 1).[104] Those who pursue socially beneficial downstream uses can face significant financial and legal barriers to utilizing basic genetic information, quite aside from the risk of infringement, and many researchers give up.

To emphasize the extent of the uncertainty regarding patent claims and infringement, in 2000 alone, US-based companies spent $4 billion on patent litigation, although litigation costs are typically hidden in so-called R&D investment. New start-up biotech companies budget as much for patent litigation as they do for research. According to Shand, fully 46% of the biotech patents granted in the US are later overturned (189). As Ruiz notes, the US prefers to grant the patents and then undertake comprehensive prior art searches only once a patent is challenged (6). In the meantime, the patentee is free to work (and profit from) the patent. This environment hardly seems conducive to encouraging innovation or protecting legitimate claims, and it discourages many researchers who cannot afford litigation battles.

Problems that result from the relaxation of the criteria of patent law are not limited to patents on isolated and purified DNA sequences. Species claims over some key genetically modified crops have also raised concerns about the granting of overly broad patents. In 1994, the biotech firm Agracetus obtained a European patent granting the company exclusive rights to *any and all* genetically modified soybeans developed, not just using their method, but by *any other method that might be developed*. This patent sought control over the *idea* of genetic manipulation. It also sought control beyond soybeans to other crops as well. The patent was subsequently challenged in the EPO by a number of civil society organizations, including the ETC Group and Greenpeace, on the basis that it was immoral and technically invalid. It was also challenged by a number of industry players including Syngenta and Pioneer Hi-Bred. In 1996 Agracetus was bought by Monsanto. Monsanto had also originally opposed the patent in 1994, with one of its scientists testifying that the description of the genetic engineering process used was "insufficient to allow someone skilled in the science to replicate the procedure" – a necessary criterion for patentability (ETC Group, 2003). But it changed its stance once it

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[104] See Barry Commoner, *The Spurious Foundation of Genetic Engineering* http://www.commondreams.org/views02/0209-01.htm. Commoner explains that gene sequences often overlap or code for different proteins depending on how the sequence is folded or how the amino acids it expresses are folder or arranged as a three dimensional structure.

acquired the patent, no doubt in recognition of the potential for achieving market dominance over one of the world's most important crops. It took nine years for the case to reach the EPO tribunal in 2003, and in a surprising decision, the patent was upheld. Monsanto surrendered only the claim in the patent that sought control beyond soybeans to other plants. As a consequence of that EPO decision, Monsanto gained control of 100% of the world's genetically modified soybeans (36.5 million hectares), which in 2002 amounted to over half the world's total area of soybeans. Monsanto was given a powerful monopoly over a basic agricultural resource. A subsequent decision on appeal finally overturned the patent in 2006, but by then there was less than a year remaining in the patent term (ETC Group, 2007). This case demonstrates that under current patenting practice, small advances can support enormously wide-ranging claims. Genetic modification often entails only a minor change to a seed's germplasm, yet the patent provides effective control over the use of the whole seed and its progeny, as the Schmeiser case demonstrated. And in this case, the patent was actually extended to a *concept,* which must surely inhibit if not preclude entirely any independent innovation using other methods, contrary to the patent system's mandate.

So far in this section I have focused on the challenge to the patent system's integrity and credibility posed by the erosion of patent criteria and the gene's dual status as information and patentable entity. While juridical and legislative changes have facilitated this erosion, the USPTO, in adopting a decidedly pro-industry stance, is also implicated. The pro-patent climate in the US is no doubt partly attributable to the fact that patent offices are funded by registration and maintenance fees, and their policy and consultative committees are dominated by multinational corporations. Drahos and Braithewaite discovered that multinationals also routinely "appeal patent office decisions in the courts with an eye to securing precedents that turn the body of law to their structural advantage" (204). These patent offices are thus more likely to treat patent applicants as clients rather than making sure that unwarranted monopolies are not granted and that disclosure requirements are met (Correa and Musungu 37, Drahos and Braithwaite 204). Glieck agrees, adding that the USPTO also lacks the competency necessary for effective evaluation. Just as drafting patent applications is an art, so too is their evaluation, requiring a significant level of scientific expertise (Glieck 2000). Whether it is lax oversight, preferential treatment, lack of scientific expertise, or explicit policy, entire species (gm cotton and soybeans), varietal characteristics (canola oil

quality, enola bean colour), plant reproductive behaviour, types of asexual reproduction, and basic genetic engineering techniques are being patented. And as a consequence of the restrictive stipulations for prior art, so too are products of communally developed ethnobotanical knowledge that originate outside of the US. These developments indicate that greater protection for owners (not necessarily individual innovators) is given much higher priority than the swift diffusion of new social knowledge or preservation of the public domain.

Ironically, perhaps the biggest challenge to the patentability of genes arises out of research into the nature of the human genome conducted under the auspices of the US National Human Genome Research Institute by a consortium of scientists from around the world. Their research confirms that the human genome is not a "tidy collection of independent genes...with each sequence of DNA linked to a single function," as was originally thought when the pioneering work was being done in genetic engineering (Caruso 2).[105] Since 1976, the central dogma of molecular biology has been that each gene in any living organism carried the information required to construct one protein. Genes were associated with "specific functions, discrete properties and clear boundaries" (3). This one-to-one correspondence was the "economic and regulatory foundation" of the biotechnology industry, since it was the uniform function and predictability of individual genes that provided the basis upon which the USPTO allowed genes to be patented. In fact US patent law defines a gene as a DNA sequence that "encodes a specific functional product" (3). Now, however, the legal basis for gene patents ought to be reexamined in light of the finding that that it is the interplay between multiple genes that produces a given effect or function, and no single gene is the sole source of a given protein's genetic information and therefore of the inherited trait. It should come as no surprise that genetically modified crops are increasingly revealed as lacking stability and homogeneity, two fundamental requirements for IP protection.[106] Moreover, genes are by their very nature fluid and adaptable, as As Mae Wan Ho states in *Genetic Engineering: Dream or Nightmare?* They need to be in order to both "maintain stability on the one hand and to respond to environmental challenges on the other" (Ho

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[105] See Barry Commoner, *The Spurious Foundation of Genetic Engineering* at http://www.commondreams.org/views02/0209-01.htm for a more detailed discussion of this issue.

[106] See http://www.i-sis.org.uk/transgenicLinesUnstable2.php. The Institute of Science in Society provides in depth analysis of this and many other issues and concerns related to genetic engineering. See http://www.i-sis.org.uk/index.php.

108). She adds: "The notion of an isolatable, constant gene that can be patented as an invention ... is the greatest reductionist myth ever perpetrated" (Ho 108).

CHAPTER 5: CONCLUSION

As I discussed in the first chapter of this work, the justificatory theories that offer a legitimated history of property and individual property rights in the western liberal tradition do not apply particularly well to intellectual goods. The concept of knowledge as property is not self-evident or natural given its non-rival features and its cumulative nature. Nevertheless, despite its being contrary to the theoretical underpinnings of IP, the notion that ideas can be owned in the same way as material property has achieved wide consensus in the industrial countries, where the bulk of IP consumers and the majority of IP producers reside (Maskus 387). This acceptance not only speaks to the appeal of the authorial regime, which exalts the individual as original transformative creator, it speaks to the strength of what May calls the "knowledge structure:" the power in the international political economy to set agendas with respect to knowledge generation and distribution, and the rules governing the ownership and characterization of knowledge as property (May 30).

While the authorial regime has both romantic appeal and *apparent* efficacy in balancing opposing public policy interests, the reality is that it does not reflect the real world of commerce in intellectual property. Patents have a long history of being exploited to establish cartels and monopolize markets. The aim is frequently to keep knowledge about the working of the invention inaccessible, while the benefits fall largely to the large transnational corporations who hold the majority of patents. Rights-holders tend to be favoured over the public of users in conflicts about the economics of information (Boyle 1996:116) not just as a function of economic and political power, but because the values of the romantic author paradigm are so entwined with liberal individualism and individual property rights. The acquisition and protection of private property, after all, lies at the heart of our political and economic system. But intellectual property is not the same as material property; it depends on rights of exclusion rather than rights of possession, and the ability to exclude is difficult to maintain because of the non-rival nature of knowledge goods. Tighter controls and more punitive laws are deemed necessary to protect private interests. And despite its philosophical importance in the construction of IP, it appears

that little consideration is *actually* given to maintaining the public domain in legislative philosophy and practice, particularly in the US, widely acknowledged as the nation that sets the standard for IP protection, and in the global TRIPS Agreement, which reflects US standards. The necessity for the TRIPS Agreement was linked to the global move to neo-liberalism, based on the premise that unrestrained, unregulated markets best serve the common good, yet this agreement is clearly not in the best interests of many countries, especially developing countries. The same powerful political and economic forces that shaped the TRIPS Agreement limit debate about philosophical foundations to a contemporary variant of the utilitarian justificatory schema, which equates promoting intellectual property with promoting innovation and assumes, therefore, the more IP rights the better.

Nowhere is this maximalist rights culture more visible than in patents over the products and processes of agricultural biotechnology. The knowledge structure disseminates a powerful discourse linking progress and humanity's future well-being with biotechnology research and development, and couples it with the need for ever expanding IP rights in order to stimulate further innovation. The power of this discourse is such that the fundamental trade-off between private individual rights and the public interest, which lies at the heart of IP, is being ignored. It promotes a strategy that is at best counterproductive, with both moral and utilitarian costs (Boyle, 1996). Patenting criteria have been so distorted and weakened to fit an ownership model for genetic material that scientific progress is being impeded, new opportunities for innovation are being diminished, and the dissemination of socially valuable information is being curtailed. Even the *concept* of gm soy was considered patentable, which is antithetical to the promotion of innovation and preservation of a vibrant public domain.

Moreover, the agricultural products derived through genetic manipulation and protected by patents have done little to alleviate world hunger. In fact, they are increasingly linked to excessive profits and widening income inequalities between developed and developing countries. Patented seed serves as a method of monopolizing markets and extracting rents in a sector that was traditionally characterized by a diverse collection of commonly developed and shared resources, and viewed as the common heritage of mankind. Fully 71% of genetically modified agricultural seed is glyphosate resistant, most of it gm soybean that is used for animal feed or for the production of biofuels, not

human food. The long shadow of agricultural biotechnology and its attendant proprietary rights also threatens legitimate and viable alternatives to industrial agriculture and genetic modification. These alternatives include those practiced by indigenous communities whose traditional agricultural knowledge and practice is integral to their world view, and the practices of a diversity of organic farmers who seek a more sustainable means of food production.

In fact, the manner in which patents over crop genetic resources have been deployed presents significant threats to biodiversity, encourages the misappropriation of traditional knowledge, overrides national interests, entrenches historic inequalities between developed and developing nations, and promotes poor public policy, especially in terms of the cost to society of reliance on expensive genetically engineered crop varieties. Furthermore, patent law, which is rooted in concepts designed to protect mechanical inventions, is unable to deal with the legal problems flowing from proprietary rights over genetic material, as the Schmeiser case demonstrates.

These issues underscore the logical flaw in the-more-rights-the-better rhetoric about IP and social utility. As Boyle points out, innovation depends on having rules that establish the correct balance between the public domain and private property (2004: 2-3). In the case of crop genetic material, there are clearly severely problematic outcomes in terms of wide social utility, not only as a consequence of far-reaching concessions to private interests in the legal settlements governing its trade, but also simply as a consequence of its conversion to commodity form, especially in terms of the capture of information in these patents. Too many rights, especially over basic scientific information, are being granted. These outcomes ought to be of greater public concern, particularly in a climate of increasing energy costs, population growth, environmental degradation and climate change, where food security will be increasingly important. A concerted worldwide effort to overcome these obstacles will, I believe, necessitate a widespread sharing of germplasm resources and knowledge and a renewed public mandate to develop and disseminate public varieties.

The expansion of intellectual property rights to plant genetic material, as it has been legitimated through western intellectual property regimes and incorporated into the TRIPs Agreement and UPOV, has involved a process of enclosure and exclusion by corporate interests. As Shiva notes, the culture of the seed has been reconfigured from

one of "reciprocity... and exhaustless fertility" to one of "piracy, predation...and the engineering of sterility" (2000:90).

What must be done to recover the public's interest in this one-sided bargain? Given that the legal basis for patents on genes and genetic material is in doubt, a legal challenge ought to be mounted, preferably in the US, even though I think it is unlikely to succeed without prompting some legislative response that would accommodate the influential biotechnology industry. But it would help to stimulate broad public debate about whether or not it is necessary or desirable to commodify plant genetic material in order to maximize the benefits it has to offer and whether or not patents are the appropriate mechanism to do so. I believe they are not, especially given the technical problems with satisfying all the criteria for patent including the requirement for publication of enabling description for these patents. Patents ought to be the exception and not the rule if they are to recognize true innovation, which means that patent criteria must be demanding and meaningful.

Drahos and Braithwaite suggest that broad public debate might stimulate NGOs, consumer groups and civil society representatives to become involved in the policy and administrative committees of the USPTO, currently dominated by multinationals and intellectual property lawyers, in order to confront the inequities and distributional issues that currently arise from privileging private rights over the public interest (205). They also argue that national anti-trust laws should be much more vigorously enforced to prevent the kind of IP monopolies that stifle competition. They state that global competition policy rules that can defeat "global knowledge cartels" ought to be a priority concern for NGOs and others seeking reforms (206).

At the very least, revising national prior art stipulations to mandate searches of traditional knowledge and incorporating requirements for prior informed consent and disclosure of origins into the TRIPs Agreement would be valuable steps in preventing unwarranted claims of novelty. Certainly, there ought to be some flexibility in the TRIPs Agreement so that the burden of economic rent does not fall so heavily on developing countries. Signing on to the multilateral ITPGR as a condition of membership in the WTO would help to promote the protection of agricultural biodiversity and address the inadequacies of the CBD and its related bilateral agreements, as would the recognition of farmers' rights.

While investigating these options is beyond the mandate of this paper, there is no doubt in my mind that Richards is correct when he states that there clearly need to be changes to the global trading system that move away from the "neoliberal myth of global market forces as guarantor of a socially optimal, allocation of resources" (194). Conceptions of social utility have to move beyond the monopoly interests of multinational agrochemical companies, especially in the realm of information, the lifeblood of the public sphere and the foundation of innovation. So far, as this work demonstrates, we have seen exceptions to the theoretical underpinnings of IP, which are predicated on *preserving* the public domain, made only on behalf of powerful business interests, at great, and growing, social cost.

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