GENE CARTELS

Biotech Patents in the Age of Free Trade

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With a Foreword by Baruch S. Blumberg

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Gene Cartels

To my wife, Vanessa

Foreword

The patent system and its predecessors date back to the earliest period of the Common Law. British practices applied to their North American colonies and the US constitution of 1787 included a provision for the granting of patents. Benjamin Franklin was not only a politician, diplomat, soldier, and public official but also a very productive inventor and successful entrepreneur. He managed to franchise his printing business at an early age, giving him the time and the resources to pursue his interest in science and in national and world affairs. He was a member of the US Constitutional Convention and is believed to have encouraged the inclusion of the patent provision into the Constitution; he himself never patented his own many inventions. Thomas Jefferson, initially as Secretary of State, had responsibilities for the patent law. He was skeptical, but in time appreciated the potential value of linking the possibilities of personal profit with the introduction of new and applicable ideas that would benefit society in general. The system was open, relatively inexpensive, and available to all, no matter their social status.

When Franklin founded the American Philosophical Society ('Philosophical' in the 18th century sense of 'natural philosophy', that is, science) he emphasized the discovery of the new:

> All new-discovered Plants, herbs, Trees, Roots, etc. their Virtues, uses, etc; Methods of propagating them. . . .New Methods of Curing or Preventing Diseases. New and useful improvements in any Branch of Mathematics; New Discoveries in Chemistry, such as Improvements in Distillation, Brewing, Assaying of Ores. New mechanical Inventions for saving labour; as Mills, Carriages, etc., and for Raising and Conveying of Water, Draining of meadows, New Arts, Trades, manufactures, etc. that may be proposed or thought of; Surveys, maps and Charts of Particular Parts of the Sea-coasts or Inland Countries.

His list included discoveries about the natural world, ideas and abstract notions, but also the practical application this 'new' and 'useful knowledge' through the action of human ingenuity into inventions. It was the voice of the enlightenment on a new shore speaking to a new nation about the importance of science and scientific endeavor.

They wanted to foster discovery and invention and patents were seen as a possible aid to the process of invention.

How does a practicing scientist regard the patent system? My experience in science spans more than 50 years, primarily in medical biological science latterly including space-related biological science. Attitude towards patents and commercial application of research have changed radically over these years. In medical school in the late 1940s, commercial applications of medicine and biological discovery did not even enter our conversation. Recently, universities and research laboratories are focussed on extracting income from the products of their staff's research activities. The academic and science institutional model comes closer and closer to the business model. Patents – that embody and order valued 'intellectual property' – are considered an important part of the assets of a successful institution. As a consequence there is an increased emphasis on application (technology transfer, translational science) to produce patentable and marketable products to add to the institutions portfolio.

However, there is a downside to this approach that could have the effect of diminishing innovation. Research programs that are directed towards a particular product – develop a drug for a specified disease, design a vaccine for an identified microbial target, devise a machine to deliver a drug for a known purpose – are goal directed; you know where the path is leading. However many of the great advances in science and medicine have come from institutions that provide an environment of basic research, research that can produce totally new ideas that could not have been perceived at the beginning of the project. The path may be known but not where it will lead. This kind of research is done to understand fundamental natural phenomenon and is often generated by a driving curiosity that may be idiosyncratic and is often not in a popular research area. Historically, it is often research of this kind – not goal directed, not patent-bound, not previously defined research – that leads to the most exciting and useful results. If institutions are totally committed to generating application and patents there will be less funding for this essential discovery activity. A well-directed institution will know how to maintain a balance and not expend all its energies on immediately patentable products. It is reassuring that many scientists, even those involved in the most basic and even esoteric fields of research, are very happy to see their discoveries applied and generate wealth and do not require much urging to do so. Independent of any other reason for obtaining a patent, at a practical level, it is usually very difficult to have research converted to a widely used product unless a commercial company assumes the burden of development; they often will not do this without patent protection.

Gene Cartels: Biotech Patents in the Age of Free Trade is a valuable book for the scientist providing, in an elegantly scholarly style, deep insights into the origins, history, evolution, and current status of patent systems. It also

discloses features that can lead, in effect, to a misuse of power. It focuses on the special case of the invention of 'naturally occurring biological materials that have been removed from their natural environment – that is isolated.' This raises profound questions including the ancient and ongoing question of 'What is life?'. It is particularly intriguing in the case of the patenting of genes. Rarely genes are totally deterministic, that is the presence of the gene in appropriate dose, is the equivalent of having the disease. There are many such genes, but the diseases they control are usually, but not always, rare. Most genes that are involved with common diseases – cardiovascular, cancer, infectious agents, etc. that impose the greatest burden on humanity are susceptibility genes. Their presence may increase the likelihood of a disease but other factors external to the gene – environmental agents, the internal environment, behavior, and other etiologic factors – are required before disease is manifest. And, there are usually many susceptibility gene loci that affect a particular disease. How does this effect invention and patentability?

Genes have many effects in addition to those initially ascribed to them and often reflected in their name. There is a remarkable amount of conservation in the human genome; that is, there are strong similarities (homologies) between the human genes and those of precedent species. It is remarkable that archaea, (bacteria-like organisms that usually live in extreme environments of temperature, pressure, pH, light, radiation, etc.) that are probably the most 'primitive' of life forms, share one third of their genome with mammals. Evolution uses existing genes, including the conserved genes, to respond to changes in the environment over generations. We, in effect, carry our biological history within our genome. It is likely that these homologous genes in humans still retain characteristics of earlier organisms that may be expressed in the human under some circumstances. Does the 'inventor' need to know what these are when a gene is used for a medical purpose?

It is likely that increasing awareness of the biology of living systems – not just of an isolated natural substance – will alter our views on the use of natural materials or life forms. It is essential for the scientists and those who apply their discoveries to understand how expanding biological knowledge engages with the long and changing history of patent systems.

Baruch S. Blumberg
Fox Chase Cancer Center

Preface

The word 'patent' does not appear in its title yet the Statute of Monopolies, passed by the English Parliament in 1623, is the mother of modern patent law in all common law countries. It became law in 1624 near the end of the reign of James I,[1] at a time when Parliament was asserting its political independence of the King and dealt with one of a number of issues that contributed to the growing tension between them and, ultimately, the King's heir, Charles I.[2]

When James I inherited the throne of England and Ireland in 1603 on the death of Elizabeth I,[3] he also inherited her dislike of Parliamentary interference. He considered himself divinely appointed and resented Parliament's claim that he was subject to its law; he dissolved it eight years later in 1611. Unfortunately for him, since Edward III had been forced to concede the royal prerogative power of taxation to Parliament in April 1341, his ability to replenish his treasury was restricted and so he, like his predecessor, sold monopolies, titles and other offices (including judicial offices) as a means of overcoming the fiscal consequences that came with this political independence. In time his excessive spending and the economic impact of the abusive monopolies, which his exercise of crown privileges created, led to his growing unpopularity, and with England in recession he begrudgingly recalled Parliament in 1621. This time however the parliamentarians were not in a forgiving mood; they realized that as long as the King had the power to finance his treasury without recourse to taxation, by bestowing monopolies as he saw fit, not only did he have the power to distort prices and the availability of commodities at will, but he could, as he had done for 10 years, rule without Parliament. This option was no longer acceptable to the Puritan parliamentarians, whose vision for England had no place for the powers expected by James I.

Regrettably the war of words begun between James I and Parliament was to end badly for Charles I, who, lacking his father's judgement, took the argument with Parliament into the battlefields of England. Having started a civil war against Parliamentary forces in 1642, when he lost in 1645 he refused to negotiate a power sharing agreement with Cromwell. Instead, during his captivity at Hampton Court Palace and, after a failed escape, at Carisbrooke Castle on the Isle of Wight, he preferred negotiating with the Scots, who promptly avenged him with a second civil war. This

was to seal his fate. Failing to triumph in battle, in 1648 he was handed over to the Parliamentary army, placed in custody, charged with treason, tried, convicted and finally publicly executed at Whitehall on 30 January 1649 as a traitor. He died holding the firm belief that as King he was accountable to no man, no court and no Parliament and that, as a divinely anointed agent of God, he was answerable to no law other than His. Charles I's execution had a profound impact upon England, leading not only to the formation of a republic, albeit briefly, but to reforms in the law and the system of justice. With the Restoration of Charles II[4] to the throne in 1660, many of those reforms were disposed of, but never again would an English King raise his standard against an English Parliament.

* * *

With this brief glimpse into the political scene that existed around the time of the Statute of Monopolies, it is worth emphasizing that the modern Anglo-American patent systems that are its progeny are intimately connected to these events. Although the present politics and economics of the world are unquestionably unique, the history of the origins of the patent systems provides useful insights into their constructions, purposes, objectives and, most importantly, limitations. Modern proponents of patents will often refer to only one objective: a reward for those who have disclosed to the world an *invention*. They cite this as if all other objectives of these patent systems are irrelevant. They ignore or are ignorant of their history. They suggest that the term 'invention' even extends to naturally occurring biological materials that have been removed from their natural environments – that is, isolated. They claim 'anything under the sun made by man',[5] including a genetically modified organism, is an 'invention' – because in 1980 the US Supreme Court held in the famous case of *Diamond v Chakrabarty* that a genetically modified bacterium, a life form, was properly the subject of a patent under US patent law. They also argue that it is right to patent even isolated human genes or gene mutations, that is those genes which are linked to human illnesses such as cystic fibrosis and breast and ovarian cancer.[6] They say that without patents the risky and expensive research and development needed to compensate investors in the pharmaceutical and biotechnology industries would evaporate.[7] But are they right? Louis Pasteur, Joseph Lister, Alexander Fleming, Howard Florey, James Watson and Francis Crick, to name a few, are persons of science whose discoveries and work were risky and time-consuming, yet they did not patent the results of their humanitarian work (although Pasteur was awarded US patents for inventions relating to beer production). Pasteur discovered that bacteria transmitted infection and developed methods

to kill them; he also developed vaccines for cholera, anthrax and rabies. Joseph Lister discovered that carbolic acid could be used to sterilize surgical equipment, wounds and surgeons' hands; Alexander Fleming observed that a fungal spore killed a bacterium and named this natural substance 'penicillin'; Howard Florey pursued Fleming's research to develop penicillin as a medicine; James Watson and Francis Crick produced a model of the molecular structure of DNA. Each have been revered for their breakthroughs in science, yet each of them was hardly motivated by the promise of a patent. In commenting on how the patent system has motivated inventors, Christine MacLeod and Alessandro Nuvolari noted that during the nineteenth century 'in Britain one could become a "great inventor" without obtaining a patent',[8] and speculated, 'it may owe something to the high esteem in which the British held public-spirited inventors who foreswore intellectual property rights, thereby enhancing their reputation as disinterested benefactors'.[9] Pasteur was buried in the Cathedral of Notre Dame, but his body now lies in the Institute Pasteur, a research institution established in his honour; Lister was made a Baron by Queen Victoria; Fleming was Knighted by King George VI and shared the Nobel Prize with Florey and Chain; Florey was made a Baron by Queen Elizabeth II; and Watson and Crick were awarded the Nobel Prize. Each of them made contributions to science and humanity, improving and saving the lives of millions. We, and future generations, owe a great deal to each of them, but had they faced the multitude of patents that face medical and scientific researchers today – patents over genes, non-genes, gene mutations, and other biological materials – would they have been free to undertake their work, to make their discoveries?

As the economic fortunes of countries and empires have waxed and waned, the walls of protection around each have gone up and down. Patents have long held a traditional role as a tool for sovereignties and governments to assist in the protection of economies; yet as the post-World War II world has firmly entered the era of free trade, the monopolies which patents create sit on the landscape like crumbling ruins of a bygone age. For many decades prior to this modern era, passionate legislative debate about the patent system was a colourful feature on both sides of the Atlantic, but this has quietened to an uneasy hum as a new patent paradigm has emerged – no longer seen as a protectionist tool, the monopoly has assumed the role of a legitimate reward for innovation, granted increasingly to multinational corporations which paradoxically hold no allegiance to any one country. And as new technologies enter the field these monopolies are now automatically granted, even when innovation is hard to discern. The once-limited monopoly of the traditional patent can now be manipulated to cover too widely and for periods many times longer than

deemed appropriate. Yet there is disquiet among legislators, the judiciary, scientists and academics alike over the role that patents play in the free-trade world, and indeed they are torn over whether they should play any role at all, as the far-reaching consequences of patents are being felt.

This book seeks to trace how we have arrived at this situation, re-examining within their historical and economic contexts the legislative debates and key judicial arguments that the patent community now dismisses as historically quaint and irrelevant, convinced as it is of the patent's legitimacy and permanency while its eyes are firmly fixed to the future. But there are strong lessons to be gleaned from turning over the debates of the past, especially for the developing world that, too, is being swept along by the enthusiasm for patents, either willingly or forcibly through international treaty, and it is this fast-growing sector that the author hopes will also find salient truths.

NOTES

1. 1566–1625; reigned as James VI of Scotland from 1567 and as James I of Great Britain from 1603.
2. 1600–1649; King of England, Scotland and Ireland, 1625–1649.
3. 1533–1603; Queen of England and Ireland, 1588–1603.
4. 1630–1685; King of Scotland, 1649–1660; King of England, Scotland and Ireland, 1660–1685.
5. *Diamond, the Commissioner of Patents v Chakrabarty*, 447 US 303, 309 fn 6 (1980).
6. Crespi, S (1995), 'Biotechnology Patenting: The Wicked Animal Must Defend Itself', *European Intellectual Property Review*, **17** (9), 431–41.
7. Blackburn, RP (1999), 'Chiron's Licensing Policy', *Science*, New Series, **285** (5430), 1015.
8. MacLeod, C and A Nuvolari (2006), 'The Pitfalls of Prosopography: Inventors in the Dictionary of National Biography', *Technology and Culture*, **47**, 757–776, 776.
9. *Ibid.*

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