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.

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