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A Comparative Analysis of Doctrines of Appropriate Patentable Subject Matter in American and European Patent Law

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How Much Does Technology Really Matter in Patent Law? A Comparative Analysis of Doctrines of Appropriate Patentable Subject Matter in American and European Patent Law

Dr. Kelvin W. Willoughby*

Introduction: Ambiguity and Controversy Regarding Patent Eligible Subject Matter

This paper will examine the ambiguity of two dominant patent law regimes regarding whether the subject matter of patents ought to be restricted to that of technology.

Why is this topic important? It is widely presumed by professionals in the field of intellectual property and by educated members of the general public that patents are legal instruments issued by governments to protect technology—or at least to protect the pertinent intellectual property rights of the inventors of technology. In other words, for most informed people it is common sense that the subject matter of patents is technology.[1] However, there are several reasons why we may wish to re-examine this very reasonable and ubiquitous presumption.

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[1] *See, e.g.,* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977). Kitch writes, "the patent system performs a function … to increase the output from resources used for *technological innovation*." *Id.* at 265. (emphasis added). Similarly, William R. Cornish and David Llewelyn write, "[p]atents are granted in respect of inventions, i.e., *technological improvements*, great and small.…" WILLIAM R. CORNISH & DAVID LLEWELYN, INTELLECTUAL PROPERTY: PATENTS, COPYRIGHT, TRADE MARKS, AND ALLIED RIGHTS 7 (Sweet & Maxwell 6th ed. 2007) (1981) (emphasis added). As an additional example

First, there is an international "anti-intellectual property rights" movement that justifies itself politically, in part, by claiming that governments have abused the application of patent law by granting protection over subject matter that ought not to be covered.[2] Second, a recent spate of legal and administrative decisions in new fields of technology, such as computer software and biotechnology, has contributed—at least on the basis of salient rhetoric—to a widespread perception that even though patents were meant to protect only technology contemporary patent protection has in fact been issued for subject matter that goes significantly beyond the boundaries of what is generally thought of as technology.[3] The frequently cited view of the US Supreme Court, that "anything under the sun that is made by man" may be patented exemplifies this trend, at least in the eyes of

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we may note that the section of Michael Spence's book that is devoted to patent law is organized under the heading of "The Protection of *Technology* Assets." MICHAEL SPENCE, INTELLECTUAL PROPERTY (Oxford University Press 2007) (emphasis added). Finally, this theme is sometimes also emphasized in the introductory clauses of national patent statues. (Republic of Korea, *Patent Act 1961* (as amended, 2004), Chapter 1, Article 1. English translation by the Korean Intellectual Property Office.) ("The purpose of this Act is to encourage, protect and utilize inventions, thereby improving and developing *technology*, and to contribute to the development of industry") (emphasis added).

[2] For example, Jeremy Rifkin's non-profit organization, the Foundation for Economic Trends, has led an international coalition of over 200 groups, to push for the revocation of a US patent for a chemical based on an extraction from a native tree from India. This is part of a larger movement to prevent patenting of chemicals and chemical extraction methods related to naturally occurring biological resources. *See*, *e.g.*, Lori Wolfgang, *Patents on Native Technology Challenged*, 269 SCIENCE 1506 (1995). Whether or not there is any basis for the accusation, there appears to be a belief amongst protagonists in the movement led by Rifkin that patent protection has been extended inappropriately beyond the boundaries of new technology to cover naturally occurring materials. *See also* PETER DRAHOS & RUTH MAYNE, GLOBAL INTELLECTUAL PROPERTY RIGHTS: KNOWLEDGE, ACCESS AND DEVELOPMENT (Oxfam 2002). In this vein, a recent study by the Intellectual Property Institute, based in London, has examined how the choice of nomenclature and metaphor by observers of and commentators on intellectual property issues may negatively shape and color the views and behavior of people towards intellectual property. For example, some academics working in the field of gender studies have made the extraordinary claim that "by limiting the ability of the mother in the developing country to gain access to necessary seed," patent rights are "a 'male' impingement on her role in feeding her children." Jeremy Philips, *Good Stuff, Shame About the Bad Press*, 3 J. INTELL. PROP. L. & PRAC. 273, 273 (2008). For an academic book arguing for the complete abandonment of patents, *see*: MICHELE BOLDRIN & DAVID K. LEVINE, AGAINST INTELLECTUAL PROPERTY (Cambridge University Press 2008).

[3] For an influential source from the news media, see James Gleick, *Patently Absurd*, N.Y. TIMES, Mar. 12, 2000, at SM44. *See also* Robert Hulse, *Patentability of Computer Software After State Street Bank & Trust Co. v. Signature Financial Group, Inc: Evisceration of the Subject Matter Requirement*, 33 U.C. DAVIS L. REV. 491 (2000); Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKLEY TECH. L.J. 577 (1999); Mark A. Lemley et al., *What to do About Bad Patents?*, 28 REGULATION 10 (2005). For a counter-view, see Helene Fagerlin et al., *A New Challenge for the Patent System*, MANAGING INTELL. PROP., Mar. 2005, at 90.

the critics.[4] Third, confusion surrounding basic doctrines of patentable subject matter has confounded contemporary decision-making by courts and legislatures on the patentability of some categories of modern inventions, such as computer software.[5] Fourth, when one reviews the intellectual property statutes of the United States and various other jurisdictions, it is surprising to discover how infrequently one finds explicit mention of the word "technology" in definitions of the subject matter eligible for patent protection.[6] This fact perhaps makes it easier for patent offices to issue patents for subject matter other than technology[7]

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[4] The most widely cited source is the following statement of Chief Justice Berger: "The Committee Reports accompanying the 1952 Act [which re-codified the patent laws] inform us that Congress intended statutory subject matter to 'include anything under the sun that is made by man.'" Diamond v. Chakrabarty, 447 US 303, 209 (1980).

[5] *See generally* Maximilian R. Peterson, *Now You See It, Now You Don't: Was It a Patentable Machine or an Unpatentable Algorithm - On Principle and Expediency in Current Patent Law Doctrines Relating to Computer-Implemented Inventions*, 64 GEO. WASH. L. REV. 90 (1995). Similar criticisms were raised over 50 years ago in the aftermath of the introduction of the new Patent Act in the United States. *See* John M. Webb, *Patents – The Changing Standards of Patentable Invention: Confusion Compounded*, 55 MICH. L. REV. 985 (1957). In Webb's words, "the statute has added more uncertainty to the already vague and indefinite standard of patentability." *Id.* at 186. For a European perspective, see Reto M. Hilty & Christophe Geiger, *Patenting Software? A Judicial and Socio-Economic Analysis*, 36 INT'L REV. OF INTELL. PROP. & COMPETITION L. 615 (2005). Hilty and Geiger have described, among other things, the highly political debate that has emerged between multiple constituencies in Europe (including the European Patent Office and the European Parliament, as well as industry groups and consumer groups) over basic principles of patentable subject matter, centered on disputes as to whether or not computer programs should be eligible for patent protection. *See id.* For a masterly review of the difficult-to-interpret, and sometimes difficult-to-reconcile, decisions of the European Patent Office's Boards of Appeal on whether-or-not and, under what circumstances, computer software might be patentable, see PHILIP LEITH, SOFTWARE AND PATENTS IN EUROPE (Cambridge Univ. Press 2007).

[6] There are some notable exceptions, to be discussed below, such as in the patent laws of the major jurisdictions of East Asia (Japan, Korea, P.R. China, Taiwan) and the revised German Patent Act that came in to force in 2008. In addition the word "technology" is included in their definitions of patentable subject matter in both the Agreement on Trade-Related Aspects of Intellectual Property Rights, art. 27(1), Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Legal Instruments—Results of the Uruguay Round, 108 Stat. 4809, 1869 U.N.T.S. 299 (1994) [hereinafter TRIPs] and the recently revised European Patent Convention, art. 52(1), Oct. 5, 1973, 1065 U.N.T.S. 255 [hereinafter EPC]. It is unclear, however, to what extent the wording of statutes of most of the signatories to these agreements actually explicitly requires the subject matter of patents to be coterminous with technology.

[7] Brian Kahin, Senior Fellow at the Computer & Communications Industry Association in Washington, DC, has recently asserted that the US Patent and Trademark Office, with the encouragement of the US Court of Appeals for the Federal Circuit, has indeed been issuing patents for subject matter other than technology. Kahin castigates such practices and also claims that they violate "first principles of democratic governance." Brian Kahin, *At the Heart of the Knowledge Economy: Should Patents be Limited to Technology?*, THE HUFFINGTON POST, May 6, 2008, http://www.huffingtonpost.com/brian-kahin/at-the-heart-of-the-knowl_b_100404.html (last visited June 18, 2008).

and for critics of the system to assert that criteria of patentability have become too loose.[8] Some critics have even averred that the US Patent and Trademark Office (USPTO) has "argued aggressively in international negotiations that patents should not be limited to technology [and] that allowing patents for any and all activities [is] 'best practice.'"[9] In short, these factors challenge us to ask the following three questions:

1. Do the dominant intellectual property legal regimes of the world (especially the United States and Europe) actually extend patent protection to subject matters other than technology?
2. If so, then was this intended by the respective legislators, including the early framers of precursor statutes to current patent statutes; or, did the law evolve that way over time, in tension with the early suppositions of modern patent law?
3. If the answer to the first question is yes, regardless of the answer to the second question, would it be prudent for legislators, courts, and patent offices to restrict the subject matter of patent protection exclusively to technology?

This paper will provide a first step towards answering these questions by conducting a comparative analysis of patent law in the United States and Europe (primarily under the European Patent Convention).

To adequately conduct the research that the above questions signal, it will be necessary to take a short excursion into one domain where many academic angels and learned judges fear to tread! I refer to philosophical discourse about the nature and meaning of "technology." It is not uncommon to find professionals in the world of technology afraid to define the term, as such, out of sober recognition that it is difficult to reach consensus on this matter. The typical view seems to be, "we cannot define technology, but we all know it when we see it."[10] Unfortunately, this understandable caution is rather problematic, given that

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[8] *See generally* ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT (Princeton Univ. Press 2004). For a more recent example of criticisms in this genre see JAMES BESSEN & MICHAEL J., MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK (Princeton Univ. Press 2008). Bessen and Meurer purport to provide strong empirical evidence for the notion that the US patent system has ceased to function effectively, especially as an institution of intellectual property, as a consequence of what *inter alia* the authors see as an overly broad conception of patentable subject matter and a failure to provide appropriate and unambiguous notice of the precise boundaries of patents. *Id.*

[9] Kahin, *supra* note 7.

[10] For example, in the words of Peter Prescott (sitting as Deputy Judge in the case of *Patent Applications by CFPH LLC*):

> We sense that we know 'technology' when we see it. And no doubt that is correct, most of the time. But it is not correct all of the time. Therein lies the delusion. You can prove that for yourself by trying to find a definition of

the whole conceptual edifice of patent law arguably stands on the largely undefined conceptual foundation of technology. To analyze objectively the degree to which patent requirements are coterminous with the core features of technology, it is necessary to articulate a robust definition of technology. That is a tall order. However, it is also a challenge that one ought not to evade if one wishes to make a serious contribution to basic conceptual analysis of patent law. The field needs a definition of "technology" close enough to widely held common sense notions to be comprehensible to the typical, educated person, yet sufficiently precise to permit rigorous analysis vis-à-vis patent law.

In investigating whether the de facto subject matter of patents has, in some jurisdictions, extended beyond the boundaries of technology, we should be careful to avoid getting stuck in a conceptual tangle. Some commentators choose to adopt a very broad and flexible definition, whereby almost anything that human beings produce or anything that they do may be labeled as "technology." Such a definition would effectively push the primary questions of this paper towards absurdity: if all inventions were technology, by definition, then the subject matter of all patents would also be technology. In other words, by definition, it would be impossible for a patent to be issued for anything other than technology (excluding, of course, the cases where patents might erroneously be issued for "inventions" that are not actually inventions). One task that therefore requires some attention is to differentiate carefully between the meaning of "invention" and "technology."

Some scholars have recognized the ambiguity of patent law vis-à-vis technology as a particular example of a more general phenomenon in intellectual property law: that the scope of intellectual property rights (not just patents, but also marks, including trade-dress, copyrights, designs, utility models, databases, etc.) is often remarkably uncertain, both theoretically and in practice.[11] There is some debate in the scholarly literature about whether this is necessarily negative. The main insight we may draw from that literature is that ambiguity about the position of technology in patent law arises not just from clumsy or non-existent use of the appellation "technology," but also from vagueness in the statutes themselves about the precise scope of various kinds of intellectual property rights.[12]

> 'technology' that everybody can agree on. The more you try, the more you will discover what a horribly imprecise concept it is.

PHILIP LEIGH, SOFTWARE AND PATENTS IN EUROPE 6 (Cambridge Univ. Press 2007) (quoting Patent Applications by CFPH LLC [2005] EWHC 1589 (Pat.)).

[11] *See generally* Spence, *supra* note 1.

[12] *See id.* at 19–21. On the topic of the difficulty of discussing the scope of intellectual property rights, Spence observes:

> This difficulty arises from many of the rules determining the scope of a protected intangible, and from some of the rules as to defenses and compulsory licenses. Those rules are surprisingly, sometimes perplexingly, vague. They

I will now review selected sources to explore the degree of ambiguity in the legal literature surrounding the notion that patents ought to be issued only for inventions that qualify as technologies.

I. Evidence From the Early History of Patent Law

A. What Did the Earliest European Patent Laws Have to Say About the Appropriate Subject Matter of Patents?

The Venetian patent statute of 1474,[13] which is widely thought to be the first European patent law, and in fact, the first "modern" patent law in general, is based on the idea that patent protection (limited exclusive rights) should be available for *new* and *ingenious devices* that have *utility* and that have been *made*. Even though the Venetian lawmakers did not use the word "technology," the notion of "ingenious device," especially when qualified by the notions of newness, utility, and manufacture (to be "made"), seem to immediately evoke a common-sense idea of what today would be called "technology." The following English translation of an extract from the original Venetian statute contains almost all of the putative basic features of 20th Century patents: invention (make, devise, discover), novelty (newness/distinctiveness), utility (usefulness/industrial applicability), non-obviousness/inventiveness (ingeniousness), reduction-to-practice, territoriality, registration, exclusive rights (prohibition of unauthorized use) and a limited term (time period) of protection. The statute states:

> WE HAVE among us men of great genius, apt to invent and discover ingenious devices; and in view of the grandeur and virtue of our City, more such men come to us every day from diverse parts. Now, if provision were made for the works and devices discovered by such persons, so that others who may see them could not build them and take the inventor's honor away, more men would then apply their genius, would discover, and would build devices of great utility and benefit to our commonwealth.
>
> Therefore:
>
> BE IT ENACTED that, by the authority of the Council, every person who shall build any new and ingenious device in this City, not previously made in our Commonwealth, shall give notice of it to the Office of our General Welfare Board when it has been

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are vague to an extent that would never be tolerated in rules determining the boundaries of physical property.…

Id. at 19–20.

[13] Giulio Mandich, *Venetian Patents (1450-1550)*, 30 J. PAT. OFF. SOC'Y 166, 177 (1948) (reprinting the statute).

> reduced to perfection so that it can be used and operated. It being forbidden to every other person in any of our territories and towns to make any further device conforming with and similar to said one, without the consent and license of the author, for the term of 10 years.[14]

Paul Goldstein, in his own discussion of the history of patent law, writes as if what the Venetians had in mind by "new and ingenious device" was what is now called "technology". Goldstein writes:

> The first known system for granting patents to *inventions in the useful arts* dates to Venice in the mid-fifteenth century. The Venetian system, codified into a general patent statute in 1474, sought to spur the introduction of *new technologies* by giving patentees the exclusive right to practice their art for a specified period, usually ranging from ten to fifty years. Some patents issued to *inventions* originated by the patentee; others issued to technologies that the patent seeker had imported in to Venice from other regions.[15]

Goldstein also uses the term "inventions" or "inventions in the useful arts" with the same meaning as "technologies" (or "new and ingenious devices"). There is prima facie evidence that the very first European patents were consciously granted for technologies. This quote also provides anecdotal affirmation of the general observation underlying this paper; that professionals in the field of

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[14] *Id.* at 176–77. Mandich's research is the root source of contemporary knowledge about the Venetian patent system. For an alternative translation of this seminal statute, *see* Christopher May, *The Hypocrisy of Forgetfulness: The Contemporary Significance of Early Innovations in Intellectual Property*, 14 REV. OF INT'L POL. ECON. 1 (2007):

> There are in this city and its neighborhood, attracted by its excellence and greatness, many men of diverse origins having most subtle minds and able to devise and discover various ingenious devices. And if it should be provided that no-one else might make or take to himself to increase his own honour the works and devices discovered by such men, those same men would exercise their ingenuity, and would discover and make things which would be of no little utility and advantage to our state. Therefore, it is enacted by the authority of this body that whoever makes in this city any new and ingenious device, not previously made within our jurisdiction, is bound to register it at the office of the *Provveditori di Comun* as soon as it has been perfected so that it will be possible to use and apply it. It will be prohibited to anyone else within any of our territories to make any other device in the form or likeness of that one, without the author's consent or license, for the term of ten years.

Id. at 3–4.

[15] PAUL GOLDSTEIN, INTERNATIONAL INTELLECTUAL PROPERTY LAW 297 (Foundation Press 2001) (emphasis added).

intellectual property tend to presume, as a matter of common sense, that technology is the natural, appropriate, and intended subject matter of patents.

B. What Did the Earliest American Laws Have to Say About the Appropriate Subject Matter of Patents?

The first patent laws in North America were enacted in American colonies prior to the adoption of the United States Constitution, and in most cases, each patent required a specific decision by the respective legislature.[16] The first general patent law (as opposed to legislative decisions to issue particular patents) in North America was adopted by South Carolina in 1784, one year after its independence from Britain and following several decades of legislative debate on the subject.[17] As part of an "Act for the Encouragement of Arts and Sciences," establishing both copyright and patent rights, the law included the following clause:

> And be it … enacted … That the inventors of useful machines shall have a like exclusive privilege of making or vending their machines for the like term of fourteen years, under the same privileges and restrictions hereby granted to and imposed on the authors of books.[18]

The South Carolina statute employed the term "useful machines" to describe patentable subject matter, and by employing the term "inventors," presaged the subsequent use of the term "invention" in other jurisdictions. While South Carolina did not use the term "technology," the term "useful machines" indicates that the authors of that statute had something in mind that was narrower in scope than "anything under the sun that is made by man." In addition to the requirement of utility, the South Carolina statute also required that the "thing under the sun" was not just "made by man" (i.e., that it was an invention) but also that it was a *machine*. The term "useful machines" suggests that, in the minds of the South Carolina lawmakers, utility was a quality of an invention that needed to

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[16] *See generally* Bruce W. BUGBEE, GENESIS OF AMERICAN PATENT AND COPYRIGHT LAW 57–103 (Public Affairs Press 1967); DONALD S. CHISUM ET AL., PRINCIPLES OF PATENT LAW: CASES AND MATERIALS 16–19 (Foundation Press 3d ed. 2004); Frank D. Prager, *A History of Intellectual Property from 1545 to 1787*, 26 J. PAT. OFF. SOC'Y 711, 758–59 (1944); Edward C. Walterscheid, *Charting a Novel Course: The Creation of the Patent Act of 1790*, 25 AIPLA Q. J. 445, 451–54 (1997).

[17] *See* BUGBEE, *supra* note 16, at 77–82.

[18] Act of Mar. 26, 1784, No. 1221, sec. iv, *reprinted in* 4 STATUTES AT LARGE OF SOUTH CAROLINA 618, 620 (Thomas Cooper ed. 1838) (on file with the author). Grateful thanks are due to Ms. Stacy Etheredge, of the Coleman Karesh Law Library of the University of South Carolina, Mr. Steve Tuttle, of the South Carolina Department of Archives and History, and Ms. Elaine Sandberg, of the South Carolina State Library, for assistance in locating and obtaining a copy of this document.

be evaluated in addition to that of it being a machine. As with the Venetians, the South Carolinians seemed to believe that patent protection belonged to a certain class of inventions only—to useful technologies.

Just a few years after South Carolina led the way, pioneering intellectual property law, in 1787, the authors of the U.S. Constitution included a clause in the new constitution that has provided the legal basis for much of the subsequent intellectual property law in the United States:

> Congress shall have 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.[19]

Interestingly, this seminal statement in the U.S. Constitution does not even define patent, let alone state explicitly whether patent protection ought to be limited to technology. The word "technology" does not appear in the clause, although the term "useful Arts" does. It may be inferred that what the drafters had in mind by "useful Arts" is similar to what would now be called "technology." Drawing such an inference requires stepping beyond the literal wording of the text; nevertheless, as we shall see in Section VI below, this interpretation has, in fact, been repeatedly affirmed in case law.[20]

In the subsequent practice of the USPTO, and in the majority of patent offices elsewhere in the world, the term "prior art" has generally meant previously published science and technology, as well as documented public use of the invention for which protection has been sought.[21] This is circumstantial evidence that the term "arts," as found in the U.S. Constitution and in subsequent patent statutes, had quite a different meaning than the word now possesses in contemporary English parlance. It seems to have meant "fields of technology", rather than what we normally think of as "the arts" today. This old use of the term "art" (meaning "technology") has deep etymological roots in European

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[19] U.S. CONST. art. I, § 8, cl. 8.

[20] For a fascinating analysis of the history of the Constitutional intellectual property clause, *see generally* Edward C. Walterscheid, *To Promote the Progress of Science and Useful Arts, The Background and Origin of the Intellectual Property Clause of the United States Constitution*, 2 J. INTELL. PROP. L. 1 (1994). Walterscheid's detailed research suggests that "promotion … of useful arts" was employed consciously by the drafters of the Constitution with the same meaning as "the encouragement of manufactures," the equivalent term from British law with which many of the framers of the Constitution were familiar. *Id.* at 28. Walterscheid also suggests that the framers intended that the clause would assist the development of "helpful and valuable trades" in the new United States of America. *Id.* at 52.

[21] This has been stated succinctly, for example, by Chisum and his colleagues in their popular book on US patent law : "'Prior Art' is a term used in patent law to refer broadly to known technical information." CHISUM, *supra* note 16, at 80. The European Patent Convention, for example, also embodies such nomenclature and such an understanding. *See* EPC, *supra* note 6, at arts. 52, 54, 56.

languages. The current English word "technology"—and its variants in other European languages—originates from the ancient Greek word *"techné"* (which denoted something along the lines of art, craft, skill and practical knowledge) combined with another Greek word *"logos"* (which denoted knowledge and logic).[22] Vestiges of the ancient meaning of "the arts" still carry over in some European and American universities where students are awarded a Bachelor of Arts, rather than a Bachelor of Science, for a degree in science.[23] In short, there is credible evidence that "Arts," as employed in the U.S. Constitution's "copyright and patent clause", had a meaning almost the opposite of the meaning now attached to the word; it referred to technology and the practices associated with technology.

Following the example of the South Carolina law, the copyright and patent clause refers to "Inventors." It also refers to "Discoveries," thereby providing some additional hints about what might have been in the minds of the drafters as the subject matter of the "exclusive Right" for which they intended Congress to legislate. It is not clear from the clause what the intended relationship was between "Science" and the "useful Arts," but the language of the clause suggests that something along the lines of "discovered inventions in the useful arts"—or today's "technology"—is what the authors of the Constitution had in mind.

While the copyright and patent clause refers to both "Authors" and "Inventors," and while it is plausible to infer that "Writings" belong to "Authors" and "Discoveries" belong to "Inventors," the close juxtaposition of these concepts, and the fact that they are not defined, suggests that the drafters might not necessarily have drawn strict boundaries between the respective subject matters that would later become the law of copyrights and the law of patents. This interpretation is supported by the fact that the terms and conditions of copyright and patent protection were identical under the South Carolina law, which it appears the authors of the U.S. Constitution took into account during their deliberations. The fact that the clause makes explicit reference to "Science" and "Discoveries," while making no explicit mention of "inventions," "useful machines," or "ingenious devices" is rather intriguing. It suggests that the authors of the U.S. Constitution did not draw very strong boundaries in their minds between the notion of science and the notion of what is now "technology".

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[22] Kelvin W. Willoughby, *Technological Semantics and Technological Practice: Lessons from an Enigmatic Episode in Twentieth-Century Technology Studies*, 17 KNOWLEDGE, TECH. & POL'Y 22, 27 (2005).

[23] For example, graduates of the undergraduate program in physics at the University of Oxford are awarded a Bachelor of Arts degree, University of Oxford Undergraduate Physics Courses, http://www.ox.ac.uk/admissions/undergraduate_courses/courses/physics.html (last visited Oct. 9, 2008), and graduates of the undergraduate program in physics at Harvard University may also receive a Bachelor of Arts degree, Harvard College Handbook for Students, http://webdocs.registrar.fas.harvard.edu/ugrad_handbook/current/ugrad_handbook.pdf (last visited Oct. 9, 2008).

In short, the U.S. Constitution is rather vague and perhaps even bordering on silent about what the appropriate subject matter of a patent should be.[24] Perhaps the contemporary debates over the patenting of biotechnology discoveries (read as "scientific discoveries") in the United States may have some of their roots traced back to the centrality of "discovery" rather than "invention" in the seminal text of U.S. intellectual property law.

We can find more clues about what the authors of the U.S. Constitution intended vis-à-vis patent protection from the subsequent writings of the individuals who participated in its drafting. James Madison, one of the main protagonists of the intellectual property clause in the U.S. Constitution, wrote: "the copyright of authors has been solemnly adjudged, in Great Britain, to be a right of common law. The right to *useful inventions* seems with equal reason to belong to inventors."[25]

In contrast with the Constitution, Madison's use of the term "useful inventions" here suggests some putative content for the patent in subsequent legislation. Despite the extreme vagueness of the Constitution itself on this matter, it is plausible that Madison himself had in mind something along the lines of what we would call "technology." Madison's comments also presage a distinction between copyright and patent rights that cannot be found in the wording of the Constitution.

The United States Congress passed patent laws just a few years after the adoption of the Constitution, which added specificity to the basic idea of intellectual property rights. The first federal patent law of the United States, entitled "An Act to promote the progress of useful Arts," stated that upon the petition of any person or persons who had:

> [I]nvented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used, and praying that a patent may be granted therefor [sic], it shall and may be lawful [for the designated officers of the government] if they shall deem the invention or discovery sufficiently useful and important, to cause letters patent to be made out in the name of the United States … reciting the allegations and suggestions of the said invention or discovery, and describing the said invention or discovery, clearly, truly and fully ….[26]

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[24] In fact, the word "patent" was not even used in the Constitution. U.S. CONST. art. I, § 8, cl. 8. Adding content to the ideas of the constitution drafters, in this field, was a responsibility to be left to the Congress.

[25] CHISUM, *supra*, note 16, at 17 (quoting THE FEDERALIST NO. 43 (James Madison)) (emphasis added).

[26] An Act to Promote the Progress of Useful Arts, § 1, 1 Stat. 109, 109–110 (1790).

The inclusion of the words "manufacture", "engine", "machine," and "device," alongside "useful art" in the Act places considerable restrictions on the scope of the "Discoveries" mentioned in the Constitution. In this respect, the concept of protectable subject matter in the first U.S. patent law was similar to that found in the South Carolina law of 1784, and in many ways expressed the same notion of protectable subject matter as found in the fifteenth century Venetian patent act.

In short, the authors of the first federal patent law in the U.S. did not intend for patent protection to extend to "anything under the sun that is made by man." Rather, they intended such protection to extend only to a narrow range of items "made by man"; to technologies. Admittedly, the language of the act suggests technologies of a largely mechanical nature. However, during the 18th Century, unlike today, most technologies were tangible rather than intangible, and hence it was natural and appropriate for the dominant technologies of that period (mechanical machines) to become the primary technological metaphor. Notwithstanding these considerations, it is difficult to escape the conclusion that the scope of the patent under the first U.S. patent law was meant to be restricted not only by utility and novelty, but also by the technology requirement (useful "art," manufacture, engine, machine, or device).[27] The United States Court of Appeals for the Federal Circuit (or "CAFC", the U.S. appeals court for patent cases) affirmed this interpretation of the Act in a 1985 decision, where the CAFC described the basic purpose of the U.S. patent system, stating that "[t]he exclusive right, constitutionally derived, was for the national purpose of advancing the useful arts—the process today called *technological innovation*."[28]

More than two decades later, the CAFC again confirmed this view of the original purpose of patents:

> … the framers [of the Constitution] consciously acted to bar Congress from granting letters patent in particular types of business. The Constitution explicitly limited patentability to "the national purpose of advancing the useful arts—the process today called *technological innovation*."[29]

In summary, early U.S. patent laws were arguably based on the idea that patent protection was intended for technologies. In other words, the 18th Century's "useful arts" may be thought of as conceptually equivalent to the 20th Century's "technological arts," or as conceptually equivalent to technology.[30]

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[27] *See supra* Section I.A–B.

[28] Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (emphasis added).

[29] *In re* Comiskey, 499 F.3d 1365, 1375 (Fed. Cir. 2007) (emphasis added).

[30] The case law of the United States Court of Customs and Patent Appeals (the precursor to the CAFC) also reveals a presumption that, for most of the history of US patent law, patentable inventions—whether machines, materials, manufactures or methods—have generally been thought of as equivalent to what in contemporary times are called "technologies" and that the

II. What Does Contemporary International Law Have to Say About the Appropriate Subject Matter of Patents?

A. The Paris Convention and the Patent Cooperation Treaty

The Paris Convention for the Protection of Industrial Property, the seminal international agreement on intellectual property rights, does not contain a definition of patent in its articles dealing with patents.[31] Its comments about patents are restricted largely to procedural, transactional, administrative, and legal issues related to international dealings between parties to the Convention and, in particular, the principle of national treatment of intellectual property rights.[32] In effect, the Paris Convention is silent on the matters of concern to this study.

However, the Patent Cooperation Treaty ("PCT"), to which the majority of the world's countries are signatories, does discuss the permissible subject matter of a patent.[33] The PCT primarily provides for arrangements by which inventors may use a centralized search and examination procedure (headquartered at the World Intellectual Property Organization in Geneva) to apply for national patents in designated member states of the PCT.[34] In discussion of the international preliminary examination procedure, the PCT states the following:

> The objective of the international preliminary examination is to formulate a preliminary and non-binding opinion on the questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), and to be industrially applicable.[35]

Except for the fact that the third patentability criterion refers to industrial applicability rather than utility, the qualifying requirements for patents in the PCT are similar to those of contemporary U.S. patent law. This begs the question, what qualifies an invention as an invention? On this matter, the PCT definition (quoted above) is silent. In addition, the PCT leaves it to each

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present day equivalent of the term "useful arts" is "technological arts." *E.g., In re* Bergy, 596 F.2d 952, 959 (C.C.P.A. 1979), *aff'd*, 447 U.S. 303 (1980).

[31] *See* Paris Convention for the Protection of Industrial Property, Mar. 20 1883, revised on July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305 [hereinafter *Paris Convention*].

[32] *Id.* at art. 4 (procedural issues: right of priority), art. 5bis (administrative issue: grace period for fees), art. 5ter (legal issue: exceptions to infringement) art. 2 (national treatment).

[33] Patent Cooperation Treaty, art. 33, June 19, 1970, 28 U.S.T. 7645, 9 I.L.M. 978 [hereinafter PCT], *available at* http://www.wipo.int/export/sites/www/pct_en/texts/pdf/pct.pdf. As we shall see below, in Section III(A), the principles of patentability contained in the PCT appear to have been derived directly from the principles enunciated by the Council of Europe, some two decades earlier, in the Strasbourg Convention.

[34] *Id.* at arts. 3–42.

[35] *Id.* at art. 33(1).

contracting state to apply "additional or different criteria for the purpose of deciding whether, in that State, the claimed invention is patentable or not."[36] In effect, the PCT provides no absolute restrictions on patentability in contracting states, and it refrains from providing a formal definition of "invention" and, hence, of what makes a patent a patent.

Despite the definitional vagueness of the PCT and the flexibility allowed for its signatories, the text of the treaty does provide us with some interesting clues about whether patentable inventions ought to be technologies. In its sub-definition of the criterion of industrial applicability (the counterpart of the U.S. criterion of utility[37]), the PCT states the following:

> … a claimed invention shall be considered industrially applicable if, according to its nature, it can be made or used (*in the technological sense*) in any kind of industry.[38]

This clause suggests that *the authors of the PCT believed that only technologies should receive patent protection*. The PCT does not define "technology," but it leaves no doubt that patentable subject matter is presumed to be technological. The fact that the U.S. has been a signatory to the PCT since 1978[39] raises some interesting questions about the consistency of domestic U.S. law versus its international agreements since, as discussed in Section IV, U.S. patent statutes do not explicitly mention "technology" in their definition of patentable inventions. From a legal point of view, the PCT does not require its signatories to apply the criteria of patentability embodied in its text, so the U.S. seems to be on solid legal ground. Nevertheless, the contrast between PCT Article 33 and the respective section of the U.S. patent statutes is instructive.

B. The World Trade Organization and TRIPs

The General Agreement on Tariffs and Trade (GATT), executed under the auspices of the World Trade Organization (WTO) in 1994 as the Final Act of the 1986–1994 Uruguay Round of trade negotiations, included an agreement on trade-related aspects of intellectual property rights.[40] Commonly known as "TRIPs",[41] the agreement covers virtually all fields of intellectual property and includes a section on patentable subject matter. The TRIPs agreement applies to

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[36] *Id.* at art. 33(5).

[37] 35 U.S.C. §§ 101, 112 (2006). These sections codify the utility requirement, which will be discussed below in Section IV.

[38] PCT, *supra* note 33, art. 33(4) (emphasis added).

[39] *See* WORLD INTELLECTUAL PROPERTY ORGANIZATION, PCT APPLICANT'S GUIDE – INTERNATIONAL PHASE – APPENDIX A: PCT CONTRACTING STATES (2008), http://www.wipo.int/pct/guide/en/gdvol1/annexes/annex/ax_a.pdf.

[40] *See* TRIPs, *supra* note 6.

[41] *Id.* at art. 1.

all members of the WTO, which, as of July 2008, included 153 countries.[42] The United States and all of the major European countries are members of the WTO, and hence subject to the articles of the TRIPs agreement.[43]

The section of the TRIPs agreement delineating patentable subject matter[44] contains basic content, including provisions for exceptions to patentability, which is very similar to the material in the current British and pre-2008 German patent statutes, which will be discussed below. While, in contrast with the PCT, the TRIPs agreement does not include a clause defining the meaning of industrial applicability (and hence does not attach technological dimensions to the industrial applicability requirement), it does refer directly to technology in the main clause of the agreement specifying the basic parameters of a patent:

> [P]atents 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.[45]

This clause in the TRIPs agreement provides a strong signal that the majority of WTO members accept the general idea that patent protection is for technologies.

The explicit inclusion of the phrase "products or processes" in TRIPs Article 27(1) raises some interesting questions. In what sense might a product be considered a technology? How might the criterion of being in a field of technology be applied to the concept of a patentable method? Should the appellation "technology" apply differently to products than it does to processes? And, what if the method involves the use of software, or is directed towards solving a business problem? Some interpretation is required to discern the meaning of "in all fields of technology" in Article 27(1).

The obvious interpretation of the phrase is that for an invention to be patentable, it is not sufficient for it simply to be an invention that is new, that involves an inventive step, and that is capable of industrial application. Rather, it must be a *technology* that is new, that involves an inventive step, and that is capable of industrial application.

Some commentators, however, apply broader interpretive license to the phrase.[46] Thus, an alternative interpretation is that a patentable invention does

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[42] World Trade Organization, Understanding the WTO: The Organization, Members and Observers, http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm (last visited July 23, 2008).

[43] *Id.*

[44] *See* TRIPs, *supra* note 6, at art. 27.

[45] *See id.* at art. 27(1) (emphasis added).

[46] *But see* Paul Hartnack, Comptroller Gen., U.K. Patent Office, Chairman's Opening Remarks at Software Patents in Europe, UK Patent Office Conference (Mar. 23, 1998) (transcript

not need to be technological—it could be a supposedly non-technical invention (such as a business method or a mathematical algorithm) that simply needs to be applied in a technological context or industry, or to draw upon some kind of technological source, to qualify as TRIPs-compliant patentable subject matter. Early case law of the European Patent Office employed a doctrine along these lines, sometimes referred to as "the contribution approach."[47] Other commentators, sympathetic to a loose interpretation of the "technology" clause in TRIPs Article 27, have averred that if TRIPs does impose a technological requirement on the issuing of patents by WTO member states, then the U.S. would face problems.[48] For now, it is sufficient to note that, given that the U.S. is simultaneously bound by the TRIPs agreement yet appears (at least in the minds of critics) to have patent laws that allow for patent protection over inventions other than technologies, there is an ostensible tension that calls for careful thought. The U.S. situation vis-à-vis TRIPs highlights difficulties that may be generated by sloppy technological semantics in the domain of patent law.

Arguably, the natural interpretation of the TRIPs clause requiring patents "in all fields of technology" is that it represents a formal international decision to narrow the scope of patent-eligible subject matter to that of technology. There is evidence, however, that that phrase in Article 27(1) was actually placed there at the behest of WTO member states who wished to ensure that TRIPs required a maximally broad scope of patent-eligible subject matter, in opposition to those who wished to "exclude certain fields of technology from patent protection."[49] This concern was a central factor in the inaugural meeting of the TRIPs

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available at http://web.archive.org/web/20041209195828/www.patent.gov/uk/about/ippd/softpat/1000.htm).

[47] *See*, e.g., LEITH, *supra* note 5, at 22–38.

[48] The Foundation for a Free Information Infrastructure (FFII) has asserted that the TRIPs Agreement

> does not mandate a specific invention concept.… Even within the realm of patentable "technology", Art 27(1) can hardly be interpreted as a rigid framework that outlaws all fine-tuning. If it was to be interpreted in this rigid way, as some patent lawyers propose, U.S. law would fall afoul of TRIPs in at least four areas: pharmaceuticals [35 USC § 155, 156, term extensions; 35 USC § 271(e), experimental use]; biotechnology processes [35 USC § 103(b), providing special non-obviousness standard]; medical and surgical procedures [35 USC § 287(c), limiting remedies], and methods of doing business [35 USC § 273(a)(3), providing prior user rights].

Foundation for a Free Information Infrastructure (FFII), *The TRIPs Treaty and Software Patents, Article 27(1): Patentable Subject Matter*, http://eupat.ffii.org/analysis/trips/#art27 (last visited 27 July 2008).

[49] Note by the International Bureau of the World Intellectual Property Organization, *Existence, Scope and Form of Generally Internationally Accepted and Applied Standards/Norms for the Protection of Intellectual Property*, ¶ 1(ii), MTN.GNG/NG11/W/24, (May 5, 1988), *available at* http://www.ipmall.info/hosted_resources/lipa/trips/W24.pdf.

Negotiating Group in 1987, as illustrated by the following statement recorded on the first page of the Minutes of that historic meeting:

> Some participants said that trade problems were arising as a result of deficiencies in the protection accorded to intellectual property, both because of *inadequacies in the scope and availability of intellectual property rights* under many national laws and because of lack of effective procedures and remedies for the enforcement of such rights where they existed. *As regards inadequacies in the scope and availability of rights, reference was made to the absence in certain countries of patent or copyright laws or of the protection of designs, computer programmes or geographical indications; exclusions of categories of products or of works from protection*; insufficient duration of protection; misuse of compulsory licensing; and procedural obstacles or de facto discrimination that makes it difficult for foreign firms to obtain protection for their intellectual property.[50]

Notwithstanding the arguably contrary motives of the protagonists of the "all fields of technology" requirement, the end result is that TRIPs Article 27(1) contains what may also be viewed as a scope-narrowing element, since it arguably excludes from patentability all inventions that do not belong to a field of technology. Despite the problems just highlighted, the general conclusion we may draw from TRIPs Article 27(1) is that since 1994, by signing on as members of the WTO, the majority of nations have thereby formally assented to the general idea that patent protection is meant for inventions in fields of technology.

C. Complementary Evidence from Contemporary Patent Laws in Asia

Although this study focuses on patent law in the United States and Europe, it may be instructive to look briefly at the statutes of other countries that are internationally prominent in the issuing of patents to investigate the degree to which they explicitly mention technology in clauses dealing with subject-matter eligibility.

For example, the patent laws of Japan, Korea, and Taiwan, respectively, contain definitions of patentable inventions as follows:

[50] Note by the Secretariat, *Meeting of 25 March 1987*, ¶ 3, MTN.GNG/NG11/1 (Apr. 10, 1987) (emphasis added), *available at* http://www.ipmall.info/hosted_resources/lip/trips/1.pdf.

> "Invention" in this Law means the highly advanced creation of technical ideas by which a law of nature is utilized.[51] [Japan]
>
> "Invention" means the highly advanced creation of a technical idea using the rules of nature;[52] [Korea]
>
> The term "invention" as used herein refers to any creation of technical concepts by utilizing the rules of nature.[53] [Taiwan]

The definitions of patentable inventions in the Japanese, Korean, and Taiwanese statutes are explicit in their reference to technology. The basic concept of the patentable invention in these three Asian countries is remarkably similar in spirit to the concept of a patentable invention in German case law (reviewed below), especially in its emphasis on the requirement that a technical idea—or technical teaching, to use the German terminology—must conform to *natural laws*. As illustrated by the Patent Examination Guidelines of the Taiwan Intellectual Property Office, "… inventions that are mere discovery, against the rule of nature, not using the rule of nature, or non-technical in character are not considered as inventions."[54] This theme also accords closely with the examination practices and case law of the European Patent Office that have emerged since the mid-1990s.[55]

The Patent Act of the People's Republic of China, in contrast to those of Japan, Korea, and Taiwan, does not include a clause explicitly defining patentable subject matter.[56] Its basic definition of a patent, found in the chapter dealing with the requirements for granting patent rights, is very similar to the basic definition found in the PCT. The precise wording is as follows:

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[51] Tokkyoho [Japanese Patent Law], Law No. 121 of 1959, art. 2(1), *translated in* WORLD INTELLECTUAL PROPERTY ORGANIZATION COLLECTION OF LAWS FOR ELECTRONIC ACCESS (CLEA) – SAPAN: PATENTS, LAW, *available at* http://www.wipo.int/clea/en/text_pdf.jsp?lang=EN&id-2624.

[52] Republic of Korea Patent Act, Act No. 950 of 1961, art. 2(1), *translated in* WORLD INTELLECTUAL PROPERTY ORGANIZATION COLLECTION OF LAWS FOR ELECTRONIC ACCESS (CLEA), *available at* http://www.wipo.int/clea/en/text_pdf.jsp?lang=EN&id=2751.

[53] Zhuan Li Fa [Taiwan Patent Act], art. 21, Faigui Huibian (2003), *translated by* the Taiwan Intellectual Property Office, Patent Act, *available at* http://www.tipo.gov.tw/en/AllInOne_Show.aspx?guid=173f4350-93d4-43c9-a475-042ce0f3ac8c&lang=en-us&path=1448.

[54] Jerry I.-H. Hsiao, *Patent Protection for Chinese Herbal Medicine Product Invention in Taiwan*, 10 J. WORLD INTELL. PROP. 1, 11 (2007).

[55] *See generally* CASE LAW OF THE BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE 1–47 (Albert Ballester Rodès et al. eds., 5th ed. 2006) [hereinafter EUROPEAN PATENT OFFICE CASE LAW].

[56] Patent Law (promulgated by the Standing Comm. Nat'l People's Cong., Mar. 12, 1984, effective Apr. 1, 1985, amended Aug. 25, 2000) (P.R.C.), *translated in* WORLD INTELLECTUAL PROPERTY ORGANIZATION COLLECTION OF LAWS FOR ELECTRONIC ACCESS (CLEA) [hereinafter P.R.C. Patent Law], *available at* http://www.wipo.int/clea/en/text_pdf.jsp?lang=EN&id=860.

> Any invention or utility model for which patent right may be granted must possess novelty, inventiveness and practical app1icability.[57]

However, the accompanying text that defines the meaning of the three basic patentability criteria (novelty, inventiveness, and practicability),states:

> Inventiveness means that, as compared with the *technology* existing before the date of filing, the invention has prominent substantive features and represents a notable progress …[58]

This qualification concerning prior art, which, once again, echoes the spirit of the equivalent clause from the PCT, expresses unmistakably that, in China, patentable subject matter is understood to be technology. The language of the introductory chapter of the statute reinforces this interpretation, explaining the basic purposes of patent law in China in the following terms:

> This Law is enacted to protect patent rights for inventions-creations, to encourage invention-creation, to foster the spreading and application of inventions-creations, and to promote the development and innovation of science and *technology*, for meeting the needs of the construction of socialist modernization.[59]

Once again, while a separate definition of patentable subject-matter is not provided—and while such an omission is puzzling for such a recently developed set of patent laws—the Chinese statute reveals the presumption of its authors that patents are indeed intended for technologies. This presumption is, in any case, also made explicit within the patent examination guidelines issued by China's intellectual property office (SIPO):

> An invention or utility model for which a patent right may be granted shall be one that can solve a *technical* problem and can be put in to practice. ... Only when a patent application for a product or process satisfies such conditions, can it be granted a patent right.[60]

To summarize this brief excursion outside the boundaries of Europe and the United States, we may observe that the major patent jurisdictions of East Asia (Japan, Korea, China, and Taiwan) all embrace the basic common-sense notion

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[57] *Id.* at art. 22, para. 1.

[58] *Id.* at art. 22, para. 3 (emphasis added).

[59] *Id.* at art. 1 (emphasis added).

[60] GUIDELINES FOR EXAMINATION, State Intellectual Property Office of the People's Republic of China, Ordinance No. 38, 1 July 2006, Part II, Ch. 5, §2. Emphasis *in italics* added.

that technology is coterminous with the subject matter of patents. Japan, Korea, and Taiwan, in particular, are very explicit about this point in their respective definitions and China is unequivocal about it when the totality of its laws, regulations and administrative guidelines are considered.

III. What Does Contemporary European Statutory Law Have to Say About Patent-Eligible Subject Matter?

A. Foundational European Efforts to Harmonize Legal Requirements for Patenting Inventions

The Council of Europe crystallized most of the essential features of contemporary patent law in Europe, both under the European Patent Convention and under the patent laws of individual member states, over four decades ago through a series of consultations. The principles that emerged from those consultations were formalized in a seminal agreement settled at the *Convention on the Unification of Certain Points of Substantive Law on Patents for Invention*, otherwise known as the "Strasbourg Convention," in 1963.[61] The Convention (while European centered) both preceded and presaged the language and principles of the PCT (global in reach). The PCT was not finalized until some two decades after the Strasbourg Convention.[62] The Convention laid out the basic criteria for evaluating the eligibility of the subject matter for patent protection as follows:

> In the Contracting States, patents shall be granted for any inventions which are susceptible of industrial application, which are new and which involve an inventive step. An invention which does not comply with these conditions shall not be the subject of a valid patent.[63]

The participants in the Convention chose to describe patentable subject matter in a formal, abstract, and generic manner, in contrast with the American preference for specifying particular categories of inventions, such as machines or manufactures. We can also see the direct influence of the Strasbourg Convention in the wording of key elements of the PCT.

The text of the Strasbourg Convention provides definitions of each of the core elements of a patentable invention, as follows:

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[61] Convention on the Unification of Certain Points of Substantive Law on Patents for Invention, Nov. 27, 1963, Europ. T.S. No. 47 [hereinafter Strasbourg Convention].

[62] PCT, *supra* note 33.

[63] Strasbourg Convention, *supra* note 61, art. 1.

> "An invention shall be considered to be susceptible of *industrial application* if it can be made or used in any kind of industry including agriculture."[64]
>
> "An invention shall be considered to be *new* if it does not form part of the state of the art."[65]
>
> "An invention shall be considered as involving an *inventive step* if it not obvious having regard to the state of the art."[66]

In addition to outlining a number of procedural matters, the Strasbourg Convention specified that the scope of patent protection must be determined by one or more patent claims, that the claims must be accompanied by an adequate description of the invention, and that the patent specification must "disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art."[67] In addition, the Convention specified certain categories of inventions explicitly excluded from patent protection: inventions incompatible with "order public" or "morality" and "plant or animal varieties or essentially biological processes for the production of plants or animals."[68]

The text of the Strasbourg Convention does not include the word "technology." However, common sense, combined with the fact that the Convention's preamble mentioned promoting "technical progress" as a goal, suggests that the drafters of the document probably had something along the lines of what would now be called "technology" in their minds when employing the phrase "inventions which are susceptible of industrial application." Nevertheless, as we have also noted in relation to the PCT, the Strasbourg Convention was not clear whether patents should be coterminous with technology.

Before examining what the European Patent Convention has to say about patent-eligible subject matter, it is appropriate—in view of the fact that as yet there is no European Community patent, and that all patents in Europe are issued as national patents[69]—to look briefly at the patent law of Europe's two largest patent jurisdictions, the United Kingdom and Germany.

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[64] *Id.* at art. 3 (emphasis added).

[65] *Id.* at art. 4 (emphasis added).

[66] *Id.* at art. 5 (emphasis added).

[67] *Id.* at art. 8.

[68] *Id.* at art. 2. With remarkable foresight, the Convention explicitly excluded "micro-biological processes and the products thereof" from the prohibition on "essentially biological processes." *Id.* at art. 2(b).

[69] The European Patent, once issued, is actually a bundle of national patents issued through the vehicle of the European Patent Office, under the rules of the European Patent Convention.

B. British Statutory Law

Although Venice enacted patent laws earlier than Britain, most historiographies on the subject point to Britain as the primary antecedent of modern patent law.[70] After approximately three centuries of endogenous patent jurisprudence, Britain's patent laws underwent significant changes during the latter half of the 20th Century as a consequence of its participation in the European Community/European Union, the Strasbourg Convention, the PCT, and the European Patent Convention.[71] The signal event in this process was the adoption by the United Kingdom of a new patent statute about three decades ago, The Patents Act 1977, amended in 2007.[72]

Cornish and Llewelyn have encapsulated the heart of the extensive legal history of the United Kingdom concerning patentable subject-matter, prior to the influence of the European Community on British intellectual property law, succinctly as follows:

> In Britain, before the 1977 Act, the judges dealt with [defining the types of subject matter to which patent law accords protection] guided only by the Jacobean catch-phrase, "manner of new manufacture."[73]

The British Crown had issued letters-patent and authorized monopolies for various types of commerce since the Fifteenth Century; but, by the early Seventeenth Century the abuse of this practice by the Crown had led to such criticism that the British Parliament passed the Statute of Monopolies, which annulled previous monopolies issued by the Crown.[74] Nevertheless, the statute also provided for patent protection of limited duration (14 years) for certain types of inventions ("manufactures").[75] This law, developed further by British courts, eventually became the archetype of modern patent law for other countries.[76]

The term "manner of new manufacture," which, as Cornish and Llewelyn have noted, has formed the central pillar of British patent law for most of its

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[70] BRAD SHERMAN & LIONEL BENTLY, THE MAKING OF MODERN INTELLECTUAL PROPERTY LAW: THE BRITISH EXPERIENCE, 1760-1911 9 (Cambridge Univ. Press 1999).

[71] *See generally* WILLIAM CORNISH & DAVID LLEWELYN, INTELLECTUAL PROPERTY: PATENTS, COPYRIGHT, TRADE MARKS AND ALLIED RIGHTS (6th ed., London Sweet & Maxwell 2007).

[72] *See generally* The Patents Act, 1977 (Eng.).

[73] CORNISH, *supra* note 71, at 214.

[74] ARTHUR R. MILLER & MICHAEL H. DAVIS, INTELLECTUAL PROPERTY; PATENTS, TRADEMARKS AND COPYRIGHT 4–6 (West Group 2000).

[75] Statute of Monopolies, 1623, 21 Jac., c. 3 (Eng.).

[76] MILLER, *supra* note 74. As noted above, the framers of the U.S. Constitution were heavily influenced by the British common law tradition, drawing on the *Statute of Monopolies*. Walterscheid, *supra* note 16.

history, originated in the Statute of Monopolies, the most pertinent section of which is worded as follows:

> Provided also that any declaration before mentioned shall not extend to any letters patents (b) and grants of privilege for the term of fourteen years or under, hereafter to be made, of the sole working or making of any manner of new manufactures within this Realm (c), to the true and first Inventor (d) and Inventors of such manufactures, which others at the time of making such letters patent and grants shall not use (e), so as also they be not contrary to the law nor mischievous to the state, by raising prices of commodities at home, or hurt of trade, or generally inconvenient (f); the same fourteen years to be accounted from the date of the first letters patents or grant of such privilege hereafter to be made, but that the same shall be of such force as they should be if this act had never been made, and of none other.[77]

Court decisions based on the Statute of Monopolies played a dominant role in British patent law for the next three centuries in producing a shared understanding amongst intellectual property professionals, both within the U.K. and abroad, about what constituted patentable subject matter.[78]

In 1977, however, with the passing of the new Patent Act, the Statute of Monopolies ceased being the basis for patent law in the U.K.[79] The new act defined the pertinent basic principles to be followed by the judiciary as follows:

> A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say – (a) the invention is new; (b) it involves an inventive step; (c) it is capable of industrial application; (d) the grant of a patent for it is not

[77] Statute of Monopolies, *supra* note 75, c. 3, §6.

[78] MILLER, *supra* note 74, at 40–44.

[79] Interestingly, the definition of patentable subject matter in the patent statutes of Australia (which are rooted historically in U.K. law) still retains the old (pre-1977) U.K. patentable-subject-matter concept derived from the Statute of Monopolies: "an invention is a patentable invention for the purposes of a standard patent if the invention. . . is a manner of manufacture within the meaning of the Statute of Monopolies." Patents Act, 2006, c.2, pt. 3, div. 1, § 18(1) (Austl.). Australia (which, unlike the U.K., is largely immune to the pressures of European Community jurisprudence), appears to have held on more successfully to some old British legal notions than has Britain itself. The same is true for New Zealand's patent law: "Invention means any manner of new manufacture the subject of letters of patent and grant of privilege within section 6 of the Statute of Monopolies and any new method or process of testing applicable to the improvement or control of manufacture; and includes an alleged invention." Patents Act 1953, 2007 S.R. No. 64 § 2(1) (N.Z.).

> excluded by subsections (2) and (3) below; and references in this Act to a patentable invention shall be construed accordingly.[80]

The British Patent Act basically follows the pattern of the Strasbourg Convention and the PCT in defining patentable subject matter, except that it also contains a number of specific exclusions that are not specified in the text of the PCT:

> (2) It is hereby declared that the following (among other things) are not inventions for the purpose of this Act, that is to say anything that consists of – (a) a discovery, scientific theory or mathematical method; (b) a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever; (c) a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer; (d) the presentation of information; but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act only to the extent that a patent or application relates to that thing as such. (3) A patent shall not be granted for an invention the commercial exploitation of which would be contrary to public policy or morality.[81]

These exclusions mean that the boundaries of patentable subject matter in the U.K. statute are significantly narrower than those under U.S. patent law. Specifically, the British law does not allow the inclusion of methods to the same extent as the U.S. law, and it also excludes computer software. Clause (3) of the British law is directed at ethical and policy concerns regarding the end-uses to which inventions may be put, rather than to intrinsic qualities of the inventions themselves. In addition, the U.K. Patent Act until very recently excluded methods for medical and veterinary diagnosis and treatment from patentability.[82] *The British law refrains from explicitly mentioning that the basic subject matter of patents should be coterminous with technology.*[83] Furthermore, in contrast with the PCT, in its sub-definition concerning the meaning of industrial applicability, the British Patent Act does not assert the additional criterion of the invention needing to exhibit technological characteristics.[84] Through its exceptions to patentability, the Patent Act of 1977 moves a little in the direction of adding

[80] Patents Act, 1977, *supra* note 72, pt. I, §1(1).

[81] *Id.* § 2–3.

[82] *Id.* § 4(2). This exclusion was repealed in the recent version of the Act that came in to force on 17 December 2007.

[83] The same lacuna incidentally exists in Australian patent law (Patents Act, 1990, *supra* note 79), New Zealand patent law (Patents Act, 1953, *supra* note 79) and Canadian patent law (Patent Act, 1985 R.S.C., 1985, c. P-4 (Can.)). Both the Australian and New Zealand patent laws, in particular, are heavily influenced by the British legal tradition.

[84] Patents Act, 1977, *supra* note 72, pt. I, § 4.

some definitional shape to the notion of an invention through a kind of "negative definition". However, in essence, the British Patent Act fails to positively define what an invention is and to address the question of whether a patentable invention needs to be a technology to qualify for protection.

A debate has apparently been taking place in British jurisprudence about whether the meaning of "invention" can be fully determined simply on the basis of the three positive requirements of patentability, specified in § 1.-(1) of the British Patent Act, and the list of exclusions to patentability, specified in § 1.-(2), and elsewhere.[85] The British House of Lords has apparently not embraced this idea. Nevertheless, the British courts have so far apparently refrained from providing a formal definition of an invention under the act.[86]

C. German Statutory Law

The German Patent Act (1998), still in force at the end of 2007, on patentable subject matter,[87] states that, "[p]atents shall be granted for inventions that are new, involve an inventive step and are susceptible of industrial application."[88] The 1998 version of the German statute basically adopts the same concept of a patent as found in the Strasbourg Convention, the PCT, and in the British statute. It also contains a similar list of exclusions to patentability[89] as summarized above in the British law, including the exclusions related to plant or animal varieties or essentially biological processes for the production of plants or animals.[90]

Like the British Patent Act, the 1998 German Patent Act departs from the position of the PCT by not asserting (in its sub-definition concerning the meaning of industrial applicability) an additional criterion of the invention needing to exhibit technological characteristics to be eligible for patent protection.[91] In short, in keeping with the British statutes, the German statutes (at least the versions available in the English language) do not explicitly mention technology as being coterminous with the basic subject matter of patents.

German case law, however, tells a different story, more in line with the technological theme "hidden" inside the text of the PCT. Beginning with the

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[85] *See id.* § 1(2).

[86] CORNISH & LLEWELYN, *supra* note 71, at 215.

[87] Patentgesetz [Patent Law], Dec. 16, 1980 BGBl. 1981 I S. 1 (F.R.G.), last amended by Laws of July 16 and Aug. 6, 1998, *translated in* WORLD INTELLECTUAL PROPERTY ORGANIZATION COLLECTION OF LAWS FOR ELECTRONIC ACCESS (CLEA), *available at* http://www.wipo.int/clea/docs_new/pdf/en/de/de081en.pdf.

[88] *See id.* § 1(1).

[89] *Id.* § 1(2).

[90] *Id.* § 2(1).

[91] *Id.* § 5.

well known "*Red Dove*"[92] case, the German Federal Supreme Court, building upon the German statutes and the associated tradition of jurisprudence in the German courts, has interpreted a patentable invention to be a:

> … teaching to methodically utilize controllable natural forces to achieve a causal, perceivable result, …, provided that teaching meets the general prerequisites of industrial application, novelty, etc."[93]

The German jurisprudence on this matter is remarkable in at least two ways. First, the courts have taken a bold step by not only seeking to define the content of "invention" in a way that other courts have shied away from, but by incorporating a definition of "technology" (even if the word "technology" is not explicitly used) in the definition of "invention." *The German courts have effectively ruled that the appropriate subject matter for a patent is technology; and, they have provided us with a reasonably accessible description of what makes an invention technological*.[94] Second, the jurisprudence has added semantic clarity by emphasizing the difference between the patent itself and the subject matter underlying the patent, by portraying the content of the patent as a "teaching" about what is, in effect, technology. Joseph Straus has stated this concept succinctly:

> Patents are construed as exclusive rights, which confer on the patentee the right of exclusive use of the patented invention, i.e., an instruction how to solve a specific problem with technical means, provided the invention meets the patentability criteria of novelty, inventive activity (non-obviousness) and industrial applicability (utility).[95]

German jurisprudence, beginning with case law as early as four decades ago, has construed patentable subject matter as being coterminous with technology (expressed in the form of a "technical teaching"). This German jurisprudence and academic legal thought has, after several decades, finally found expression in the German patent statute, which from 2008 onwards defines a patent as follows:

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[92] Bundesgerichtshof [BGH] [Federal Supreme Court] Mar. 27, 1969 (F.R.G.), *translated in Rote Taube (Red Dove)*, 1 INT'L REV. INDUS. PROP. COPYRIGHT L. 136–37 (1970).

[93] Joseph Straus, *Biotechnology and Patents*, 54 CHIMIA 293, 293 (2000).

[94] *See generally* Computer Program Inventions before the German Supreme Court, *available at* http://www.jenkins.eu/articles/computer-program-inventions---germany.asp (last visited on Oct. 12, 2008).

[95] Straus, *supra* note 93, at 293.

> Patente werden für Erfindungen auf allen Gebieten der Technik erteilt, sofern sie neu sind, auf einer erfinderischen Tätigkeit beruhen und gewerblich anwendbar sind.[96]

This revision is more explicit than the PCT in stating its intention that patents be granted for *technological* inventions and has embraced the spirit, if not the literal meaning, of patents as found in the TRIPs agreement, assented to by Germany more than a decade earlier.

D. The European Patent Convention

In November 2000, the contracting states to the European Patent Convention (EPC) held a conference to revise the text of the European Patent Convention of 1973.[97] The new text of the European Patent Convention, known informally as "EPC 2000", was agreed upon by the Diplomatic Conference on November 29, 2000, was formally adopted on June 28, 2001, and came into force on December 13, 2007.[98] EPC 2000 replaced EPC 1973, which contained the following clause on the patentability of inventions:

> European patents shall be granted for any inventions which are susceptible of industrial application, which are new and which involve an inventive step.[99]

As we have seen, the patentability criteria of EPC 1973 were very similar to those included in the Patent Act of 1977 in the U.K. and in the Patent Act of 1998 in Germany. This holds for exclusions to patentability as well as to the positive criteria of novelty, inventive-step, and industrial applicability. Furthermore, in like manner to the statutes of Germany and Britain, EPC 1973 contained no special sub-definition of industrial applicability specifying a requirement that the invention be technological.

In EPC 2000, however, a significant change was introduced to bring the EPC into conformity with TRIPs:

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[96] Patentgesetz, *supra* note 87, § 1(1). ("Patents shall be granted *in all fields of technology* for inventions that are new, involve an inventive step and are industrially applicable." English translation by Kelvin Willoughby).

[97] *See generally* Act Revising the Convention on the Grant of European Patents, Nov. 29, 2000, 1065 U.N.T.S. 1999 [hereinafter EPC 2000], *available at* http://www.parlament.gv.at/PG/DE/XXII/I/I_01281/imfname_055868.pdf; European Patent Office, *revision of the European Patent Convention (EPC 2000) Synoptic Presentation of EPC 1973/2000 – Part I: The Articles*, EPO OFFICIAL J. (Spec. Ed. 4 2007) [hereinafter *Synoptic Presentation*].

[98] EPC 2000, *supra* note 97, at ch. 1, art 52(1).

[99] European Patent Convention on the Grant of European Patents, ch. 1, art. 52(1), Oct. 5, 1973, 1065 U.N.T.S. 199, *available at* http://www.epo.org/patents/law/legaltexts/html/epc/1973/e/ar52.html [hereinafter EPC 1973].

> European patents shall be granted for any invention, *in all fields of technology*, provided that they are new, involve an inventive step and are susceptible of industrial application.[100]

The explanation provided by the European Patent Office for the logic behind this significant change is illuminating. The changes to Article 52(1) of the EPC were introduced

> … with a view to enshrining the word "technology" in the basic provision of substantive European patent law, clearly defining the scope of the EPC, and making it plain that patent protection is available to technical inventions of all kinds. The new wording of Article 52(1) EPC plainly expressed that patent protection is reserved for creations in the technical field. In order to be patentable, the subject-matter claimed must therefore have a "technical character" or, to be more precise, involve a "technical teaching", i.e. an instruction addressed to a skilled person as to how to solve a particular technical problem using particular technical means. It is on this understanding of the term "invention" that the patent granting practice of the EPO and the case law of the Boards of Appeal are based. Thus, it will remain incumbent on EPO practice and case law to determine whether subject-matter claimed as an invention has a technical character and to further develop the concept of invention in an appropriate manner, in light of technical developments and the state of knowledge at the time.[101]

The logic embraced by the European Patent Office (EPO) is clearly reminiscent of the German jurisprudence surrounding patents and the observations of German commentators that were briefly reviewed above. In particular, the idea that *the subject matter of a patent must contain a technical teaching addressed towards solving a technical problem using particular technical means*, adds remarkable substantive content to the notion of a patentable "invention." In doing so the authors of the EPC have stepped boldly beyond the wording that has dominated the patent statutes of other jurisdictions from prior decades, yet they have done so in a way that speaks to the original "technology-oriented" spirit that could be discerned in the very early European patent statutes and the very early American (pre-federal) patent statutes. This technology-oriented spirit is also consistent with what might arguably be seen as common sense notions of technology and patents. The spirit of EPC is also very

[100] EPC 2000, *supra* note 97, ch. 1, art. 52(1).

[101] *Synoptic Presentation*, supra note 97, at 48.

similar to the spirit of the patent laws of the major jurisdictions of East Asia, which themselves appear to have been influenced by German legal tradition.

The rationale articulated by the EPO for the recent changes in the EPC also accords with the insight of Cornish, who stated that "[i]nevitably, patent systems have been shaped over time by the *technologies* for which their aid has been sought."[102] This statement, by a seasoned observer and analyst of intellectual property law, is both additional anecdotal evidence of the historically intimate connection between technology and patents, and an observation that technological change itself may generate pressure for more explicit discussion of technology in patent law.

IV. What Do Contemporary American Statutes Have to Say About Patent-Eligible Subject Matter?

The original U.S. patent statute of 1790 was modified and extended a number of times during the following century, but the basic form of contemporary U.S. patent law came into place at the mid-point of the Twentieth Century, in the 1952 Act of the U.S. Congress, embodied in Title 35 of the United States Code.[103] Congress has amended the law a number of times, with the current version enacted in 2003.[104] The 2003 version defines the basic concept of a patent under the general rubric of "patentability of inventions" with the following wording:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.[105]

Consistent with the nomenclature employed by Madison over 150 years earlier, the current U.S. Patent statute employs the term "invention" as the general rubric for the content of the patent.[106] The statute retains the terms "machine" and "manufacture" from the original 1790 verison as qualifiers of "invention." Interestingly, however, the original terms "engine" and "device" have disappeared from the definition, and "composition of matter" has been added as a new qualifier of "invention." Finally, the 1790 term "art" has been replaced by the new term "process."[107] The current statute retains the qualities of

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[102] WILLIAM R. CORNISH, INTELLECTUAL PROPERTY: OMNIPRESENT, DISTRACTING, IRRELEVANT? 10 (Oxford Univ. Press 2004) (emphasis added).

[103] ROBERT L. HARMON, PATENTS AND THE FEDERAL CIRCUIT §§ 1.2–.3 (8th ed. 2007).

[104] 35 U.S.C. § 1 *et seq.* (2006).

[105] *Id.* § 101.

[106] "Whoever invents" implies "invention."

[107] The term "art" has nevertheless been retained as part of the generic term for prior technology ("prior art").

novelty and utility from the 1790 Act as additional qualifiers of the patentable invention. In short, the basic concepts of a patentable invention that were present in the 1790 Act have been retained in the 2003 version of the statute, but with an apparent reduction in the emphasis placed on mechanical devices, or, at least, a reduction in the mechanical connotations of "invention". Congress has also added some new elements to the definition, namely, those of the "useful process" and "composition of matter." *Lawmakers in the U.S. have apparently expanded the admissible scope of patentable subject matter beyond that of the original scope articulated by the 1790 Act.* However, whether the scope has really been expanded depends upon how the connection between the "useful arts" and the instantiations of the "useful arts" as articulated by Congress are construed.

On the matter of whether discoveries (which some commentators might see as the ostensible domain of science, rather than technology) are patentable, the current U.S. law is clear: "The term "invention" means invention or discovery."[108] As we saw earlier, this terminology is rooted in the language of the U.S. Constitution, so it is not surprising to find it in the current statute. We might presume that the U.S. Congress may have intended that different types of discovery might be conceptually differentiated, with only some types (engineering discoveries as opposed to scientific discoveries?) qualifying as "discoveries" under the meaning of Title 35 of the Code. Such a presumption would be consistent with a 1958 U.S. Senate report that expressed the opinion that it is inappropriate to equate discovery with invention.[109] Nevertheless, while the distinction between invention and discovery was explicit in the Senate report, such a strict differentiation was not, and still is not, present in the U.S. patent statute. In the decades following the 1952 Act, however, the U.S. Supreme Court has held that certain categories of discoveries—namely, scientific principles, natural phenomena, mental processes and mathematical formulae, in the abstract—are not patentable, as such.[110] Under both statutory and case law in the U.S. some, although not all, categories of discoveries are patentable, regardless of whether they are normally described as "inventions" in the English language.

Ambiguity has been present in U.S. intellectual property law from the beginning regarding whether strong distinctions should be made between

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[108] 35 U.S.C. § 100(a). This nomenclature is consistent with the wording of the original 1790 statute that, as noted above, permitted patents for either inventions *or* discoveries. In the contemporary statute the meaning of the word "invention" has been expanded to become an umbrella term embracing that of "discovery."

[109] The report contained the following statement: "An invention is a new contrivance, device, or technical art newly created, in contrast to a discovery of a principle or law of nature that has already 'existed' though unknown to man." STAFF OF S. SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 6 (Comm. Print 1958) (prepared by Fritz Machlup).

[110] *See* Gottschalk v. Benson, 409 U.S. 63, 67 (1972); Parker v. Flook, 437 U.S. 584, 594 (1978); Diamond v. Chakrabarty 447 U.S. 303, 309 (1980); Diamond v. Diehr, 450 U.S. 175, 185 (1981)).

scientific discoveries and technological discoveries when deciding if discoveries (otherwise exhibiting the conventional qualities of patentable inventions—novelty, non-obviousness and utility) should be patentable.[111] In short, there is a persistent tendency in U.S. patent law to conflate discovery and invention.

The 2003 statute includes a definition of the term "process" as employed in the definition of a patentable invention in § 101 of the statute:

> The term "process" means process, art or *method*, and includes a new use of a known process, machine, manufacture, composition of matter, or material.[112]

Of particular interest in this sub-definition is the inclusion of "method" as an admissible invention or discovery under the statute. The wording of the statute suggests that any method that is new, useful, and non-obvious),[113] and that is not otherwise excluded elsewhere in Title 35, is eligible for patent protection. [114] The method does not need to be a "technical method" and it does not need to be qualified by any quality other than the basic qualities required of the other categories of patentable subject matter. Under current U.S. law it appears that *any method* that has actually been invented by the applicant may be patented, so long as it is novel, useful, and non-obvious and otherwise satisfies all statutory requirements of patentability. Logically, this would include business methods and other types of methods—such as psychological methods, organizational methods, propaganda methods, educational methods, traffic control methods, agricultural methods, food processing methods, scientific methods, and many others—so long as those methods are novel, useful, and non-obvious, and not otherwise disqualified from patentability for various procedural violations. Whether the USPTO[115] or U.S. courts would honor this broad scope of patentability allowed for in the statute may be an interesting matter for discussion; as we shall see in our analysis of U.S. case law in Section VI the courts have often refused to interpret the statutes literally. A careful reading of the statute certainly supports the view that 35 USC § 101 allows for any method (from any field) that also satisfies the normal criteria of patentability to be

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[111] It appears that, in addition to the specific controversy over whether "discoveries" may patented, ambiguity and debate as to what constitutes basic patent-eligible subject matter in general has characterized US patent law for most of its history. *See* Frank D. Prager, *Standards of Patentable Invention from 1474 to 1952*, 20 U. CHI. L. REV. 69, 69–92 (1952).

[112] 35 U.S.C. §100(b) (2006) (emphasis added).

[113] Section 103 requires that for an invention (a "method," in this case) to be patentable it must, in addition to being novel and useful, not be obvious at the time of invention to a person having ordinary skill in the relevant art. *Id.* § 103.

[114] Grounds for exclusion might include, for example, the applicant having published information about the invention prior to the permitted one-year grace period before filing the patent application, §102(b), or the applicant not being the true inventor, §102(f).

[115] United States Patent and Trademark Office.

patented. This holds true even though the method might not embody the putative features of technology that have traditionally been associated with inventions (i.e., machines, manufactures, devices, engines, etc.) under various patent law regimes.[116]

The definition of "process" in 35 USC § 101 also includes "a new use of a known … material." This stretches the boundaries of "useful art, manufacture, engine, machine, or device" that characterized the notion of a patentable invention under the original U.S Patent Act. The language of the code does not qualify this part of the clause by requiring that the use of the known material be a technical use, or that it needs to exhibit any quality other than the basic qualities required of patentable subject matter. Under current U.S. law, therefore, *any new use of a known material that the applicant has invented may be patented, so long as that use is novel, useful, and non-obvious.*

Interestingly, despite the fact that the word "technology" is now ubiquitous in English discourse, the word "technology" is conspicuously absent from the definition of a patent in the U.S. Code.[117] Even though technology has arguably been the historical putative content of patents for at least a few hundred years, and even though it is arguably the presumed primary content of patents in the minds of the majority of people, it is striking that the word is so noticeably absent from formal definitions of patentable material in the current U.S. code.

To summarize this section of our short review, we may conclude that contemporary U.S. patent law broadens the scope of patentable subject matter significantly beyond that expressed in the seminal patent statutes of the country, and beyond the boundaries of what might conventionally be thought of as "technology." Nevertheless, the extent and significance of this apparent broadening will depend upon the meaning one attaches to "technology." In addition, as will become apparent in the analysis of case law in Section VI, judicial conversation in the U.S. on whether patents should be coterminous with

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[116] At the introduction of the new patent act in 1952, despite the clear wording of the act, it was by no means accepted by all professional observers that the traditional "technological" features of inventions (as conventionally understood) were no longer required for patentability. For example, in the words of patent attorney, Robert Coulter,

> A statutory 'useful art' is any technological process or method which is of utilitarian service to man; as distinguished from the cultural arts and other historically disparate arts (such as business, teaching, medicine, etc.). It must involve a definite procedure (an act or mode of acting) by means of which the forces and materials of nature are intelligently controlled and utilized to accomplish a practical result beneficial to the material well-being of mankind. . . .

Robert I. Coulter, *The Field of the Statutory Useful Arts, Part III*, 34 J. PAT. OFF. SOC'Y 718, 737 (1952). *See also* Robert I. Coulter, *The Field of the Statutory Useful Arts, Part I*, 34 J. PAT. OFF. SOC'Y 417 (1952); Robert I. Coulter, *The Field of the Statutory Useful Arts, Part II*, 34 J. PAT. OFF. SOC'Y 487 (1952).

[117] *See* 35 U.S.C. §§ 101–103.

technology has been suffused within a related conversation about whether only physical inventions may be patent-eligible.

V. What Does Contemporary European Case Law Have to Say About Patent-Eligible Subject Matter?

A. Case Law of the Boards of Appeal of the European Patent Office

The early case law of the European Patent Office employed a doctrine sometimes referred to as "the contribution approach" in seeking to determine if, in principle, an invention was subject matter eligible for patent protection.[118] This doctrine, which evolved over time and which in one derivative version is sometimes referred to as the "technical effects" approach, [119] grew largely out of the EPO's efforts to grapple with patent applications in one of the most important fields of modern technology—computer software—in the face of what for all intents and purposes is a prohibition on the patenting of such technology under the terms of the EPC.[120]

Examples of cases of the EPO's Technical Boards of Appeal which exemplify the "contribution"/"effects" approach include a 1986 case concerning a patent application by Vicom for a computer program which enhanced the quality of digitally processed images.[121] There was also a 1987 case concerning a patent application by Koch & Sterzel for a computer program that controlled X-ray tubes to ensure optimum exposure with efficient protection against overloading,[122] and, a 1990 case that concerned a patent application by IBM for a computer program that conducted automatic spell checking and correction in a text processing system.[123] In these, and other similar cases, the EPO's Boards developed the general principle that inventions that were otherwise un-patentable "as such" under EPC Art. 52(2)(c) and Art. 52(3) due to being "non-technical" could be patentable if they contributed to a technical process or if technical

[118] For the EPO's own catalogue of pertinent cases on the question of the technical character of patentable inventions, *see* EUROPEAN PATENT OFFICE CASE LAW, *supra* note 55.

[119] *Id.*

[120] Through a remarkable feat of legal fiction, article 52(2)(c) of the European Patent Convention requires that "programs for computers" shall not be regarded as "inventions" within the meaning of Art. 52(1). EPC 2000, *supra* note 97, at ch. 1, art. 52(1). Ironically, article 52(1) actually requires that patents be granted for inventions in "all fields of technology." *Id.* To make things even more perplexing, and to require even more mental acrobatics from an inventor not trained in the subtle art of legal semantics, article 52(3) of the EPC qualifies article 52(2)(c) by asserting that the prohibition refers only to programs for computers "as such." *Id.*

[121] Case T-208/84, *In re* Vicom, E.P.O.R. 74 (1987).

[122] Case T-26/86, *In re* Koch & Sterzel, E.P.O.R. 72 (1988).

[123] Case T-121/85, *In re* IBM, OJ EPO 384 (1990).

considerations (beyond those specific to the claims) were required to implement the invention.[124]

The EPO's contribution approach presumes that an artifact is only "technical" (i.e., a technology) if it is a physical machine, or perhaps just simply physical. This may stem from the metaphor of the physical machine, well established within orthodox fields of engineering. as exemplifying technology. Ralph Nack, in his masterly German-language treatise on the subject, has characterized this phenomenon as the "tree of knowledge" approach to patentability.[125] Nack argues that only fields of technology that may easily be characterized using established images, concepts, and nomenclature from orthodox fields of science and engineering (i.e., the trunk and main branches of the tree) may qualify as new patentable subject matter (i.e., as new branches on the tree). In other words, unless new technologies either fit within or sit adjacent to established technological paradigms, they will not be seen as possessing bona fide "technical" characteristics, and hence will not be seen as eligible for patent protection.[126]

Under the EPO's contribution approach, intangible artifacts, such as computer software inventions—which when viewed through the orthodox lens of engineering are not seen as eligible for protection, since they are not conventional physical machines—are treated as technologies only if they make a contribution to, or have a technical effect on, a physical device or system of devices that is patent-eligible subject matter in itself.[127] One astute critic has made the following comments about this approach to the patenting of software inventions:

> The situation of protecting this new technology [software] through a [physical] device is akin to protecting chemistry through dressing up the inventions with test tubes and flasks and locating the invention in the laboratory hardware. Such an approach is hardly appropriate for such a far-reaching technology.[128]

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[124] *E.g.*, Case T-121/85, *In re* IBM, OJ EPO 384 (1990); Case T-26/86, *In re* Koch & Sterzel, E.P.O.R. 72 (1988); Case T-208/84, *In re* Vicom, E.P.O.R. 74 (1987).

[125] *See generally* RALPH NACK, DIE PATENTIERBARE ERFINDUNG UNTER DEN SICH WANDELNDEN BEDINGUNEN VON WISSENSCHAFT UND TECHNOLOGIE [THE PATENTABLE INVENTION UNDER THE CHANGING CONDITIONS OF SCIENCE AND TECHNOLOGY] (2002), especially at 313-315. An English language summary of Nack's "tree of knowledge" concept may be found in the following document: Dr. Ralph Nack, Bird & Bird, Munich & Beijing, Patent Protection for Computer Software in Europe: Current Legislation and Implications in Practice, November 26, 2007, http://www.dziv.hr/webcontent/file_library/izvori_inf/novosti/CARDS_2003/softver/sw1.pdf (last visited September 14, 2008)), especially at 24-25 (copy on file with the author).

[126] *Id.*

[127] Case T-121/85, *In re* IBM, OJ EPO 384 (1990).

[128] LEITH, *supra* note 5, at 194.

The difficulty faced by uninitiated observers seeking to untangle the doctrinal web of the EPO's case law on subject-matter patentability may be partially explained by the EPO Boards of Appeal's tendency to conflate the concepts of "physical" and "technical."

Perhaps sensing the awkwardness of the logical corner into which it had metaphorically backed itself, the EPO appears to have subsequently moved away from reliance upon the contribution doctrine by instead requiring that the claimed invention itself, rather than the context in which it makes a contribution, must exhibit technical characteristics to be patentable. For example, in a 2000 case concerning a patent application by Pension Benefit Systems Partnership for a method and apparatus containing computer software for managing the allocation of benefits in a pension program, the Technical Board of Appeal ruled that a method involving the use of technical means for a purely "non-technical purpose" and/or for processing purely "non-technical" information does not give technical character to an invention.[129] Additionally, in a 2002 case concerning a patent application by Geodynamik HT Aktiebolag for a method and device containing computer software for measuring the degree of compaction of a surface, the Technical Board of Appeal ruled that eligibility for patent protection ought to be judged by the technical character of the totality of the invention itself, rather than by a technical contribution outside the claimed invention.[130]

Even though some of the more recent decisions of the EPO Boards have treated its earlier approach as inappropriate, the contribution doctrine, or technical effects doctrine, still holds considerable sway in EPO decisions regarding fields of invention such as computer software.[131] Thus, while the EPO's practices ostensibly embody the TRIPs requirement of allowing inventions in all fields of technology, the EPO's convoluted approach to dealing with the EPC's prohibition of patents on computer programs—one of the most important fields of modern technology—has generated ambiguity. The EPO's approach creates ambiguity as to whether: (a) inventions must in themselves be technical (and hence also physical); (b) inventions can be treated as "legally technical" if they have an effect in a field of technology—in a field that is traditionally considered by engineers to be technological and hence, by definition, physical; or, (c) inventions may be considered technical in their own right, regardless of whether they are physical.

Throughout its case law, the EPO tends to conflate the notions of "technical," "physical," and "hardware"—thereby also conflating the concepts of "non-technical," "non-physical," and "software." In short, the EPO apparently

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[129] Case T-931/95, R. v. PBS Partnership E.P.O.R. 52 (2002).

[130] Case T-1001/99, *In re* Geodynamik HT Aktiebolag, http://legal.european-patent-office.org/dg3/biblio/t991001eu1.htm, para. 3.2 (2002).

[131] This is acknowledged explicitly in one of the EPO's own publications: "Even after the criticism of the 'contribution approach' to the assessment of the technicality of an invention, the case law starting with T 208/84 (OJ 1987, 14) remains the basis for EPO practice with regard to computer implemented inventions. EUROPEAN PATENT OFFICE CASE LAW, *supra* note 55, at 3.

operates according to a metaphorical rule that if an invention is likely to cause pain if you drop it on your foot, then it is probably a technical invention; but, if it does not cause pain when you drop it on your foot, then it is probably not a technical invention and, therefore, is not patentable "as such." Software inventions are generally not "technical" according to this way of thinking. However, given the large demand for the EPO to issue patents on software inventions, and perhaps also given the common-sense presumption that computer software is a modern form of technology, the EPO's case law has held that if the software is functionally embedded inside something that will hurt you if you drop it on your foot, then it may be deemed as "technical" and hence patentable.

Practical problems ensue under this approach. How might one decide whether software technology was sufficiently embedded in another technical artifact to qualify for exemption from the EPC's exclusion from patentability for computer programs? How much of the combined software-hardware system would need to be accounted for by the hardware for that system as a whole to qualify, for the purposes of patent law, as a hardware invention rather than a software invention?

The EPO's mixed signals on this subject shadow the imprecise wording of TRIPs regarding whether patents ought to be coterminous with technology. Nevertheless, despite this ambiguity, the EPO's examination practices and case law have affirmed the fundamental technology-patent nexus that we previously observed within TRIPs.

B. Example of Recent Case Law of National Courts Associated with the European Patent System

While both EPC statutory law and EPO Boards of Appeal case law affirm the general principle that inventions must be "technical" in order to receive patent protection, the ambiguous approach of the EPO to defining when an invention is actually "technical" creates problems for national courts which must make decisions on matters of infringement and validity of patents. What should a national court from a country that is a member of the EPO do when faced by a suit to invalidate a patent on the grounds that it is not patentable subject matter? Or, when it is faced with an appeal by an applicant against a refusal of a national patent office to grant a patent on the grounds that the invention does not qualify as patentable subject matter? A national court wishing to honor the law of the EPC but finding that law difficult to interpret will find itself in an uncomfortable position, and the patent holders or patent applicants thus affected may feel aggrieved by the lack of legal certainty surrounding the investment decisions associated with their inventions. One British court has faced this situation. We will review this British case briefly to illustrate the legal flux associated with the ongoing ambiguity surrounding the meaning of "technical invention" in the EPO's jurisprudence.

The United Kingdom's Court of Appeal recently issued two complementary judgments in a combined case, *Aerotel/Macrossan*[132] involving disputes as to the patentability of two inventions according to Art. 52(2) and Art. 52(3) of the EPC.[133] One part of the case involved an appeal by Aerotel Limited against the revocation of its patent containing method and system claims for making telephone calls using prepayments ("*Aerotel*").[134] The other part involved an appeal by Mr. Neal Macrossan against an unfavorable decision by the UK Intellectual Property Office (UKIPO) in response to his application for a patent containing both method and system claims for constructing corporate entities over the Internet, in other words, for carrying out legal procedures for the creation of companies ("*Macrossan*").[135] Both parts of the case involved the question of whether the subject matter in question qualified as a "technical invention" under the terms of the EPC.

Lord Justice Jacob, in handing down the judgment of the Court of Appeal, overruled the judgment of the High Court and reinstated Aerotel's patent, but affirmed the decision of UKIPO to disallow Mr. Macrossan's patent application.[136] While both inventions were concerned with methods of conducting business (and therefore fell within an excluded category under EPC Art 52(1)(c)), the Aerotel invention was in fact patentable because the method involved the use of an apparatus—a physical device consisting of various components—and thereby qualified as a technical system in itself.[137] In the case of *Macrossan*, however, the Court held that there was nothing technical about Mr. Macrossan's contribution "beyond the mere fact of the running of a computer program" and therefore there was no patentable subject matter.[138] In issuing this judgment, Jacob LJ indicated that the absence of a new kind of "hardware" invention in Mr. Macrossan's claims meant that his patent application was for a business method "as such," a category explicitly excluded under EPC Art. 52(1)(c).[139]

The *Aerotel/Macrossan* case is instructive for a number of reasons. First, it affirms the general principle of the EPC and of the EPO's jurisprudence that patent protection should only be available for technical inventions, i.e., for technologies. Second, it embraces the sometimes-explicit and sometimes-implicit doctrine of the EPO Boards of Appeal that an artifact must be physical in order to be technical. That is, the UK's Court of Appeal also conflates the concept of "technical" with the concept of "physical". Third, however, it also

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[132] [2006] EWCA (Civ) 1371, [2007] 1 All ER 225.

[133] *Id.* at 1.

[134] Aerotel Ltd. v. Telco Holdings Ltd. [2006] EWHC 997 (Pat).

[135] Macrossan v. Comptroller-General of Patents, Designs and Trade Marks [2006] EWHC 705 (Pat).

[136] *Aerotel Ltd.*, EWCA (Civ) 1371 ¶ 77.

[137] *Id.* ¶¶ 50–57.

[138] *Id.* ¶¶ 71–74.

[139] *Id.* ¶¶ 63–65.

raises for attention the difficulties faced by national patent offices and national courts in seeking to apply the EPO's contribution approach/technical effect approach to deciding when an ostensibly excluded category of subject matter does not, in fact, need to be excluded from patent protection.

The lack of a clearly defined concept of what makes an invention "technical" for the purposes of patent law confounded much of the deliberations that led to the final judgment of the Court in *Aerotel/Macrossan*. Most remarkable, however, was the fact that the Court's nearly 50-page judgment was replete with analysis, questions, and comments about what the Court saw as the "mutually contradictory"[140] decisions and doctrines of the EPO's Boards of Appeal regarding the basic criteria for determining patentable subject matter in inventions. The perceived ambiguity of the EPO's positions led the Court to issue its judgment, not simply as an expression of its normal and proper role as an appellate court to the lower courts in the UK, but as a kind of open letter to the EPO; even though, in Jacob LJ's words, "[i]t is formally no business of [the Court's] to define questions to be asked of an Enlarged Board of Appeal."[141] In short, the British court, in this instance, is stepping outside the boundaries of its normal role to engage the EPO in a conversation about pan-European jurisprudence on whether patent protection ought to be restricted to "technology." This extraordinary act surely signals the practical importance of the basic question that underlies this study.[142]

VI. What Does Case Law in the United States Have to Say About Patent-Eligible Subject Matter?

A. Early U.S. case law

The debate within Europe about whether an invention needs to be technical—and perhaps by implication, also physical—to be eligible for patenting is also salient in the United States.[143] *In re Bilski*[144]. a case currently before an en banc panel of the U.S. Court of Appeals for the Federal Circuit (CAFC), is directed at very similar issues to the ones addressed by the UK's Court of Appeal

[140] Lord Jacob explicitly made this assertion. *Id*. ¶ 25.

[141] *Id.* ¶¶ 75.

[142] The apparently interminable difficulty of resolving the underlying problems exemplified by this debate has led some in Europe to advocate a special stand-alone form of intellectual property protection for computer programs, separate from the patent system. For a review of this phenomenon, see Steven B. Toeniskoetter, *Protection of Software Intellectual Property in Europe: An Alternative Sui Generis Approach*, 10 INTELL. PROP. LAW BULL. 65 (2005).

[143] For two recent publications documenting this phenomenon in the U.S., *see* Lois Matelan, *The Continuing Controversy Over Business Method Patents*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 189, 189–23 (2007); Symposium, *Patent Reform: Can the Law Keep Pace with Technology?*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 1025 (2008).

[144] No. 200-1130 (Fed. Cir. filed Feb. 15, 2008).

in *Aerotel/Macrossan*. *In re Bilski* seeks to define the general standard that should govern whether a process is patent-eligible subject matter.[145]

The debate, however, is not new. One commentator ("J.B.W.") published a critical response in 1917 to a "feeling" he perceived amongst some of his contemporaries that "the subject matter of a patent … must be a tangible thing of some sort."[146] He argued that, in contrast to the common law, which "recognized no property right whatever in an invention" and which tended to closely link the concept of property to tangible assets and physical possession, the U.S. patent statutes did "not require tangible instrumentalities to effectuate the desired result" for an invention to be eligible for patent protection.[147] In his words, ". . . when the Patent Law has been pressed to the point, it has invariably acted on the assumption that patented property is intangible."[148] He averred that the tendency of some to believe that patentable inventions needed to be tangible was primarily a spill-over from old common law sentiments about the nature of property, perhaps exacerbated by some ambiguities in the language of the statutes.[149]

One early precedent that seems to support J.B.W.'s assertion that intangible technologies were patentable under U.S. law may be found in a claim for an invention included in Morse's famous patent from the first half of the 19th Century:

> The use, system, formation, and arrangement of type, and of signs, for transmitting intelligence between distant points by the application of electro-magnetism and metallic conductors combined with mechanism described in the foregoing specification.[150]

The invention described in this claim was clearly for an intangible method (what today might be called a "business method"). Furthermore, the format of the patent claim presaged a format that was to become common in U.S. patent practice more than a century later for computer software inventions (to be discussed in Section VI.B below), whereby software is described in such a way that its application requires implementation in a physical apparatus (i.e., a tangible machine). In this way, non-physical inventions are treated as de facto

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[145] *Id.* *See infra* Section VI.D.

[146] J.W.B., *The Patentability of a Mental Process*, 15 MICH. L. REV. 660, 660–61 (1917).

[147] *Id.* at 661–62.

[148] *Id.* at 663.

[149] This Common Law sentiment appears to be alive and well today in the United States. For example, it features prominently in BESSEN & MEURER, *supra* note 8, in which one of the authors' indictments against the patent system is that it, in their view, inappropriately allows notions of property to be applied to intangible phenomena.

[150] U.S. Patent No. 1,647 p.6 (filed Apr. 7, 1838) (issued June 20, 1840). The Court allowed claim 3 to stand, even though one of the other claims in the patent (claim 8) was invalidated. *See* O'Reilly v. Morse, 56 U.S. 62, 121–22 (1853).

physical inventions, due to their contribution to physical processes or their manifestation through physical systems. This may be called the "contribution approach", the "physical contribution approach" or the "technical contribution" approach. As noted above in Sections V.A and V.B, an almost identical approach has emerged in the jurisprudence of the EPO. However, the important thing to recognize here is that patents for intangible inventions have a history of at least one and a half centuries in the U.S.

Decades after Morse was issued his patent, in *Burr v. Duryee*,[151] the U.S. Supreme Court issued a decision revealing a distinct preference for requiring physicality in patentable inventions:

> In this case we have an attempt to convert an improved machine into an abstraction, a principle or mode of operation, or still a more vague and indefinite entity often resorted to in argument, an 'idea.' Those who use the latter term seem to have no fixed idea of what they mean by it. But it may be used as successfully to mystify a plain matter as the words used in the specification.[152]

The Court perhaps even expressed a hint of disdain here for those who did not concur. Just over a decade later in *Cochrane v. Deener,*[153] the Supreme Court issued an opinion in contrast with *Burr*, ruling that a process (which it also described as "art"), in contrast to a machine, could be patented in its own right.[154] However, the Court once again revealed a preference that patentable inventions involve physicality, even when they are processes rather than machines:

> A process is a mode of treatment of certain materials to produce a given result. It is an act, or series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing.[155]

Whether the Court's apparent preference should be interpreted as a formal physicality requirement for inventions depends upon what interpretation one attaches to the word "materials". Could a material be non-physical? One gets the distinct impression after reading the case that the Court presumed that materials were, by definition, always physical.

A few years later, in an infringement case involving questions of invalidity, the Supreme Court moved in the other direction, expressing sympathy

[151] 68 U.S. 531 (1863).
[152] *Id.* at 577.
[153] 94 U.S. 780 (1876).
[154] *See id.* at 788.
[155] *Id.*

for the notion that an invention did not need to be physical in order to be patentable. In *Tilghman v. Proctor,*[156] the Court ruled as follows:

> It seems to us that this clear and exact summary of the law affords the key to almost every case that can arise. 'Whoever discovers that a certain useful result will be produced in any art by the use of certain means is entitled to a patent for it, provided he specifies the means.' But everything turns on the force and meaning of the word 'means.' It is very certain that the means need not be a machine, or an apparatus; it may, as the court says, be a *process*. A machine is a thing. A process is an act, or a mode of acting. The one is visible to the eye,—an object of perpetual observation. The other is a conception of the mind, seen only by its effects when being executed or performed. Either may be the means of producing a useful result.[157]

This decision from 1880 set a precedent for the late 20th Century CAFC decisions that permit patents on useful processes in their own right, whether or not a physical machine is specified in the claims. However, it was not necessary to wait that long. The USPTO was certainly issuing patents for intangible "business methods" in the early 20th Century. For example, the USPTO issued a patent to Mr. Robert C. Russell in 1922 for an invention that related to "improvements in indexes,—the object of the invention being to simplify and improve an index wherein names are to be entered and grouped phonetically rather than in accordance with the alphabetical construction of the names."[158] Mr. Russell's invention involved no machine, and involved no physical effect either on a machine or on materials; it was simply a method for organizing information. The first claim of the patent was worded as follows:

> 1. An index comprising a key element and index elements, said key element comprising designations representing phonetic-subdivisions, each of said index elements comprising guide and name members, the guide members only of said index elements having thereon, phonetic key designations in accordance with

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[156] 102 U.S. 707 (1880).

[157] *Id.* at 728.

[158] U.S. Patent No. 1,435,663 p.1 (filed Nov. 28, 1921) (issued Nov. 14, 1922). The patent appears to have been issued for the same invention for which a patent had already been issued to Mr. Russell by the Patent Office four years earlier. U.S. Patent No. 1,261,167 (filed Oct. 25, 1917) (issued Apr. 2, 1918). The specification was more extensive for the '663 Patent than for the '167 Patent, suggesting that in "re-issuing" the patent, the Patent Office was concerned to ensure that the enablement and adequate-disclosure requirements of the law were properly respected. A recent business-method/software patent, U.S. Patent No. 7,210,100 col.7 ll. 44–46 (filed Dec. 20, 2000) (issued Apr. 24, 2007), cited both of Mr. Russell's patents as prior art.

> names received by the name members of the index elements and in accordance with key designations of the subdivisions of the phonetic key.[159]

In *Tilghman,* the Court did not rule explicitly on the question of whether the "useful result" of the application of the intangible means needed to be tangible in order for the intangible means itself to be patentable. However, its silence on this question should not be interpreted to suggest that the Court was confused or that the justices were in disagreement about this matter; rather, the Court simply did not feel the need to embrace the kind of elaborate logic of doctrines conforming to the contribution approach, towards which courts in latter years would be drawn. As Mr. Russell's 1922 "Index" patent suggests, the USPTO and wider patent community were apparently also not confused about this matter: a non-physical invention for the improved organization of information was patentable, without involving a machine, and without the applicant engaging in legal sophistry or obfuscatory patent-claiming manouevers concerning physical effects.[160]

These few examples of patents and pertinent cases during the first century or so of U.S. patent law reveal that the judiciary was not consistent in its feelings about whether inventions needed to be physical in order to be patentable. At best, the judiciary, over time, was ambivalent; at worst, they issued inconsistent decisions. Decades later, when information technology had emerged as a prominent field of technology, this lack of certainty in the law would become more problematic. We will now briefly review some of the signal cases from the second half of the 20th Century that are pertinent to this issue.

B. Established 20th Century U.S. Case Law Prior to 1982

In 1970 the U.S. Court of Customs and Patent Appeals (CCPA), the precursor to today's CAFC, heard *In re Albert W. Musgrave* ,[161] an appeal from the Patent Office's Board of Appeals, which affirmed a rejection of a patent application by Albert Musgrave for a process he had invented for obtaining seismograms which delineated precisely subsurface formations in the earth's crust.[162] The patent was rejected because it was supposedly not patentable subject matter under 35 USC § 101 and § 100(b), on the grounds that some or all of the steps in the process were "mental" in nature and that the claims were "non-statutory because they were not physical acts applied to physical things."[163]

The CCPA reversed the decision of the Board of Appeals, observing that the language of the patent statutes ". . . contains nothing whatever which would

[159] '663 Patent at p.3 ll. 34–46.

[160] *See* '663 Patent at p.1.

[161] 431 F.2d 882 (C.C.P.A. 1970).

[162] *See id.* at 882.

[163] *See id.* at 885–86, 888, 893.

either include or exclude claims containing "mental steps" and whatever law there may be on the subject cannot be attributed to Congress."[164] The court also described the "it-must-be-physical" position of the Supreme Court in *Cochrane* as erroneous and as inconsistent with later Supreme Court decisions, and expressed unequivocally that it was a misconstruction to assume that all processes must "operate physically upon substances" in order to be patentable.[165] The CCPA ruled as follows:

> All that is necessary, in our view, to make a sequence of operational steps a statutory "process" within 35 USC 101 is that it be in the *technological arts* so as to be in consonance with the Constitutional purpose to promote the progress of "useful arts."[166]

In this decision, the court clearly expressed the view that an invention did not need to be *physical* in order to be *technological*.

Shortly after the CCPA's *Musgrave* decision, the Supreme Court again heard a subject-matter patentability case, *Gottschalk v. Benson*[167]—which, like *Musgrave*, also concerned information technology—and in the process tilted the balance of the legal scales back towards the "it-must-be-physical" doctrine that the Court asserted in the late 1800s. The case involved an appeal of a USPTO decision to reject a patent application by Gary Benson and Arthur Talbot for a method of converting binary-coded decimal numerals into pure binary numerals, for use with computers.[168] On appeal, the USPTO's Board of Appeals affirmed the decision by the examiner, but the CCPA eventually reversed the decision of the Board of Appeals.[169] The Supreme Court decided to hear the case upon petition from the USPTO, and then reversed the decision of the CCPA.[170]

The Supreme Court held that the invention, which it described as a mathematical formula, had "no substantial practical application except in connection with a digital computer" and that allowing a patent on the invention would be akin to patenting an "idea" (which the Court apparently believed was not appropriate).[171] In justifying its decision, the Court cited its 1887 doctrine in *Cochrane*,[172] that process (or method) patents must involve the transformation of physical material, and then proceeded to rule generally against the patenting of computer programs, as follows:

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[164] *See id.* at 890.
[165] *See id.* at 882.
[166] *Id. at* 893 (emphasis added).
[167] 409 U.S. 63 (1972).
[168] *See id.* at 64.
[169] *See id.*
[170] *See id.* at 64, 73.
[171] *See id.* at 71.
[172] *See id.* at 69.

> Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted.[173]

This landmark decision by the Supreme Court ostensibly cut off the possibility of patenting software technology. The decision also had the unintended effect of influencing practitioners to draft patent applications for computer programs (i.e., software technology) by wording the claims in a way as to emphasize that the software would have a physical effect on a physical machine (i.e., hardware technology).[174] In this sense, applicants for U.S. patents began emphasizing an approach almost identical in spirit to the contribution/technical effects approach that has characterized the EPO's handling of software patents.

One illustrative case in this genre, *In re Toma*,[175] was an appeal to the CCPA by Peter P. Toma, following a rejection of his application for a "Method using a programmed digital computer system for translation between natural languages"—a language-translation software application for translating Russian to English.[176] The Board of Appeals affirmed the USPTO's rejection of the patent, citing the Supreme Court's *Gottschalk v. Benson* as precedent, and ruling that Toma's invention was not statutory subject matter, since it had "no substantial practical application except in connection with a digital computer" and since a "computerized method of translating" was not in the "technological arts."[177]

The CCPA reversed the decision of the Board of Appeals after arguing that the invention was not merely a set of steps for solving mathematical problems and that the claim did not recite an algorithm (as held by the Board); hence, that the invention was not directed to non-statutory subject matter.[178] The court concluded:

> [We] hold that the method for enabling a computer to translate natural languages is in the technological arts, i.e., *it is a method of operating a machine*. The "technological" or "useful" arts inquiry must focus on whether the claimed subject matter (a method of operating a machine to translate) is statutory, not on whether the

[173] *Id.* at 72.
[174] *See id.*
[175] 575 F.2d 872 (C.C.P.A. 1978).
[176] *Id.* at 873–74 & n.1.
[177] *Id.* at 875–77.
[178] *Id.* at 877.

> product of the claimed subject matter (a translated text) is statutory …[179]

The CCPA essentially shifted the focal point of the invention for the purpose of deciding its eligibility as statutory subject matter from the heart of the invention (computer software for translation of languages) to a secondary, or contextual, factor (to the contribution of the software to the operations of the hardware in to which it would need to be loaded). This logical manoeuvre was similar, if not identical, to the logical manoeuvres that the EPO Board of Appeals employed some years later in *Vicom*, *Koch & Sterzel*, *IBM*, and similar EPC Art. 52 cases.[180]

Around the same time that the CCPA heard *Toma*, the Supreme Court heard *Parker v. Flook*,[181] an appeal from the CCPA, also on a question related to basic subject-matter eligibility under 35 USC § 101 and also concerning software technology.[182] The patent application concerned an invention by Dale R. Flook for a method for calculating alarm limits in processes for the catalytic chemical conversion of hydrocarbons.[183] The patent examiner rejected the application on the grounds that the only difference between Flook's patent claims and the prior art was a mathematical formula, and that mathematical formulae were not statutory subject matter.[184] The USPTO's Board of Appeals upheld the examiner's decision, but the CCPA reversed based on the assertion that the claims recited "post-solution activity," thereby avoiding preemption of the mathematical formula.[185] In other words, the applicant (with the approval of the CCPA) was claiming patent-eligibility in principle for unpatentable subject matter by linking it with practical, physical applications outside the parameters of the claimed invention itself. In short, this was another variation of the contribution or technical effects approach.

The Supreme Court, however, agreed with the USPTO and the Board of Appeals and ruled that the invention was not patentable under § 101 of the Patent Act, since the only novel claim was for a mathematical formula, which was not statutory subject matter.[186] The Court explained its decision by ruling that the identification of useful post-solution applications of an otherwise non-patentable principle, or method, cannot transform that principle or method in to a patent-eligible process.[187] Hence, in *Parker*, the Supreme Court effectively invalidated

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[179] *Id.* (emphasis added).

[180] *See supra* Section V.A.

[181] 437 U.S. 584 (1978).

[182] *Id.* at 588.

[183] *Id.* at 585, 596.

[184] *Id.* at 587.

[185] *Id.* at 587, 590.

[186] *Id.* at 588, 594–95.

[187] *Id.* at 590. The Court also justified its ruling with a rather confusing, or even circular, argument that seemed to suggest that a formula could only be patentable in principle if it was

the use of approaches to patenting non-physical inventions that relied upon external or contextual effects or contributions of the invention. In doing so, the Court seems to have presaged the ruling of the U.K.'s Court of Appeal, over a quarter of a century later, in *Aerotel/Macrossan*, while also harking back to its own older rulings in *Cochrane* and *Gottschalk.*

Just a few years later, in the landmark case of *Diamond v. Diehr,*[188]concerning an application for a patent by James Diehr and Theodore Lutton for an invention consisting primarily of the application of a well-known scientific principle and mathematical formula to controlling the process of molding uncured synthetic rubber into cured precision products, the Supreme Court tipped the balance of the scales away from the direction in which they had been tilting in *Parker*.[189] In *Diamond,* the Court affirmed the CCPA's ruling and overturned the decisions of the USPTO examiner and the Board of Appeals—which themselves had been inspired by the Supreme Court's previously expressed thinking in *Gottschalk* and in *Parker*—in the following language:

> When a claim containing a mathematical formula implements or applies the formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect … then the claim satisfies § 101's requirements.[190]

The CCPA and the Supreme Court both chose to focus on the rubber-processing part of the patent-application (which they held was patentable subject matter because it involved "physical and chemical processes"[191]), rather than on the software and mathematical formula part of the patent application. In reality, the factual situation in Diehr and Lutton's patent application was essentially the same as that in Flook's patent application. However, by treating the otherwise non-statutory claims as part of a larger "invention" that implemented other claims that were statutory, the Supreme Court in effect endorsed the doctrine articulated by the CCPA just a few years earlier in *Toma*, which it ostensibly ruled against in *Parker*.

Most commentators view the *Diamond* decision as a landmark ruling that created precedent in the United States permitting a computer program or a mathematical formula to be patented—but only through the ruse of claiming it narrowly and treating it as a critical element within some other patentable subject

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within the prior art, but that if it was indeed assumed to be within the prior art then the application as a whole would contain no patentable invention. *Id.* at 594.

[188] 450 U.S. 175 (1981).

[189] *Id.* at 177–78.

[190] *Id.* at 192–93.

[191] *Id.* at 184, 187, 191.

matter.[192] For our present purposes, the important insight is to recognize that while commentators are undoubtedly correct in their observation, *Diamond*—although clouded in sophisticated juristic rhetoric—also represents a re-affirmation of the Supreme Court's 19th Century "it-must-be-physical" doctrine articulated in *Cochrane*, which held that a patentable process must involve the transformation of physical material.

To deal with the complexity of the situation generated by the Supreme Court's sometimes difficult-to-comprehend decisions on information technology inventions, the CCPA developed a two-step test, known as the Freeman-Walter-Abele Test. The two steps were as follows:

> First, does the patent claim recite, directly or indirectly, a mathematical algorithm, formula or "mental step"? (If no, then the claim is statutory subject matter; if yes, the second inquiry must be reached). Second, does the claim involve *application* of the algorithm, etc. to specific physical elements or processes? (If yes, the claim is statutory subject matter; if no, the claim is not statutory subject matter).[193]

We can see that the Freeman-Walter-Abele Test was basically a judicial formalization of a combination of what we have described above as the "it-must-be-physical" doctrine and the contribution/technical effects approach.

C. Established U.S. Case Law From 1982 to Present

In 1982, the U.S. Congress created the Court of Appeals for the Federal Circuit (CAFC), with the new court having exclusive subject-matter jurisdiction on patent appeals from all district courts across the country and from the USPTO.[194] The CAFC adopted the decisions of its predecessor court, the CCPA, as precedent.[195]

In 1992, the CAFC heard *Arrhythmia v. Corazonix*,[196] an appeal from a decision by the U.S. District Court for the Northern District of Texas, wherein the district court declared the patent invalid for failure to claim statutory subject

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[192] *See, e.g.,* E. S. Matt Kemeny, *Computers and Non-Patentable Matter: Rejections Under Article I of the Constitution*, 74 PAT. & TRADEMARK OFF. SOC'Y 669, 673 (1992). Gruner put it this way: "Where software or associated computer-based systems are used to control a device that would qualify as patentable subject matter in its own right, the resulting computer-enhanced innovation is also patentable subject matter." (Richard S. Gruner, *In Search of the Undiscovered Country: The Challenge of Describing Patentable Subject Matter*, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 395, 407 (2007)).

[193] CHISUM, *supra* note 16, at 838.

[194] MARTIN J. ADELMAN, RANDALL R. RADER, & GORDON P. KLANCNIK, PATENT LAW IN A NUTSHELL (Thomson West 2008) at 22.

[195] *Id.*

[196] 958 F.2d 1053 (1992).

matter.[197] The patent concerned a method and apparatus for the analysis of electrocardiographic signals to determine characteristics of heart function, and according to the district court, the subject matter was non-statutory because the claims were directed to a mathematical algorithm.[198] The CAFC reversed the decision of the district court after applying the Freeman-Walter-Abele Test and holding that the algorithm was, in fact, applied to physical process steps.[199] In doing so, the majority of the CAFC affirmed the "it-must-be-physical" doctrine articulated in various earlier cases.

While concurring with the final decision, Judge Rader issued an opinion criticizing the application of the judge-made Freeman-Walter-Abele Test and advocating a return to assessing the patentability of inventions according to the law as expressed in the statutes themselves.[200] Citing the Supreme Court as authority, Rader argued that it was inappropriate to place limits (such as requiring physicality) on the statutory definition of "process," and for judges to create special laws for some classes of inventions such as computer programs and not others when Congress had not opted to do so.[201]

Two years later, the CAFC, sitting en banc, heard *In re Alappat*,[202] another software technology patent appeal, in which the court, continuing in the direction set by *Arrythmia*, ruled that:

> [A] computer operating pursuant to software *may* represent patentable subject matter, provided, of course, that the claimed subject matter meets all other requirements of Title 35.[203]

The patent in question covered an invention by Kuriappan P. Alapatt[204] and others employing an anti-aliasing technique, a rasterizer, to eliminate irregularities in the visual appearance of waveforms on digital oscilloscopes.[205] The invention was essentially software (a "mathematical algorithm"); but, based on the fact that the software technology was part of an oscilloscope (a physical machine), and apparently influenced by the insight that computer programs could

[197] *Id.* at 1054.

[198] *Id.* at 1054–55.

[199] *Id.* at 1059, 1061.

[200] *Id.* at 1061.

[201] *Id.* at 1064–65. Judge Rader's stance on this matter has subsequently come under criticism by a number of academic commentators. *See, e.g.,* Dan L. Burk, *Tailoring Patent Policy to Specific Industries*, 7 MARQUETTE INTELL. PROP. L. REV. 1 (2003).

[202] 33 F.3d 1526 (Fed. Cir. 1994).

[203] *Id.* at 1545.

[204] U.S. Patent No. 5,440,676 (filed Jan. 29, 1988) (issued July 28, 1995).

[205] *Alappat*, 33 F.3d at 1537.

be manifested in either a software or hardware format,[206] the majority held that the "the appealed claims are directed to a machine, which is one of the categories named in 35 USC § 101 . . . ."[207] Despite considerable dissension[208] amongst the justices on the merits and law in the case, *In re Alappat* was interpreted by many in the patent community as having cleared away "some of the doctrinal haze obscuring the statutory requirements for patentability of applications software."[209]

The lack of harmony among the justices revealed a lingering sense of confusion in the court as to whether the old "it must be physical" doctrine should be maintained in the face of the large number of applications that the USPTO examined for intangible inventions. Even the Chief Judge dissented, in part, from the majority decision based on his belief that the rasterizer software invented by Alappat and his colleagues, apparently lacking physicality in its own right, did not belong to any category of statutory subject matter.[210] In the Chief Judge's words:

> Any definition or description … of the act of invention, which excludes the application of the natural law, or power, or property of matter, on which the inventor has relied for the production of a new effect, and the object of such application, and confines it to the precise arrangement of the particles of matter which he may have brought together, must be erroneous.[211]

In re Alappat represented a strong move in the direction of formalizing support for allowing patents on intangible technological inventions. Nevertheless, the decision also represented the difficulty the courts had with letting go of the "feeling" (to echo J.B.W.'s words from two generations earlier) that, in order to be technological, "the subject matter of a patent . . . must be a tangible thing of some sort."[212]

Several years later, the CAFC once again had an opportunity to bring more certainty to the question of whether intangible inventions, particularly in the form of computer software, were eligible for patent protection. In *State Street*

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[206] *Id.* at 1541–45. *See also id.* at 1583(Rader, J., concurring) ("Alappat's machine or process might employ an equation, it does not pre-empt that equation. Consequently, whether the invention is called a machine or a process is inconsequential.").

[207] *Id.*

[208] *Id.* at 1545–85.

[209] *See, e.g.*, W. Wayt King, Jr., *The Soul of the Virtual Machine: In re* Alappat, 2 J. INTELL. PROP. L. 575, 577 (1995).

[210] *Alappat*, 33 F.3d at 1567–68.

[211] *Id.* at 1552 (Archer, J., concurring in part, dissenting in part) (citing George Curtis, A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS xxiii–xxv (4th ed. 1873)).

[212] J.W.B., *supra* note 146, at 661.

Bank & Trust Co. v. Signature Financial Group, Inc.,[213] the court heard an appeal of a district court judgment declaring invalid a patent owned by the Signature Financial Group for a data processing system for a hub-and-spoke financial services configuration.[214] The patent cited, in essence, was for software technology designed to carry out a business procedure.[215] The district court invalidated the patent, primarily under the so-called "business method exception" and under the mathematical algorithm exception, arguing that the patent was claimed "sufficiently broadly to foreclose virtually any computer-implemented accounting method necessary to manage this type of financial structure."[216]

Drawing upon its own precedent in *Arrythmia* and *Alappat*—and, in particular, the call by Judge Rader in *Arrythmia* to rely upon statutory law rather than unhelpful judge-made law to decide questions of patent-eligible subject matter—the CAFC reversed the district court's declaratory judgment, finding that the claims were not invalidated by the mathematical algorithm exception and that there was no "business method exception" to patentability in U.S. law.[217] The court ruled:

> Today, we hold that the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces a "useful, concrete and tangible result"[218] . . . .Whether the claims are directed to subject matter within § 101 should not turn on whether the claimed subject matter does "business" instead of something else.[219]

The landmark rulings of the CAFC in *State Street Bank* are generally viewed as the turning point in U.S. case law, after which intangible software inventions, despite whether their field of application was physical, were treated as unequivocally patentable under 35 USC § 101.[220] For the purposes of our present study, it is also important to observe that in this case, the CAFC had, in effect, substituted the criterion of "utility" for the criteria of "physical thing" or "physical effects" which had arisen over the years in U.S. courts when deciding questions of patent-eligible subject matter. The court accomplished this shift in

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[213] 149 F.3d 1368 (Fed. Cir. 1998).

[214] *Id.*at 1370.

[215] *Id.*

[216] *Id.* at 1377 (citing State St. Bank & Trust Co. v. Signature Fin. Group, 927 F. Supp. 502, 516 (D. Mass. 1996)).

[217] *Id.* at 1375–77.

[218] *Id.* at 1373.

[219] *Id.* at 1377.

[220] *See, e.g.,* Jeffrey M. Kuhn, *Patentable Subject Matter Matters: New Uses for an Old Doctrine*, 22 BERKELEY TECH. L.J. 89, 99–100 (2007).

doctrine by reframing the meaning of "tangible" so that any invention found to be useful would also be presumed tangible, or concrete. The court also seemed, in *State Street Bank*, to have finally completely abandoned the contribution approach to determining patent-eligible subject matter.

Even though the invention in *State Street Bank* was directed towards solving certain business problems, the patent covered a computer software system.[221] Less than a year later, the CAFC had an opportunity to address the question of whether an intangible process invention was patent-eligible in its own right, regardless of whether it was claimed in the form of computer software.[222] In *AT&T Corp. v. Excel Communications, Inc.* ("*AT&T*")[223] the CAFC considered an appeal of a district court decision to invalidate a patent for a method of enhancing the keeping of records of long distance telephone calls through the use of a primary interexchange carrier for the purpose of facilitating billing as non-statutory subject matter.[224] Excel Communications argued that AT&T's patent was not valid because it comprised method claims that consisted of mathematical algorithms that were supposedly not patentable because they did not involve physical transformation of subject matter.[225] The CAFC reversed, rejected unequivocally the district court's reasoning, and instead asserted statutory law and precedent from its own case law.[226] The court ruled that patentability analysis of a method claim involving a mathematical algorithm should focus on whether the algorithm is applied in a practical manner to produce a useful result (such as useful information to aid business processes) rather than on whether any physical transformation was required.[227]

In summary, in *AT&T*, the CAFC signalled explicitly and without ambiguity that the days of the "it must be physical" doctrine in U.S. patent law were over.[228] Many commentators perceived the *State Street Bank* and *AT&T* decisions, together, as signifying a radical change in U.S. patent law.[229] However, the decision was, in many ways, simply a reaffirmation of the established case law from *Musgrave*, decided by the CAFC's predecessor court three decades earlier, and from *Tilghman*, decided by the Supreme Court more than a century earlier. In the minds of the CAFC, *AT&T* represented a simple

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[221] *State Street Bank*, 149 F.3d at 1370.

[222] AT&T Corp. v. Excel Commc'ns, Inc. 172 F.3d 1352 (Fed. Cir. 1999).

[223] 172 F.3d 1352 (Fed. Cir. 1999).

[224] *Id.* at 1353.

[225] *Id.* at 1358.

[226] *See id.* at 1361.

[227] *Id.* at 1359–60.

[228] *Id.* at 1360.

[229] *See* Scott D. Locke & William D. Schmidt, *Business Method Patents: The Challenge of Coping With an Ever Changing Standard of Patentability*, 18 FORDHAM INTELL. PROP. MED. & ENT. L.J. 1079, 1083–86 (2008). *See also* Nari Lee, *Patent Eligible Subject Matter Reconfiguration and the Emergence of Proprietarian Norms—The Patent Eligibility of Business Methods*, 45 IDEA 321, 342–46 (2005).

return to literal interpretation of the statutes. The question that remained unanswered by *State Street Bank* and *AT&T*, however, was: by focusing on the utility of an invention as sufficient to satisfy the requirements of 35 USC § 101,[230] had the court thereby abandoned the idea that an invention needed to fall within the "technological arts" to be patent eligible? Or, was the court rather just reaffirming the "technological arts" requirement, but using different language to do so?

This question was taken up in 2005 by the USPTO's Board of Patent Appeals and Interferences (USPTO-BPAI) in *Ex parte Lundgren*,[231] appealing a rejection of a patent application for a method of compensating a manager, who exercises administrative control over operations of a privately owned firm, according to a set of specified performance criteria.[232] The examiner rejected the patent application on the grounds that both the invention and its practical application did not fall within the technological arts, and concluded that the invention was non-statutory because it was no more than "an economic theory expressed as a mathematical algorithm without the disclosure or suggestion of computer, automated means, apparatus of any kind . . . ."[233] This decision is intriguing, since it flew brazenly in the face of the established law laid down more than five years earlier by the CAFC in *State Street Bank* and *AT&T*—and it did so by simultaneously asserting the importance of technological features in patentable inventions.

In a designated precedential opinion, the Board reversed the decision of the examiner, thereby affirming the pertinent doctrines enunciated by the CAFC.[234] Its primary grounds for doing so were that "there is currently no judicially recognized separate 'technological arts' test to determine patent eligible subject matter."[235] While in this case it was clearly respecting the authority of the CAFC, the USPTO-BPAI appears to have interpreted *State Street Bank* and *AT&T* to mean that the CAFC had actually abandoned the idea that an invention needed to fit within the "technological arts" in order to be patent-eligible. *In other words, the majority of the Board was of the opinion that, in light of case law of the superior courts, the statutory subject matter of patents legitimately extended beyond the boundaries of technology.*

Is this what the CAFC had in mind? At least two judges on the Board in *Ex parte Lundgren* thought not. Judge Barrett and Judge Smith, in a long and meticulous dissenting opinion,[236] expressed the view that even though there was

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[230] Assuming, of course, that the invention is also fitted within at least one of the four statutory categories—process, machine, manufacture or composition of matter—or any new and useful improvement thereof.

[231] No. 2003-2088, 2005 Pat. App. LEXIS 34 (B.P.A.I. 2005).

[232] *Id.* at 1–2.

[233] *Id.* at 4.

[234] *Id.* at 9.

[235] *Id.* at 55.

[236] *See id.* at 10–11 (Smith, J., dissenting); *see id.* at 16 (Barrett, J.,concurring).

no separate technological arts test in U.S. patent law, the "useful arts" clause in the U.S. Constitution was indeed the equivalent of a "technological arts" clause; therefore, the Constitution implied—if not required—a technological arts test for the determination of patent eligibility.[237] In addition, according to Judges Barrett and Smith, the four categories of statutory inventions stipulated by Congress in 35 USC § 101 defined "technological arts" and were encapsulated by the term "engineering."[238] In short, while agreeing that there was no separate technological arts test, in the opinion of Judges Barrett and Smith, § 101 of the U.S. Code *in itself* amounted to a technological arts test.

In addition to asserting the primacy and constitutional pedigree of the technological arts requirement for patent-eligible subject matter, Judges Barrett and Smith also asserted an understanding of "technology" that required physicality. Citing *Burr*, *Cochrane,* and their progeny, the dissent opined that unless there was transformation of physical subject matter, or some sort of physical substantiation, an invention could not be considered under U.S. patent law to be a technology.[239] In contrast with the established position of the CAFC, the minority of the Board in *Ex parte Lundgren* (apparently with the sympathy of a significant number of the Examining Corps of the USPTO[240]) still embraced the old "it must be physical" doctrine. In this respect, the counter-culture in U.S. patent law, represented by Judges Barrett and Smith and their philosophical allies, embraced a point of view almost identical to that found in the EPO—that a patent should only be issued for a technical invention and that an invention may only be technical if it is physical.

Against this backdrop, in 2006, the Supreme Court briefly flirted, in a somewhat fumbling manner—without the involvement of the Chief Justice, without the Court having received a petition from the parties, and without the question before the Court having even been raised below—with the issue of subject-matter eligibility for patents.[241] In *Laboratory Corporation of America Holdings v. Metabolite Laboratories, Inc.*,[242] the Supreme Court granted certiorari to determine whether a patent was invalid on the grounds of improperly claiming "a monopoly over a basic scientific relationship", after the patent had been held valid on appeal by the CAFC,[243] but then dismissed the writ of certiorari as improvidently granted.[244]

Nevertheless, Justice Breyer issued a dissenting opinion (supported by two colleagues) that appeared to signal to the patent community that the Supreme

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[237] *See id.* at 10–11.

[238] *Id.* at 78–79.

[239] *See generally id.*

[240] *See id.* at 2–5, 6.

[241] *See* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 125 (2006).

[242] 548 U.S. 124 (2006).

[243] Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 1358, 1368 (Fed. Cir. 2004).

[244] *Lab Corp. of Am.*, 548 U.S. at 125–126.

Court was considering the idea of intervening in CAFC jurisprudence, for purposes of narrowing the scope of what some of the justices apparently believed was an overly broad interpretation that the CAFC had been applying to 35 USC § 101.[245] Breyer and his fellow justices referred back to the old cases, such as *Cochrane* and *Gottschalk*, in a veiled signal that they believed the CAFC's recent decisions might have been inconsistent with Supreme Court precedent.[246] In this rather bizarre episode, the Supreme Court effectively "spoke without speaking" and insinuated that the issue of subject-matter patentability was back on the table; but, unfortunately, the justices failed to provide any clear guidance as to the fundamental question of whether patents should be issued only for technologies, and whether only physical inventions may qualify as technologies. In the process, the Court has exacerbated, rather than ameliorated, uncertainty about the questions at hand amongst the interested parties.[247]

D. Current U.S. Case Law: *In re Bilski*

We will now return to the case with which we commenced this review of U.S. case law, *In re Bilski*, currently before the CAFC.[248] The case originated in a 1997 patent application by Bernard L. Bilski and Rand A. Warsaw—filed prior to the *State Street Bank* and *AT&T* decisions—for a method practiced by a commodity provider for managing the consumption risks associated with a commodity sold at a fixed price.[249] The examiner rejected the application because it was "directed solely to an abstract idea and [solved] a purely mathematical problem without practical application in the technological arts."[250]

The applicant appealed to the USPTO Board of Patent Appeals and Interferences in 2002, which heard the case in 2006.[251] Despite the fact that *State Street Bank* and *AT&T* had established clear doctrines on how such a case should be handled, the Board affirmed the decision of the examiner rejecting the patent, on the grounds that the invention was not in the technological arts because it did not "add any transformation of physical subject matter."[252] The Board also affirmed because the patent did not involve "some sort of physical instantiation,"[253] and because the claims did not recite a "tangible result."[254] The

[245] *Id.*at 132, 136–37.

[246] *Id.* at 135–36.

[247] For a review of some of the controversy and confusion the *LabCorp v. Metabolite* case has created in industry and the patent community, in both the U.S. and internationally *see* Cynthia M. Ho, *Lessons from Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.*, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 463 (2007).

[248] *See In re* Bilsky, 264 F. App'x 896 (Fed. Cir. 2008).

[249] *Ex parte* Bilski, No. 2002-2257, 2006 WL 4080055, at *2 (B.P.A.I. 2006).

[250] *Id.* at *2.

[251] *Id.* at *1.

[252] *Id.* at *19.

[253] *Id.* at *22.

applicant appealed to the CAFC, which heard the case in October 2007; the court then ordered that the case be heard en banc in May 2008.[255] The court announced that it would address, among other things, "what standard should govern whether a process is patent-eligible subject matter" and "whether a method or process must result in a physical transformation or an article or be tied to a machine to be patent-eligible subject matter" under § 101.[256]

This is a remarkable and even strange turn of events, given that the court has already issued firm opinions on these questions in recent years. However, one clue to the CAFC's action—besides the fact that the USPTO and the USPTO-BPAI had apparently not been hearing the CAFC's opinions clearly, and that the Supreme Court had recently given perplexing signals pertaining to these questions—may lie with the opinion of the Board of Appeals, replete with references to "technology," "technologies," "technological," "technological arts," "technological environment," "technique," and "techniques."[257] The evidence suggests that the USPTO-BPAI judges were concerned with maintaining the technological arts test as a formal and authentic expression of the requirements of § 101. But, due to their assumption that an invention needed to be physical or to involve physical instantiation in order to be technological, they were forced by their own logic into a dilemma. The USPTO-BPAI judges either had to reject a non-physical invention that was ostensibly patentable—according to criteria laid down in the statutes and in the case law of the CAFC—in order to preserve the principle of "technological arts", or to accept what the CAFC might consider as a technological method, at the price of having to compromise their own conception about what it meant for a thing to be a technology (i.e., that it must, *inter alia*, be physical). This dilemma encapsulates the dialectic of more than a century of U.S. case law on patent-eligible subject matter.

Where does this leave us? I propose that, in order fulfil its own mission of formulating a lucid and robust standard to govern the determination of when subject matter is patent-eligible, in a way that will increase rather than decrease legal certainty, the CAFC will need to decisively answer the following two questions:

1. Should the useful arts requirement of the Constitution, which has been articulated by Congress in the four categories of patentable subject matter in § 101 of the Patent Act, be interpreted to have the same meaning as

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[254] *Id.*

[255] *In re* Bilski, 264 F. App'x 896 (Fed. Cir. 2008); *Ex parte* Bilski, No. 2002-2257, 2006 WL 4080055, at *1–2 (B.P.A.I. 2006).

[256] *Bilski*, 264 F. App'x at 897.

[257] *See generally ex parte* Bilski, 2006 WL 4080055. Judge Barrett, who authored the long "technological arts" opinion in *Ex parte Lundgren*, was also a member of the Board of Appeals in *ex parte Bilski*. *See id.* at *1; *Ex parte* Lundgren, 76 U.S.P.Q.2d 1385 (B.P.A.I. 2005).

technological arts? In other words, is being part of the useful arts equivalent to being a technology?[258]

2. Should the concept of physicality be used as a proxy in patent law for the concept of technicity? In other words, does an invention need to be physical in order to be a technology?

The second of these two questions relates closely to a question the CAFC posed for itself in its order in *In re Bilski*, namely, "Whether a method or process must result in a physical transformation of an article or be tied to a machine to be patent-eligible subject matter under section 101?"[259] However, the CAFC's language in the order does not include the word "technology." It could be argued that this omission does not matter, because one would presume that by "method" or "process" the court has "technology" in mind; and that this should be obvious to any person who has read the CAFC's opinions in *Paulik v. Rizkalla*[260] and *In re Comiskey*.[261] On the other hand, the recent behavior of the USPTO and its Board of Appeals suggests that this presumption is not actually obvious, even to patent professionals, whether or not they have diligently read the pertinent cases, or that some in the field of patent law might not wish to acknowledge the link. It may be wise for the CAFC, when it issues its opinion in *In re Bilski*, to make sure that it does not leave any lingering doubt on this question.

If the court eventually answers "no" to the question in the order, then some interested observers may interpret the decision to mean that a patent-eligible invention does not need to be in the technological arts. If, however, those same observers believe that continuation of some kind of technological arts test is mandated by the Constitution[262], then the CAFC may find that its decision becomes a mere staging point rather than a resolution to a contentious debate on the subject. On the other hand, if the court eventually answers "yes" to the question that it has posed, then it will have to face the prospect of enforcing doctrine which its own long history of jurisprudence has held to be against the spirit, if not the letter, of the Patent Act. In addition, under this scenario the CAFC would find itself in an almost identical situation to that of the EPO's Technical Boards of Appeal, having to play interminable word games over patent applications for intangible inventions dressed up as claims for tangible inventions, according to some version of the contribution or effects approach.

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[258] *See* Paulik v. Rizkalla, 760 F.2d 1276 (Fed. Cir. 1985); *In re* Comiskey, 499 F.3d 1365, 1374 (Fed. Cir. 2007). Note: As observed above the CAFC has already ruled on this question, in the affirmative, at least twice before; so answering this question would amount to either affirming or over-ruling its own previous opinions. *See infra* Section VI.C.

[259] *Bilski*, 264 F. App'x at 897.

[260] 760 F.2d 1276 (Fed. Cir. 1985).

[261] 499 F.3d 1365 (Fed. Cir. 2007).

[262] *See Lundgren*, 76 U.S.P.Q.2d at 1388. As we observed in our discussion of *Ex parte Lundgren*, this position *vis-à-vis* the technological arts test is one that is embraced by some judges. *Id.*

While at first glance these questions are merely philosophical and semantic in nature, they have immense practical significance. At least one perhaps prescient analyst has already published a paper advocating that, in the wake of *In re Bilski*, patent applicants should include claims comprising detailed specifications of "physical manifestations"[263]—and this advice is proffered even before the CAFC issued its opinion on the case.

VII. Analysis of the Existing Legal Landscape

From its beginnings in Europe half a millennium ago, through its new beginning in North America two centuries ago, to its eventual proliferation across the world, patent law has been based on the common-sense idea that *patents are issued for technologies*. In other words, patent protection is available for novel technological inventions that exhibit a significant level of ingenuity or inventiveness and that are useful or practical. In return, the recipients of letters-patents are required to describe their technology sufficiently for people of normal skill in the pertinent field to be able to implement the invention successfully in practice, and to be able to determine what technological subject matter falls inside the boundaries of the patent and what falls outside. This common-sense idea—that *patent protection is meant for technology*—has, as we have seen in the preceding pages of this paper, been affirmed repeatedly in the discourse and decisions of courts, legislatures, practitioners, and academics.

In the early days of patent law, however, the word "technology" was rarely, if ever, used. It was just not part of normal language and there was no reason why the average person, or even an educated lawmaker, should have been expected to use the generic word "technology" as a label for the practical phenomena in which he or she was interested. Legislators used more familiar words—such as "machine," "device," "manufacture," "engine," "useful art," "method," "apparatus," or even "discovery"—as manifestations of the general phenomenon of technology towards which their laws were aimed. In the early days of patent law, most technologies were in fact physical machines, so the physical machine (typically known as "machine") became the dominant metaphor of technology. Later, as chemistry and chemical engineering emerged as important technological domains, the terms "material" and "composition of matter" were added to the semantic repertoire of the technological arts; and as technologies and their interrelationships became more complex, and as sophisticated technical systems became commonplace, the word "system" was also added to the repertoire. Even until relatively recently, however, *the image of the physical machine has remained the dominant metaphor of technology*.[264]

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[263] Lilly He, *In re* Bilski *En Banc Rehearing on Patentable Subject Matter: Farewell to Business Method Patents?*, 14 B.U. J. SCI. & TECH. L. 252, 263 (2008).

[264] There is a great deal of literature on the subject of technology in society and the metaphors that have ensued. *Cf.* LEO MARX, THE MACHINE IN THE GARDEN: TECHNOLOGY AND THE PASTORAL IDEAL IN AMERICA (rev. ed. 2000) (for an apposite source dealing with the machine as

As technology became ubiquitous in society during the 20th Century, people became more conscious of the idea of technology in general; and, as a consequence, the word "technology" gradually came in to common use in Europe, in the United States, and throughout the world.[265] The nomenclature of the world's seminal patent statutes, however, has not evolved as quickly in the face of the emergence of the technological society as has human language in general. As we have seen, European patent jurisdictions (and still not all of them) have only very recently introduced the word "technology" into their statutes. Finally, the United States, despite being a world leader in technological development, has still not introduced the word "technology" into its patent statutes, preferring instead to stick with the familiar and comfortable nomenclature of the past. The failure of the United States to recognize "technology" in its patent statutes is, however, understandable, due to the large volume of jurisprudence and weighty body of precedent in which these familiar old words are embedded. It seems that, at least for the United States, it is so obvious that the subject matter of patents is technology that it is not necessary to say so explicitly. Why state the obvious?

The case law that we have reviewed tells a different story. "It" turns out not to have been so obvious to everyone, and a confusing variety of technological semantics have emerged by the turn of the 21st Century—so much so that when one community of participants in the world of patents speaks, it cannot be confident that any other community will properly understand what it means. When it comes to the protection of technology, legal certainty is unacceptably tenuous. I suggest that failure to adopt a robust and accessible definition of technology, for the purposes of patent law, is one of the reasons for this current problem.

The physical machines, physical materials, and tangible processes for transforming physical materials that were the 19th Century's practical manifestations of the general phenomenon of technology not only became enduring metaphors of technology in the 20th Century, but also eventually became reified. In other words, instead of being seen simply for what they were—i.e., as temporal manifestations of technology—the 19th Century's physical machines, physical materials, and tangible processes for transforming physical materials began to be seen in the 20th Century (at least by those practicing professionally in the world of patents) as the totality of technology itself. Put another way, some practical examples of the general phenomenon took on a life of their own and were mistaken for the general phenomenon itself. In colloquial language, we could say that many in the courts and patent offices

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the metaphor of technology); LANGDON WINNER, THE WHALE AND THE REACTOR: A SEARCH FOR LIMITS IN AN AGE OF HIGH TECHNOLOGY (The Univ. of Chicago Press 1986). *See* METROPOLIS (Universum Film A.G. 1927) (Fritz Lang's famous movie, a classic artistic and commercial work, expresses this theme).

[265] *E.g.*, JACQUES ELLUL, THE TECHNOLOGICAL SOCIETY (John Wilkinson trans., Alfred A. Knopf, Inc. 1964) (1954).

could no longer clearly see the forest (of technology) because of all the trees (of physical machines, physical materials, and physical methods). This constrained way of dealing with technological change has dominated within the patent establishments of both the United States and Europe.[266]

In the 21st Century, one particular dimension of the "reification" problem has become more important than before. Because the 19th Century instantiations of technology were mostly physical, physicality itself came to be assumed during the 20th Century by most in the patent world to be an essential feature of technology. In the vacuum created by the lack of a clear, robust, and generally accepted definition of technology, physicality thus became a proxy in patent law for technicity. Because many of the most important technologies of the 21st Century are clearly not physical, the physicality requirement (labeled earlier in this paper as the "it must be physical" doctrine) has become an obstacle to the effective operation of the patent system.

However, because technicity is so deeply associated with the heart of what most people believe is the true subject matter of patents, and because technicity has inappropriately (in my view) been yoked to physicality, it has become almost impossible for the worldwide community of patent professionals and the judiciary to let go of the physicality requirement. This is the problem that now needs to be fixed. The effective operation of the patent system, at least in the area of subject-matter eligibility, which evidently is rising in relative importance within patent jurisprudence,[267] requires the misconceived physicality-technicity nexus to be sundered, once and for all. In plain language, *legislatures and courts in Europe and the United States need to recognize that inventions do not need to be physical in order to qualify as genuine technologies*. The corollary of this statement is that courts and patent offices do not need to fear that they will need to abandon the "technological arts" requirement or the "technical invention" requirement if they abandon the sometimes implicit and sometimes explicit "it must be physical" requirement.

Although the language, form, and context of the debate may be different, the underlying problem is the same in Europe and the United States. The majority of judges and examiners conflate technicity with physicality; and then, in the desire to retain technicity as a core criterion of patentability, they resist abandoning physicality as a de facto criterion of patentability, no matter how much they get tangled up in the contradictions and ambiguities of sophisticated legal rhetoric. Conversely, those who are brave enough to abandon physicality as a de facto criterion of patentability are forced to face the uncomfortable accusation or insinuation from others that they have thereby also abandoned

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[266] As was indicated earlier, Ralph Nack (in DIE PATENTIERBARE ERFINDUNG, *supra* note 126) has documented the intrinsic conservatism of the patent establishment that makes it difficult for new technologies to be incorporated in to the canon of patent-eligible subject matter.

[267] *See* Gruner, *supra* note 192, at 409; Ho, *supra* note 247, at 472–73. *See generally* Kuhn, *supra* note 220.

technicity—and, hence, the old and established "technological arts" presumption—in patentability decisions.

The different emphases of the European approach and the U.S. approach to the patenting of non-physical inventions played out recently in a conference on "Computer Implemented Inventions" held at the headquarters of the European Patent Office in Munich.[268] In a panel discussion, a senior representative of the EPO responded to an inspirational presentation by a well-known U.S. patent judge on the current practice of the U.S. federal courts with the plea, "Please define the technical applications of the invention."[269] A well-known professor of patent law in the U.S.[270] responded to the EPO representative, and attempted to explain the U.S. approach as follows: "I would like to have a rather broad definition of 'technical' and then make decisions on the basis of novelty and non-obviousness."[271] The EPO representative responded by saying that when the EPO's examiners and members of the Boards of Appeal use the term "technical" they attach to it the "meaning associated with Sir Karl Popper in the sense of science and falsifiable knowledge."[272]

Participants in the conference came away with the distinct impression that neither side had yet developed a robust operational definition of "technical invention," and it was not clear exactly how notions of either scientific knowledge or general utility might be used to differentiate technical inventions from non-technical inventions.[273] Given that scientific theories are expressly excluded from patentability under Art. 52(2)(a) of the EPC, was it really true that the EPO treated "science" as the underlying meaning of "technology" when examining inventions? Given that utility had typically been applied in the U.S. patent examination process as a condition of patentability only after the basic question of subject-matter eligibility had been resolved, did this mean that the USPTO had now decided to brush over § 101 analysis and instead move directly to § 102, § 103 and § 112 analysis?[274] The panelists did not answer these questions decisively during the conference, but the debate highlighted the fact

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[268] Dres. H.c. Joseph Straus, Professor, Munich Intellectual Prop. Law Ctr. (moderator), Panel Discussion at the Conference on Computer Implemented Inventions, European Patent Office, Munich, Germany (May 16, 2008). The panel discussion described here was witnessed personally by the current author, and the quotes were noted by hand during the panel session. Conference information *available at* http://www.miplc.de/cii.

[269] *Id.* (speaking to Randall R. Rader, J., Fed. Cir.).

[270] Martin J. Adelman, Professor of Intellectual Property and Technology Law, George Washington University Law School.

[271] *Supra*, note 268.

[272] Popper was the author of a very influential book on the philosophy of science, KARL. R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY (Routledge 1959) (1934).

[273] Author's impressions from the panel discussion.

[274] 35 USC § 101 ("Inventions patentable") (2006); § 102 ("Conditions for patentability; novelty and loss of right to patent"); § 103 ("Conditions for patentability; non-obvious subject matter"); § 112 ("Specification").

that the emergence of intangible technology, such as computer software, was forcing the patent community to reexamine some of the most basic concepts of patent law.

In Europe, under the influence of the EPC, technicity is explicitly required for patentability and certain classes of non-physical inventions (e.g., software technology and methods of doing business) are explicitly forbidden by statute.[275] Relying on the presumption that technicity requires physicality, the lawyers, judges, and examiners engage in complicated ruses to link claims for non-physical inventions with physical phenomena in an effort to find a way of protecting certain non-physical inventions, which they believe deserve to be patented. In the United States, in contrast, neither technicity nor physicality is explicitly required for patentability.[276] However, a lingering feeling amongst various groups in the judiciary and the examiner corps that either technicity or physicality, or both, ought to be required for patentability, leads to ruses similar to those found in European jurisprudence. Most of those who believe that non-physical inventions should be patentable in their own right tend to point to various statutory requirements of patentability (such as utility, novelty, or non-obviousness) as indicators of technicity or as de facto substitutes for technicity. Most of those who believe that technicity should be a formal requirement of patentability, but who have trouble generating a cogent concept of technology for the purposes of patent law, tend to point to physicality as a de facto substitute for technicity. Consequently, they tend to generate various arguments to support the idea that physicality in an invention, or in the effects of an invention, is required by law for patent protection.

The table below—*Patentable Subject Matter: Physicality and Technicity*—shows what the landscape of patent law might look like if one deflated, rather than conflated, the two criteria of physicality and technicity as requirements of patent-eligible subject matter. By treating physicality and technicity as two different dimensions, rather than as two ways of describing the same dimension, it becomes possible to map the essential similarities and differences between the various opinions and principles contained in the cases, statutes, and various legal frameworks we have reviewed in this paper with more lucidity. The table also makes it easier to see how letting go of the "it must be physical" doctrine does not necessarily mean that one must thereby also let go of the enduring principle that patents should be issued only for technical inventions.

[275] EPC 2000, *supra* note 97, at ch. 1, art 52(1).

[276] *See* 35 U.S.C. §§ 100–103.

Patentable Subject Matter: Physicality and Technicity

Patent-Eligible Subject Matter Under Various Legal Settings and Cases

		Technicity Does a patent-eligible invention need to be technological? **Yes**	**Unclear**	**No**
Physicality Does a patent-eligible invention need to be physical?	**No**	US Constitution (1787) [probably]; US patent statute (1790)*; Tilghman v. Proctor* (1880); USPTO: *Morse* (1853), *Russell* (1922); *In re Musgrave* (1970); *Diamond v. Chakrabarty* (1980); *Diamond v. Diehr* (1981) [partly]; *Arrythmia v. Corazonix* (1992) [partly]; *In re Allappat* (1994) [partly]; *State Street Bank* (1998); *AT&T* (1999); *Ex parte Lundgren* (2005) [partly]; EPC (2000) (statute); TRIPs; "Willoughby's Proposed Law" (2008)	US Constitution (1787) [maybe]*; State Street Bank* (1998) [maybe]; *AT&T* (1999) [maybe]; [Perhaps some biotechnology/genomics patents fall in this category]	US Patent Act (1952); Paris Convention; [Perhaps some genomics patents fall in this category]
	Unclear	Venetian statute (1474); South Carolina statute (1784); German statute (2008); British jurisprudence (post-1977); *Cochrane v. Deener* (1876); *In re Toma* (1978); *Diamond v. Diehr* (1981) [partly]; *Arrythmia v. Corazonix* (1992) [partly]; *Paulik v. Rizkalla* (1985); *In re Comiskey* (2007); *Vicom* (1987); *Koch & Sterzel* (1988); *IBM* (1990); *Geodynamik HT Aktiebolag* (2002) [partly]	EPC jurisprudence (overall); US jurisprudence (overall); PCT (1979); EPC (1973) (statute); German statute (pre-2008); Statute: Canada; Strasbourg Convention (1963); *LabCorp v. Metabolite* (2006); EPO practice (overall); USPTO practice (overall)	[Perhaps some poorly examined, questionable or "dodgy" patents fall in this category]
	Yes	British jurisprudence (pre-1977); Statutes: Japan, Korea, Taiwan, China; German jurisprudence; Purported EPC jurisprudence; *Burr v. Duryee* (1863); *Gottschalk v. Benson* (1972); *Parker v. Flook (*1978); *In re Allappat* (1994) [partly]; *Ex parte Lundgren* (2005) [partly]; *Ex parte Bilski* (2006); *Pension Benefits Partnership* (2001); *Geodynamik HT Aktiebolag* (2002) [partly]; *Aerotel / Macrossan* (2006)	Statute of Monopolies (1623); Statutes: Australia, New Zealand; Freeman-Walter-Aberle Test; [perhaps, most chemical patents fall here]	[Perhaps many chemical patents fall in this category]

VIII. Defining Technology for the Purpose of Patent Law

Successfully breaking the nexus between technicity and physicality in the practice of patent law will require adopting a cogent definition of technology. There is insufficient space here to conduct a comprehensive exposition of

technology for the purpose of patent law, but it is appropriate in this paper to suggest what a suitable definition might look like.[277]

Before formally defining our key terms, it is important to distinguish between "technology" and "technicity." Technicity may be thought of as the essence of technology or, in other words, as the distinguishing factor or core quality that makes a phenomenon technical. "Technicity" is the noun-equivalent of the every-day English word "technical." A metaphor may help here. In the same way that we may distinguish between an individual English person and the quality of "Englishness" in that person, we may distinguish between an individual technology and the technical quality that characterizes that thing as a technology. In short, an invention must possess technicity in order to be a technology, in the same way that possessing intelligence is a characteristic feature of intelligent people, or possessing "American-ness" may be a characteristic feature of American people.[278]

Secondly, and before formally defining technology, it will be useful to make a couple of general comments *about* technology. Despite the propensity for some (e.g., in the European Patent Office) to equate technology with scientific phenomena[279] and despite the propensity for some (e.g., in the U.S. courts) to equate technology with engineering,[280] technology may not be reduced to either of these domains of human endeavor. Technology, science and engineering may often be closely related but they are not the same. Technology might even typically be more closely connected to engineering than to science, but they are nevertheless still not equivalent. Some technologies (e.g., various conventional agricultural tools, transportation vehicles or weapons) have emerged without reliance upon either engineering or science.[281] In addition, without yet actually defining it, we may say that technology includes: manufactured (i.e., human made) technical artifacts (in both intangible and tangible form); technical systems; and incarnate or objectified technical knowledge.

Against that backdrop, a simplified definition of technology may be presented as follows: *a technology is an artifact that functions as an efficient means*. Thus, in keeping with the main argument of this paper, patents should

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[277] The author has conducted a previous study on the concept and definition of technology, but for a context other than patent law. *See* Willoughby, *supra* note 22. The core concepts presented in this section of the paper are drawn-from and inspired-by that study.

[278] The logical flaw that has recurred in U.S. (and also European and Asian) patent jurisprudence is to treat physicality rather than technicity as the defining characteristic of technology.

[279] Jörg Machek, European Patent Office, Panel Discussion at the Conference on Computer Implemented Inventions, European Patent Office, Munich, Germany (May 16, 2008) (Transcript unpublished, witnessed personally by author; information, flyer and slides *available at* httpd://www.miplc.de/cii).

[280] *See ex parte* Lundgren, No. 2003-2088, 2005 Pat. App. LEXIS 34, at *37 (2005).

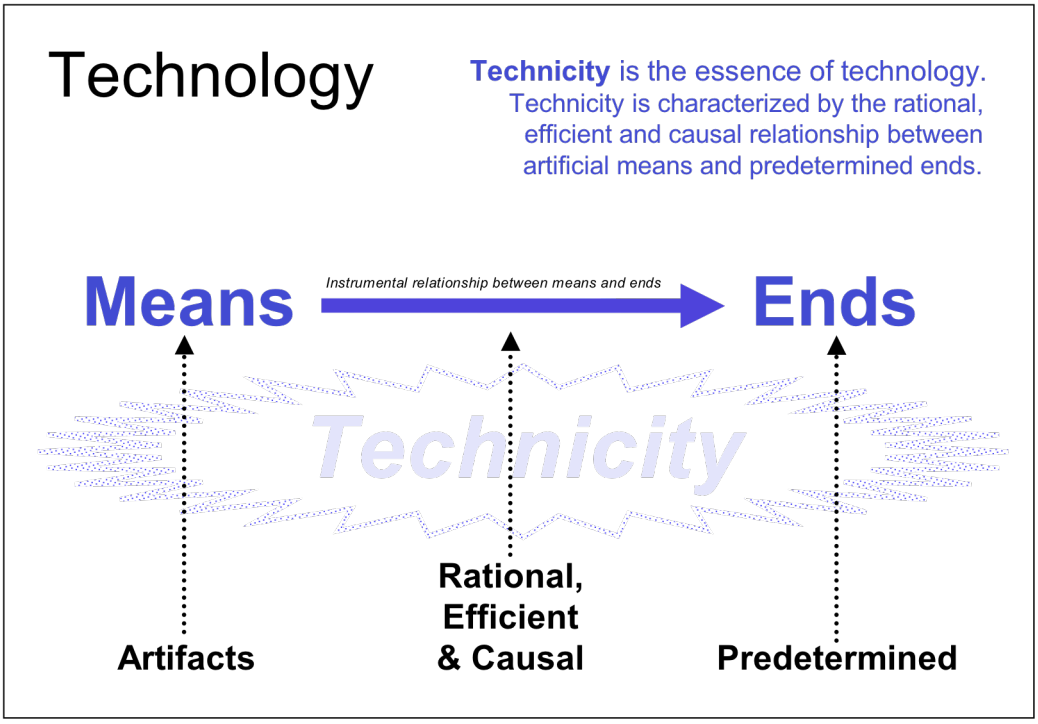
[281] *See generally* JAMES MCLELLAN & HAROLD DORN, SCIENCE AND TECHNOLOGY IN WORLD HISTORY: AN INTRODUCTION (The Johns Hopkins Univ. Press 1999).

therefore only be issued for artifacts that function as efficient means. A more rigorous definition of technology for the purpose of patent law may be presented as follows:

> A technology is an artifact or system of artifacts, either tangible or intangible, which functions as a means towards the attainment of predetermined ends in a rational, efficient and causal manner.

Accordingly, technicity may be defined as the characteristic quality found in the combination of rationality and efficiency in a causal relationship between artificial means and predetermined ends. Hence, all technologies are technical artifacts and all technologies possess technicity.[282] These ideas and definitions are illustrated in the diagram below.

Diagrammatic Representation of Technology and Technicity



In the above definitions and in the diagram the word "artifact" has the same meaning as "invention." In other words, an artifact is an invented thing; and, conversely, an invention is an artificial thing. However, not all inventions—i.e., not all artifacts—possess technicity, and hence in that case they would not

[282] These definitions of technology and technicity are derived from the author's earlier research work as described in Willoughby, *supra*, note 22.

qualify as technologies. By extension of that argument, because not all inventions possess technicity, not all inventions should be eligible for patent protection.

The definition of technology proposed here and expressed in the diagram requires that for a phenomenon to be technological it must contain three key elements:

1. **Means**
   The means must be artificial. In other words, they must be artifacts (inventions) and, as such, they will have an objective existence apart from the person or persons who invented them. In addition, the artifacts must not simply be created objects. For an artifact to be a technical artifact (i.e., a technology) it must be an object (either a physical object or non-physical object) that functions instrumentally towards some definable purpose (i.e., towards some specified end or ends).

2. **Ends**
   The ends must be predetermined. In other words, the ends must be embedded in the means, which is to say that the means should intrinsically serve particular specified ends and that those ends should not be arbitrary. Technological means and technological ends are therefore ontologically related; they are two sides of the same coin.

3. **Instrumental relationship between means and ends**
   There must be an efficient causal relationship between the means and the ends. In other words, the ends to be served by the means must be either contained within the means, or predetermined by the designer or inventor, as the necessary outcome of the use of those means. This relationship needs to be rational and instrumental, not magical, imaginary or metaphysical.[283] In addition, the instrumental pathway needs to be a more efficient way of attaining the ends than would be the case without the use of the means, recognizing, of course, that absolute efficiency is never possible in the real world.[284]

While each of the three factors—the *means*, the *ends*, and the *instrumental relationship between the means and the ends*—may be considered as distinct elements of technology in their own right, the concept of the other two elements is actually implied by each individual element. In human society at large, ends (i.e., goals or purposes) may in principle exist in the minds of people or in the

[283] Perhaps—even though they do not appear to have said so explicitly—an idea along these lines is what is actually in the minds of the EPO's examiners and judges when they speak of Karl Popper's notion of "science" as providing the meaning associated with the word "technical" in the EPO's operations and jurisprudence?

[284] The centrality of efficiency as a characteristic of technology has been recognized and elaborated upon by Jacques Ellul. ELLUL, *supra* note 265, at 21, 72–74, 80, 100.

missions of organizations as disembodied hopes and desires, disconnected from the specific means for their fulfilment. However, when construed in relation to technological artifacts, ends are not disembodied purposes; rather, they are intrinsically linked with corresponding means. Technical means always imply specific ends, through a rational and efficient causal relationship.

If an invention exhibits all of the characteristics illustrated in the above diagram we may say that it is a "technology" (or "technical invention") and that it comprises patent-eligible subject matter. Such an invention would correspond to the "useful Arts" as specified in the U.S. Constitution and should fully satisfy the corresponding "technological arts" requirement that has emerged within U.S patent jurisprudence.[285] In addition, it should satisfy the "technical invention" requirement of EPO jurisprudence.[286]

Perhaps the actual wording of the definitions proposed above might sound too academic for the "average" person or the typical practitioner in the world of patents? Undoubtedly further work needs to be done to produce more colloquial and comfortable wording for the definitions, to bring them closer to the every-day language of non-experts. This task will have to be left for another project. Nevertheless, there are a variety of comprehensible ways to define technology while retaining all the elements of the above diagram. For example, a compatible variant of my previously suggested definition of technology could be: *a technology is an invention which functions intrinsically to efficiently serve a predetermined end*. Similarly, a compatible variant of my previously suggested definition of technicity could be: *an invention possesses technicity when it necessarily serves as an efficient instrument to fulfil a predetermined and precise goal*. Surely other commentators will find more idiomatic and comfortable ways of expressing the ideas embodied in these definitions.

These illustrative definitions are just as applicable to non-physical inventions, such as computer software, methods of controlling industrial processes, methods of diagnosing propensity for disease in animals, or methods of optimizing the allocation of financial instruments, as they are to physical inventions, such as laser devices or pharmaceutical drugs.

To illustrate how the definition might be applied in practice we will now briefly re-visit the *In re Bilski* case discussed earlier in Section VI.D. As we observed earlier, the USPTO examiner rejected the Bilksi/Warsaw patent application on the grounds that the primary claim did not recite an invention

[285] The "technological arts" requirement would, of course, need to be refined by the U.S. Courts to clarify that the recurring judge-created physicality test was not applicable to determining whether an invention was part of the technological arts.

[286] The "technical invention" requirement would, of course, need to be refined by the EPO's Boards of Appeal to clarify that the physicality test which has dominated up until now would no longer be needed to classify an invention as technical. The more intractable problem in European patent law, however, remains the fact that certain categories of inventions (e.g., software and business methods, as such) are excluded by statute from patentability, even if they are genuine technical inventions.

within the technological arts; and that conclusion was, in turn, based on the prior conclusion that the invention was not a physical thing and did not produce physical effects. In contrast, under the technological test proposed here the invention would not be declared non-statutory subject matter due to physicality not being recited in the claims. The analysis would instead shift to investigating whether the method (a commodity trading technique) constituted artificial means for accomplishing the pre-determined end of balancing the risk positions of a series of market-participant transactions and a series of consumer transactions. In principle, Bilski and Warsaw's technique may be described as an artifact because it is not a naturally occurring phenomenon and because it may be articulated or manifested objectively, separate from the inventors (i.e., as an invented intangible "thing"). In addition, it is claimed as a means (to achieve the risk-balancing result defined in the claims).

Whether the Bilksi/Warsaw invention really exhibits these qualities is a question of fact for investigation and analysis by the examiner, an exercise that goes beyond what is possible in the short space allowed here (and perhaps there is a high probability that the invention would not pass the test, and hence not be patentable); but, in principle, it is plausible that the technique may be described as an artificial means. Whether the Bilski and Warsaw technique has been adequately reduced to practice or adequately disclosed by the inventors to justify patenting may be a critical issue in this case, but that is not a matter pertinent to §101 subject matter eligibility.

A properly conducted *Bilski* analysis, following the technological principles presented above, would also address whether the stated useful result of applying the technique (the balancing of risks between two series of transactions) could qualify as a predetermined end that was intrinsic to the means. It would be appropriate to analyse whether the end was specific and objective, not whether it involved physical effects. Once again, while there is insufficient space here for conducting a full analysis of the facts, it is plausible that the practical output of the Bilski/Warsaw technique could qualify as a predetermined end. The examiner would need to evaluate whether the end was articulated in the claim with sufficient specificity to ensure objectivity and that it was not arbitrary. We cannot judge here whether the claim would successfully pass through that analytical filter; but, theoretically, it is possible that it could do so.

Finally, the examiner would need to judge whether the application of the Bilski/Warsaw technique would lead to the defined end in a rational and efficient cause-and-effect manner—as the necessary outcome of the application of the technique, rather than as some arbitrary result emanating from the skill of a trader who ostensibly adopted the method. Once again, it is difficult to determine in the short space available here whether or not the invention could successfully pass through this analytical filter. However, the Bilski-Warsaw invention might qualify as a technology according to the definition portrayed above.

Applying the "it must be a technology" test advocated here to *In re Bilski*, rather than the "it must be physical" test that has often been preferred by the

judiciary and the by examiner corps, opens up the possibility that Bilski and Warsaw could be issued a patent for their invention. However, that result is not guaranteed, for two related reasons. First, the invention would still have to pass through the filters for novelty, non-obviousness, reduction-to-practice and adequate-disclosure; and it seems plausible that the Bilski/Warsaw invention might not qualify under any of those criteria. Second, the "it must be a technology" test requires the examiner to adopt a substantive and analytical approach to deciding whether or not the claimed invention really falls in the technological arts, thereby imposing a potentially more potent filter than the one imposed by the "it must be physical" test. While the Bilski/Warsaw invention would obviously not pass the "it must be physical" test, other arguably inappropriate inventions (that are not technological but which are physical—such as a chemical compound with no known practical application), might make it through the "it must be physical" filter.

In summary, the Bilski/Warsaw invention might be construed as statutory subject matter under the "technicity" approach to §101 subject matter advocated here, whereas it would not qualify under the "physicality" approach that is preferred by some examiners and judges. Furthermore, the usefulness of applying a technicity filter rather than a physicality filter to determining whether an invention falls within the technological arts, may be seen in this brief example.

Using similar logic, the inventions in the following cases discussed above—*Musgrave*, *Benson*, *Toma*, *Flook*, *Arrythmia*, and *Alappat*, for example—would probably all qualify as patent-eligible under the approach advocated here, but not because of any physical effects or qualities they might have exhibited. In contrast, the chances of the invention in *Diehr* (a well known scientific principle and mathematical formula—that was ruled patent-eligible by the Supreme Court due to its effect on an appended physical process) would have a low probability of passing successfully through the filters advocated here, due to the likelihood of it lacking technicity in itself (and, in any case, it would probably also fail to pass successfully through the novelty filter). These are just a few cursory examples; but they illustrate how the general technological approach to testing for patent-eligibility suggested here might work in practice.

How compatible is the above concept of technology with the existing statutes and case law of the United States? We may note a few indicative examples from the law. For example, in the opinion authored by Judge Barrett (affirming in-part and dissenting in-part), joined by Judge Smith, in *Ex parte Lundgren*, the following statement may be found:

> The general purpose of the statutory classes of subject matter is to limit patent protection to the field of applied technology, what the United States Constitution calls "the useful arts." … This focus on technology explains the preoccupation of patent law with *means*.

> A patent can issue only for a new means of achieving a useful end or result.[287]

In this quote we see the emphasis on both means and ends as an essential feature of technology for the purposes of patent law, consistent with the definition of technology proposed in this paper.

In addition, the insight that means do not need to be physical in order to be technological (within the Constitutional meaning of the "useful arts") was expressed clearly by the United States Court of Customs and Patent Appeals (CCPA) in a 1971 decision on a patent appeal concerning an intangible invention for processing information to compensate for distortions in seismograms: "Under this analysis it is not important whether the claims contain mental steps or not if the process is within the technological arts."[288] The insight that technology may be either intangible or tangible was elaborated upon two decades later by Justice Rader in his opinion issued in *In re Alappat*:

> In determining what qualifies as patentable subject matter, the Supreme Court has drawn the distinction between inventions and mere discoveries. On the unpatentable discovery side fall "laws of nature, natural phenomenon, and abstract ideas." ... On the patentable invention side fall everything that "is not nature's handiwork, but [the inventor's] own." … The dividing line between patentable invention and mere discovery applies equally well to algorithmic inventions. … the Supreme Court only denies patentable subject matter status to algorithms which are, in fact, simply laws of nature.[289]

In re Alappat also affirms the principle in our definition of technology that patentable things must be artificial (i.e., artifacts or inventions) rather than natural (i.e., laws of nature or natural phenomena).

In *Ex parte Bilski*, while disagreeing with the established case law that inventions do not need to be physical in order to be patentable, the USPTO-BPAI nevertheless embraced the idea, not only that patent protection belongs exclusively to technologies, but also that technological inventions are intended to "improve human *efficiency* in some respect."[290] The judges in *Ex parte Bilski* have recognized the importance of efficiency as stressed in the definition of technology proposed here.

Finally, we may note that the technological principles espoused in this paper are to some extent implied by the concept of utility (or its modern

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[287] *Ex parte Lundgren*, at *47.

[288] *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971) at 1015.

[289] *In re* Allapat, 33 F.3d 1526, 1582 (Fed. Cir. 1994) (citations omitted).

[290] *Ex parte* Bilski, No. 2002-2257, 2006 Pat. App. LEXIS 51, at *3 (2006) (emphasis added).

European counterpart of industrial applicability) that has always been part of American patent law. Thus, for an invention to qualify as a technical invention it should comprise means that serve particular specified ends; in other words, the means must be useful (i.e., have utility), or be instrumental, in the service of the specified ends. It may therefore also be argued that while the utility requirement for patentability is normally applied in the patent examination process after the issue of subject-matter eligibility has been addressed, utility is in some ways embedded in the very concept of technology and, hence, also in the concept of patent-eligible subject matter itself. This perhaps explains why, out of the three basic criteria of patentability (utility, novelty and non-obviousness), only the latter two have been given their own section in the U.S. Patent Act—§102 for novelty, §103 for non-obviousness—whereas utility has been included by Congress in §101 as an element within the section of the Act dealing with basic subject-matter eligibility.[291]

These considerations might also partly explain why the CAFC in *State Street Bank* treated utility as the primary criterion of subject-matter eligibility. Utility is only one of several essential aspects of technology; it is not, in itself, an adequate substitute for technicity. However, unlike physicality, utility is an essential aspect of technology. Hence, if one wished to use another concept as a proxy for technology in patent law (out of despair at supposedly being unable to define technology), utility is arguably a much more legitimate proxy for the real thing (technicity) than is physicality. In this paper I argue that technology is the appropriate subject matter of patents, and hence that all patentable inventions ought to possess technicity. I suggest that it is best to avoid using misconceived proxies for technicity (such as physicality) in the examination process. However, if one wished (for some extraneous and probably ill-advised reason) to use a proxy for technicity instead of technicity itself as the primary filter for deciding subject matter eligibility, utility would be a vastly superior proxy to physicality.

These few examples illustrate that the concepts embedded in the definition of technology proposed here for the purpose of patent law are not alien to patent jurisprudence in the United States and that, in fact they are sometimes expressed explicitly. These examples also illustrate that the underlying idea of technology as expressed in this paper has arguably already been implicit in much of the decision making of the USPTO examiner corps and of the pertinent U.S. courts in patent matters. Additionally, as the main body of this paper has revealed, there has been a persistent underlying theme throughout the history of U.S. patent law that patent protection is meant for technologies, even if the word "technology" did not come in to common use until well in to the 20th Century and even if the immense potential for intangible technological inventions was not fully appreciated prior to the 20th Century. The primary point of dissension in the courts and amongst the examiners remains the question of whether technicity should be equated with physicality.

[291] 35 U.S.C. §§ 101–103 (2006).

In contrast with the patent law of the U.S., European patent law has a formal requirement that inventions must possess technicity (i.e., that they must be technical inventions), and hence the applicability of the technological principles espoused in this paper is more readily appreciated in Europe. The main problems arise from the EPC doctrine that, to be treated as technical inventions, artifacts must be physical (or involve physicality in some manner acceptable to the EPO's examiners and Boards). All of the inventions in the EPO cases considered above—*Vicom*, *Koch & Sterzel*, *IBM*, *Pension Benefits Partnership* and *Geodynamik HT Aktiebolag*—would probably be admissible as technical inventions under the framework advocated here, for reasons similar to those adumbrated in our discussion of *In re Biski* (subject, of course, to detailed factual analysis of the claims). In the two recent cases, *Pension Benefits Partnership* and *Geodynamik HT Aktiebolag*, the EPO treated the inventions as non-technical simply because they lacked physicality. Since the approach advocated here does not require physicality in either the invention itself or in some external contribution-cum-effect, the inventions in these two cases would almost certainly be patent eligible.

In the *Aerotel/Macrossan* cases from the U.K., applying the approach advocated here would probably lead to the same result as that reached by the Court for both *Aerotel* (the invention was patent-eligible because it was technical) and *Macrossan* (the invention was not patent-eligible because it was not technical). The difference would lie only in the logic: under the approach advocated here there would be no need for either a physicality test or a technical-contribution test.

What has been demonstrated here, for both the European and U.S. contexts, is that by explicitly adding some simple common-sense content to the term "technology," namely the three essential elements of technology—the *means*, the *ends*, and the *instrumental relationship between the means and the ends*—as described herein, three important things become possible. First, it becomes feasible in practice to embrace the idea that patents ought to be issued only for technology. Second, it becomes possible to embrace this idea without having to retain the misguided habit of treating physicality as a proxy for technicity in patent jurisprudence. Third, it becomes possible to better align patent jurisprudence with common-sense ideas of the contemporary educated public about what constitutes the "useful arts" in the 21st Century … in other words, technology!

IX. Summary and Conclusions

There is a considerable history of thought on the matter of whether technology ought to be coterminous with the subject matter of patents. There is a good deal of variety across jurisdictions and over time in the way this matter has been treated. The challenges of dealing with the question of whether patents ought to be issued only for technical inventions may have motivated recent

developments in international patent law, and considerable ambiguity and diversity of opinion about these matters is salient in the literature. Finally, differences in the way these matters are construed may have significant political implications internationally, especially during the current period of debate over the legitimacy and scope of intellectual property rights and the appropriate exceptions that ought to be imposed upon them.

For many people involved professionally with patent law, lack of a widely adopted definition of technology makes it difficult to engage in a coherent conversation about the idea of restricting patent protection to technologies. Neither the EPC nor the U.S. patent statutes contain a definition of technology. The patent laws of some jurisdictions outside Europe and North America—especially those in East Asia—are more explicit in requiring that patentable inventions be "technical" or "technological" and give stronger clues as to what this means. Nevertheless, I have not yet found a set of patent statutes from any jurisdiction in which technology, in its own right, is adequately defined.

It might be argued that this lacuna in the patent laws stems from the fact that it is just common sense that patents are meant only for technologies and, hence, that it is therefore not necessary to make any explicit statement to this effect. Undoubtedly, there is something to this argument; in fact, this may be the main reason for the remarkable lack of an explicit proscription in European and U.S. patent statutes against patenting inventions that are not "technology." However, the lacuna in the statutes has facilitated confusion and conflict surrounding the question of what subject matter is eligible for patent protection.

In response, some commentators may say that all inventions are, by definition, "technology" and hence there really is no problem here worthy of analysis. According to this line of thinking, it is better to focus on "secondary" criteria of patentability, such as novelty or non-obviousness, rather than the "primary" criteria of fundamental subject-matter eligibility—in other words, that it is pointless to worry about whether an invention is a "technology." This way of thinking has predominated in the United States during recent decades[292]; whereas authorities in Europe and East Asia have exhibited a propensity to attempt to define more explicitly what the fundamental subject matter of patents ought to be.

The scope of potentially patentable subject matter under the patent laws of the United States is very broad. The current patent statutes (meaning the version of the U.S. patent statutes, with amendments, that have been in force since 1952) appear to allow patents to be issued on inventions or discoveries whether or not they belong to the class of phenomena commonly known as "technology." Nevertheless, even though the word "technology" has not been used to delimit the boundaries of "invention" in the U.S. patent statutes, it is arguable that during the first two centuries of U.S. patent law, it was presumed that patents really were

[292] For a review of this trend and its proponents, see Gruner, *supra* note 192, at 395-407; *cf.* ADELMAN ET AL., *supra* note 194, at 47–63.

intended only for what today would be called "technologies." Therefore, the scope of inventions eligible for patent protection has indeed expanded in U.S. patent law from the beginning of the second half of the 20th Century onwards. It is likely that this shift has stimulated today's salient debates and disagreements as to whether patentable subject matter in the U.S. is coterminous with technology.

The latest version of the EPC, that came in to force at the end of 2007, stipulates that only technical inventions are eligible for patent protection—or, at least, the EPC comes very close to formalizing such a requirement. While this requirement was not made explicit in the EPC until very recently, it was nevertheless firmly established in European patent jurisprudence (in the EPO, perhaps influenced by Germany) for many years. Thus, even though the EPC requires that the subject matter of patents be coterminous with that of technology, this was not always stated explicitly and, in addition, technology remains undefined in the EPC. Hence, even with the EPO's positive efforts to bring clarity to the law concerning whether the subject matter of patents should be coterminous with technology, a shadow of ambiguity still hovers around this theme in European Patent Law. As we observed in our discussion above, in Section V(B), of recent British case law, this ambiguity can be rather problematic for national patent courts and for patentees. Notwithstanding this vestigial ambiguity we may observe that, at least compared with contemporary U.S. law, European law is arguably growing clearer regarding the question of whether patents should only be issued for technology.

In comparison, as we noted earlier, the major patent jurisdictions of East Asia all embrace without ambiguity the idea that patents should be coterminous with technology. The laws of Japan, Korea, and Taiwan, in particular, are more explicit about "technicity" being an essential requirement of patentability than are the statutes of the United States and the major patent jurisdictions of Europe. The patent statutes of all four major East Asian jurisdictions come closer in their language to the wording of the PCT and TRIPs than does the language in the statutes of the United States, the United Kingdom and pre-2008 Germany.[293] The principle of only permitting patent protection for technical inventions was codified explicitly in the statutes of the major patent jurisdictions of East Asia earlier than it was in Europe,[294] even though the principle evolved within German case law and elsewhere in Europe for many years, and even though such jurisprudence probably had a major influence on the statutory patent law of East Asia.

In summary, we may conclude that there is ambiguity in both U.S. and European law as to whether the subject matter of patents is restricted to that of

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[293] *Compare* Patentgesetz, *supra* note 87; Japanese Patent Law, *supra* note 51, at art. 2, No. 1; Republic of Korea Patent Act, *supra* note 52, at ch. 1, art. 2; P.R.C. Patent Law, *supra* note 56; Taiwan Patent Act, *supra* note 53, at art. 21; Patents Act, 1977, *supra* note 72, at pt. I, § 1; 35 U.S.C. § 101 (2006); EPC 2000, *supra* note 97, at ch. 1, art. 52(1); TRIPs, *supra* note 6, at art. 27, §5.

[294] *See id.*

technology. During the last half century, the ambiguity has grown in the U.S., while it has decreased in Europe and the rest of the world.

I propose that a productive solution to the seemingly interminable problems of patent law, as discussed above, may be found by embracing the following three propositions:

1. *Patent protection should only be issued for technology*. In other words, only technological inventions (subject to other statutory conditions of patentability) should be eligible for patent protection.
2. *Technology is not necessarily physical*. This means that an invention should not need to be physical, or have an effect upon or contribute to another invention that is physical, or anything else physical, in order to qualify as a technology for the purposes of patent law.
3. *A robust and simple definition of technology, for the purpose of patent law, needs to be adopted*. This definition needs to be close enough to widely held common sense notions of technology to be comprehensible to the typical educated person, yet sufficiently precise to permit rigorous analysis *vis-à-vis* patent law.

The reasons for making the above propositions are as follows.

Legal Certainty. First, as has been revealed by the research and analysis in preceding pages, there is considerable dissension and confusion in the patent community of both the United States and Europe over precisely what kind of subject matter is eligible for patent protection. While, at first glance, these patent regimes possess ostensibly straightforward statutes and rules about patent-eligible subject matter, it turns out, on closer examination, that the statutes and rules are not so easy to interpret in a consistent manner in the context of the 21st Century, which is characterized by the existence of new types of technologies, new nomenclature for new technology-practice, and changes in the common meanings of old words. The regimes have their roots in the legal and technological environments of previous centuries. Thus, the legal certainty that inventors, investors, technology developers and those who depend upon them expect from the patent laws has turned out to be elusive—ironically, just at the time when the basis of wealth creation and economic development in the world's economies depends more than ever upon the ostensible subject matter of patents, namely, technology. Thus, a more cogent definition of basic patent-eligible subject matter is needed in order to bring more legal certainty to patent law.

Precaution Against Inappropriate Granting of Exclusive Rights. Second, given that in both the United States and Europe there is a natural reluctance to extend monopoly rights over economic assets inappropriately, it is very important—in the situation where exclusive economic rights are granted by governments, such as is the case with patents—that the boundaries of those rights be rationally defined, carefully chosen and awarded in a predictable and transparent manner. Defining patent-eligible subject matter more cogently will

help ensure that patent holders' exclusive rights are not granted unless they are, in fact, justified. This concern is doubly important in view of the fact that the current "anti-I.P." movement is growing more strident in its opposition to the patent system.

Technology is the Presumptive Subject Matter of Patents. Third, despite all the debates I have reviewed about what, as a matter of law, the appropriate subject matter of patents ought to be, the reality is that there is an almost universal "common sense" understanding—possessed both by educated people in general and by informed members of the legal profession—that patent protection is meant for new technology. Unfortunately, not everybody believes it is appropriate or necessary to say so in the statutes or to define what technology means. However, given that the whole edifice of patent law is arguably built on the conceptual foundation of something called "technology," it does seem important to define the term clearly. In any case, the profusion of court cases that has arisen about this question, in both the U.S. and Europe, suggests that more definitional acuity would be helpful.

Reduction in the Waste of Resources. Fourth, greater cogency and consistency in statutory definitions and judicial interpretations of patent-eligible subject matter, particularly *vis-à-vis* the question of whether or not patentable inventions need to be technical inventions, would help reduce the amount of time and money spent by applicants and litigants on patent cases, not to mention enabling greater efficiency in the administration and execution of examinations in patent offices. Perhaps some of those who currently profit by providing professional services to those caught up in legal disputes over the legitimacy of patents would prefer the *status quo* to remain intact? … but that should not be an acceptable reason for allowing unhelpful ambiguity in the law to persist.

Defining Technology for the Purpose of Patent Law is Not Such a Formidable Task. Fifth, despite the fact that it has become almost a truism amongst members of the patent community that it is impossible to define technology, some reasonable attempts to do so have been made, including one by the current author which was adumbrated in the Section VIII.[295] Despite the fact that further work is no doubt needed, articulating the basic elements of what makes an artifact a technology and how those elements might be portrayed in a definition, is actually a reasonably manageable intellectual problem. It also seems to this writer that defining important subject matter for the purpose of law is one of the basic responsibilities of lawyers; and, given that technology is

[295] Other contributions which provide a worthwhile starting point include: RIAS J. VAN WYK, TECHNOLOGY: A UNIFYING CODE (Stage Media Group 2007), LEITH, *supra* note 5, at 6–11 and Joseph Agassi, *The Confusion Between Science and Technology in the Standard Philosophies of Science*, 7 TECH. & CULTURE 348 (1966). The courts in *Ex parte Lundgren*, No. 2003-2008, 2005 Pat. App. LEXIS 34, at *35 (2005) and *Ex parte Bilski*, No. 2002-2257, 2006 Pat. App. LEXIS 51, at *35–37 (2006), for example, have also made a considered and reasonable contribution to the debate in this area (despite their propensity to conflate technicity and physicality). *See also Synoptic Presentation*, *supra* note 97, at 49.

unquestionably important subject matter for patent law, it seems inappropriate for patent lawyers to shy away from trying to define the thing (technology) that is at the heart of their profession. Fulfilling this quest will no doubt take considerable effort and intelligence, but surely that does not make the task either impossible or inappropriate to pursue.

The main conclusion of this paper is that patent law and patent practice in the United States and Europe will function best if patent protection is restricted to technology. This conclusion rests on the condition that a robust definition of technology is adopted for the purposes of patent law that does not treat physicality as a proxy for technicity.