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*1139 THE PATENTING OF THE LIBERAL PROFESSIONS

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The regime of patents has traditionally been nothing if not humble. Its plodding acquisition procedures and formal enforcement analyses historically confined themselves to the artifacts of the Industrial Revolution and their immediate successors. The painstakingly catalogued Patent Office [FN1] classification scheme betrayed the sense, shared if not easily articulated by the patent bar, of the sorts of inventions that could be the subject of a patent and those that could not. [FN2]

Times have changed in patent law. Inventors from diverse disciplines, animated by a lenient judiciary and elevated to proprietors by the Patent Office, have offered the patent system a bold new vision. The sheer range of recently issued patents suggests that few restraints bound the sorts of subject matter that may be appropriated via the patent system. As we read with amusement patent instruments claiming methods for swinging a golf club, [FN3] treating cancer [FN4] or administering a mortgage, [FN5] we come to realize that the patent law seems poised to embrace the broadest reaches of human experience.

*1140 The recent opinion in State Street Bank & Trust Co. v. Signature Financial Group, Inc. [FN6] suggests that the United States Court of Appeals for the Federal Circuit will pass an approving glance upon much of this Patent Office work product, if called upon to do so. [FN7] In State Street, the plaintiff held a patent for a data processing system consisting of software for managing a stock mutual fund. [FN8] The Federal Circuit not only held that data transformation through a series of mathematical calculations presented patentable technique, but also took the opportunity to obliterate the venerable proscription on patenting so-called "methods of doing business." [FN9] Keenly aware of the State Street holding, applicants have besieged the Patent Office with applications ranging from financial software to Internet- based business models. [FN10]

State Street presents the latest in a series of cases testing the boundaries of the "useful Arts," the constitutional expression of subject matter appropriate for patenting. [FN11] Embodying the current understanding of this term to mean the "technological arts,"

[FN12] the patent statute further refined patentable subject matter to include processes, machines, manufactures and compositions of matter. [FN13] The first of these terms appears the most troubling, particularly in light of its circular *1141 statutory definition as a "process, art or method." [FN14] For without more, the scope of the statutory term "process" appears co-extensive with nearly any possible endeavor, as almost any imaginable function can be articulated in a series of steps in the fashion of a patent instrument. [FN15]

Determining the appropriate subject matter for patenting is important because a paucity of constraining doctrines allay the proprietary rights associated with granted patents. [FN16] The adjudicated infringer need not have derived the patented invention from the patentee, as liability rests solely upon a comparison of the text of the patent instrument with an accused infringement. [FN17] Patent law also lacks a robust experimental use exemption in the nature of copyright law's fair use privilege. [FN18] Likewise, the doctrine of patent misuse has been reduced to a withered remnant of its once hale self. [FN19] The decision to subject particular areas of endeavor to the patent system is therefore of great moment, in effect subjecting entire industries to a private regulatory environment with constantly shifting contours. Given the contemporary movement towards an increasingly ambitious sense of patentable subject matter, further reflection upon the appropriate grasp of the patent system appears worthwhile.

This Article takes as its focus patentable processes and, in particular, the business methods addressed in State Street. Part I of this Article briefly reviews the history of process patents, from early case law under the Statute of Monopolies to the recent debates regarding computer-implemented mathematical algorithms. It then traces the rise of patents on computerized business models and their confirmation in State Street. Casting a critical eye towards that opinion, Part I concludes that the patent eligibility inquiry has been reduced to one of mere utility. This trend is a disturbing one, for unlike breakthroughs in computer or biotechnologies, business methods are vastly older than the patent system itself. Yet only recently have we come to understand that such techniques lie within the reach of the patent system.

*1142 In Part II, this Article explores the broad ramifications of the State Street opinion. The Patent Office's willingness to consider business method applications means that fewer constraints bar the grant of patents on other utilitarian processes. Disconnected from any physical apparatus, such patents will set forth not so much technical artifacts, but a broad category of proprietary modes of analysis, techniques and protocols from disciplines ranging from the social sciences to the law. Yet surely the constitutional directive that patents apply to the "useful Arts," as well as our long-held sense of the reach of the patent system, must somehow cabin the extent of patentable subject matter. We have come to this place, this Article reasons, because of our near-total engagement with the artificial. Identifying the ontic dimension of technology has perplexed not only the courts, but epistemologists and the most accomplished of technological observers as well.

Resolving to develop an articulation of those aspects of human endeavor we may fairly call technological, Part II invokes contemporary thought about technology. Turning to the technological commentary of Robert McGinn, Paul W. DeVore and Carl Mitcham, this Article develops a typology of traits that distinguish technology from other forms of human activity. This Article concludes that technological activities are concerned with

the production or transformation of artifacts through the systematic manipulation of physical forces. Bounded by interaction with the external environment, technological activities expend resources and knowledge in order to fabricate or modify products, or to develop procedural systems for so doing. Furthermore, technology presents a form of rational and systematic knowledge, oriented towards efficiency and capable of being assessed through objective criteria.

This Article continues in Part III by considering how we can move from a catalogue of characteristics to an essentialist, legally apt definition of the technological. Recent experience concerning methods of medical treatment suggests one technique: amendment of the Patent Act to create particularized patent-free spheres of activity. This Article concludes that due to the obligations of the TRIPS Agreement, the intellectual property component of the World Trade Organization treaty, such efforts are unlikely to succeed. [FN20] Given the TRIPS Agreement *1143 mandate that patent rights be enjoyable without discrimination as to the field of technology, even the recent amendment concerning medical methods appears suspect. [FN21]

This Article finds a more favorable solution in the standard of industrial application. Long a part of many foreign laws and fully compatible with the TRIPS Agreement, the standards developed under the industrial application requirement bear a striking resemblance to contemporary thought about the scope of technological activities. By restricting patentable advances to the repeatable production or transformation of material objects and excluding subject matter founded upon the aesthetic, social observation or personal skill, the industrial application requirement would restore a sense of patentable subject matter that matches our sensibilities.

I. THE PATENT ELIGIBILITY OF BUSINESS METHODS

A. The Foundational Law of Business Methods

From its very beginnings, the patent system has struggled with the patentability of methods. The forbearer of contemporary patent legislation, the English Statute of Monopolies of 1623, [FN22] extended the possibility of patenting only to "manufactures." [FN23] Although the usual sense of that term suggests human-made artifacts, the rationalization of production techniques brought about by the Industrial Revolution led courts to entertain a widening conception of patentable subject matter. By the mid-nineteenth century, the English patent system had extended fully to both products and processes. [FN24] Yet, discomfort with the potential scope of process protection remains today. Commonwealth courts that continued to interpret the term "manufactures" sought to limit the patent system to so-called "manual arts," [FN25] "artificially created state of affairs" [FN26] or the production or preservation of vendible products. [FN27]

*1144 Seemingly aware of the English experience, the United States Congress expressly declared a "useful Art" to be within the scope of the 1790 Patent Act. [FN28] Section 101 of the current legislation, the Patent Act of 1952, extends patentability to "any new and useful process, machine, manufacture, or composition of matter." [FN29] The statute circularly defines the term "process" to mean any "process, art or method," including "a new use of a known process, machine, manufacture, composition of matter or material." [FN30] United States Supreme Court elaborations of this definition have included "a

method of doing a thing," [FN31] "a mode of treatment of certain materials to produce a given result" [FN32] and "some practicable method or means of producing a beneficial result or effect." [FN33]

Although United States courts possessed a firmer statutory basis for processes than their common law peers, they too experienced difficulties in adjudicating disputes involving process patents. [FN34] Patented processes are often practiced in secret, with only the product of the process available to the public. The inchoate nature of processes makes it difficult to evaluate their impact upon the public domain, [FN35] assess whether they have been infringed [FN36] and determine how they can be physically marked. [FN37]

But particularly troubling within the sphere of processes is the demarcation of the limits of patentable subject matter. Seemingly any sort of communicable technique can be articulated as a series of steps and expressed in the style of a patent claim. [FN38] This sense is reinforced *1145 by the legislative history of the current patent statute, which the Supreme Court read as holding "that Congress intended statutory subject matter to 'include anything under the sun that is made by man."D¢=EQP:0017¢=' [FN39]

Perhaps realizing the expansive grasp of proprietarization made possible by the patent system, the courts developed a number of doctrines to cabin its reach. Variously expressed as bars to patents on business methods, [FN40] as well as such things as "mental steps," "algorithms" and "printed matter," these doctrines purported to hold certain subject matter unpatentable per se. [FN41] Chief among these limitations was the longstanding sentiment that "[a]n idea of itself is not patentable." [FN42] "While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." [FN43] Although the policy underpinnings of this restriction were never articulated well, the Supreme Court once suggested that such abstractions comprised "the basic tools of scientific and technological work," [FN44] too central to the process of technological development to be appropriable. Just as the copyright law limits itself to protection of expression and permits an author's ideas to enrich the public domain, [FN45] so too did the patent law concern the physical instantiation of technological knowledge rather than that knowledge itself.

The bar against patenting business methods represented an extension of the proscription on patenting abstract principles. As early as 1869, the Patent Commissioner sensed that "[i]t is contrary to the spirit of the law ... to grant patents for methods of book-keeping." [FN46] *1146 Nineteenth century courts also opined that "a method of transacting common business" [FN47] or "a mere contract" [FN48] were unpatentable. Yet it was not until the United States Court of Appeals for the Second Circuit's 1908 opinion in Hotel Security Checking Co. v. Lorraine Co. [FN49] that the proscription on business method patents was secured in the treatises. [FN50]

The patent at issue in Hotel Security Checking concerned a "method of and means for cash-registering and account-checking" designed to prevent fraud by waiters and cashiers. [FN51] The system employed certain forms that tracked sales and ensured that waiters submitted appropriate funds at the close of business. [FN52] The Second Circuit invalidated the patent on the basis of prior knowledge, finding that the patented technology "would occur to anyone conversant with the business." [FN53] However, the court further observed that:

> It is manifest that the subject-matter of the claims is not a machine, manufacture or

composition of matter. If within the language of the statute at all, it must be as a "new and useful art." One of the definitions given by Webster of the word "art" is as follows: "The employment of means to accomplish some desired end; the adaptation of things in the natural world to the uses of life; the application of knowledge or power to practical purposes." In the sense of the patent law, an art is not a mere abstraction. A system of transacting business disconnected from the means for carrying out the system is not, within the most liberal interpretation of the term, an art. [FN54]

Similarly, in 1894, in Ex parte Turner, the Commissioner of the Patent and Trademark Office stated that "a plan or theory of action which, if carried into practice, could produce no physical results proceeding directly from the operation of the theory or plan itself is not an art within the meaning of the patent laws." [FN55] Thus, both courts *1147 and the Patent Office hinged the patentability of processes upon the presence of a "physical tangible facility" for practicing the patented technique. [FN56] Importantly, both tribunals also held that mere "printed matter"--information inscribed upon a substrate for purposes of presentation--would not suffice to fulfill the requirement. [FN57] Only physical structures exhibiting a functional relationship between the substrate and written material would enter the realm of the patentable. [FN58]

Numerous decisions applied this standard while denying patents on business-oriented inventions. Citing a lack of physical structure other than printed matter, the courts struck down patents claiming a method for transferring writings from manuscript form to printed publication form, [FN59] a system of blank checks and stubs useful in a combined checking/savings account [FN60] and a system for national coordination of firefighting efforts. [FN61] Some patents were upheld. For example, a railway ticket consisting of a base and separable attachment was held not to "relat[e] merely to a 'method of transacting business,"D¢=EQP:0036¢=' but to involve a unique physical structure. [FN62]

The requirement of physical instantiation is not an illogical one. It ties the relatively abstract proprietary interests created by patent law to the corporeal things that form the traditional objects of property. The identifiable boundaries that result better enable individuals to complete transactions, form markets and determine the sorts of conduct that will be judged permissible. The stricture that processes generate tangible results also places appropriate limits upon infringement liability, for the courts may far more readily observe the market impact of manipulated objects than trace the effect of more rarefied teachings. In all of these matters, patent law reflects the precepts of the copyright law, which offers protection only to works fixed in a tangible medium of expression. [FN63]

*1148 B. Computer-Implemented Methods

The demand for physical structure proved a serviceable patent eligibility standard for most of the history of the patent system. The rise of computer technology sorely tested this familiar principle, however. Applicants in the computer arts urged that electronic circuits and the software to command them were as industrial in character as more traditional technologies. Patent examiners initially cast an extremely wary eye on these applications. The examiners recognized that much of the precedent exempting abstract ideas from the patent system would be swept away if patents were issued for computers programmed to perform newly invented mathematical algorithms. [FN64]

The Supreme Court entered the debate when it granted certiorari in Gottschalk v. Benson in 1972. [FN65] In Benson, the applicant claimed a method of converting numerals from binary-coded decimal to pure binary format. [FN66] The steps of the method comprised mathematical operations that shuffled a sequence of bits in order to express appropriately a particular number. [FN67] The application claimed this method as performed by a computer. [FN68] But the application also claimed the method more abstractly without reference to a particular physical means. [FN69] The method had broad application in data processing tasks, ranging from "the operation of a train to verification of drivers' licenses to researching the law books" in the words of the Court. [FN70]

In a cryptic opinion, the Court upheld the Patent Office's rejection of the application. [FN71] The Court first recited the traditional requirement that patentability hinged upon the "[t]ransformation and reduction *1149 of an article 'to a different state or thing."D¢=EQP:0038¢=' [FN72] Arguably, at least those claims reciting computer implementation of the numerical conversion method did involve some sort of physical conversion. [FN73] Operation of the computer would not only manipulate those electrical signals representing the data, but would also generate electrical signals in order to instruct the computer to perform certain tasks. [FN74] Yet the Court found this hardware insufficient, drawing its analysis to a close with a self-styled "nutshell":

> It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented .... The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself. [FN75]

Thus, the Court held that computerization of mathematical equations could not shift them from the realm of ideas to that of industry. [FN76] Internal circuitry operations were not enough to uphold even those claims requiring computer hardware, for barring the presence of an idiot savant or enormous mechanical computer to perform the claimed conversions rapidly, a digital computer presented the only context in which the equations might have meaning. [FN77] Nevertheless, the Court held that the digital computer amounted only to "nominal hardware" that placed no meaningful limitations upon the scope of the claims. [FN78]

The Court of Customs and Patent Appeals had numerous opportunities to follow the lead of the Supreme Court. In In re Maucorps, the applicant claimed a ""computing system for processing data" that determined the optimum number of sales representatives for a given organization as well as the number of times they should visit customers over a period of time. [FN79] The invention consisted of various formulae *1150 that Maucorps had derived from sales experience and implemented via software written in the Fortran programming language. [FN80] The court affirmed the rejection of the application, reasoning that the "claimed invention as a whole comprise[d] each and every means for carrying out a solution technique for a set of equations wherein one number is computed from a set of numbers." [FN81]

In re Meyer was decided using analagous reasoning. [FN82] Meyer's application described a computer-based expert system for aiding a neurologist in diagnosing patients. [FN83] His claims were drafted broadly, calling for a more generalized "process for

indentifying [sic] locations of probable malfunction in a complex system." [FN84] In essence, Meyer called for test data to be accumulated and for conclusions to be reached in accordance with statistical formulae. [FN85] The court again affirmed the rejection of the application, quoting with approval the Patent Office's conclusion that the "process recited is an attempt to patent a mathematical algorithm rather than a process for producing a product." [FN86]

This early resistance to patents on computer-related inventions faded over time. By the early 1980s, Patent Office examiners found more favor in computer- related inventions and courts seemed more willing to uphold the issued patents. [FN87] Although one might be tempted to see this willingness as a response to the increasingly important role that computer technology played in the United States economy, it is likely that both the Patent Office and the courts grew weary of the relentless argumentation of a bar that had scant motivation to favor restraints upon the scope of patenting. Also influential was the 1980 opinion in Diamond v. Chakrabarty, [FN88] a Supreme Court decision that opened the patent system to biotechnology.

Chakrabarty involved the Patent Office's rejection of an application claiming an artificially generated microorganism. [FN89] The Patent Office Solicitor argued to the Supreme Court that the resolution of the patentability of inventions involving genetic technology should be left to Congress because genetic technology could not have been foreseen *1151 at the time the patent statute was drafted. [FN90] En route to reversing the Patent Office decision, the Court disagreed: "A rule that unanticipated inventions are without protection would conflict with the core concept of the patent law that anticipation undermines patentability." [FN91]

The difficulty with this reasoning is that it mixes two logical classes: individual technologies are mixed with the entire domain of invention. As illustrated by Bertrand Russell in his famous debate with Father Copleston, the fact that every person has a mother does not lead to the conclusion that the human race as a whole must have a mother. [FN92] As well, that the patent statute in part judges patentability through an anticipation standard hardly suggests that we lack other governing principles of patent eligibility.

Despite this lapse in the reasoning in Chakrabarty, the Supreme Court leaned heavily on this decision in its 1981 opinion in Diamond v. Diehr. [FN93] In Diehr, the applicants claimed a process for operating a rubber-molding press with the aid of a digital computer. [FN94] Their computer continuously monitored the temperature inside a press and employed the well-known Arrhenius equation to calculate the amount of time required to cure the rubber. [FN95] When the elapsed time equaled the actual molding time, the computer signaled a device to open the press. [FN96]

At the Patent Office, the examiner determined that the process steps implemented in the computer software were non-statutory in nature. [FN97] The examiner further reasoned that the "remaining steps--installing rubber in the press and the subsequent closing of the press--were 'conventional and necessary to the process and [could not] be the basis of patentability."D¢= EQP:0047¢=" [FN98] On appeal, the Court of Customs and Patent Appeals reversed. [FN99] Following a grant of certiorari, the Supreme Court affirmed. [FN100] Relying upon Chakrabarty, the Court explained that the applicants:

*1152 do not seek to patent a mathematical formula. Instead, they seek patent protection for a process of curing synthetic rubber. Their process admittedly employs a

well-known mathematical equation, but they do not seek to pre-empt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process. [FN101]

A number of difficulties attend the Diehr court's analysis. The advancement offered by the Diehr applicants consisted of mathematical computations. The physical steps on which so much depended--reading a thermometer and signaling a press door to open--were routine. That patentability should be permitted to turn on the inclusion in the claims of such routine steps seems unwarranted, as the Diehr applicants merely stated the only technical context in which the mathematics would operate. The steps did not present meaningful limitations upon the scope of the claims. To the extent that the prohibition against patenting ideas presents sound policy, allowing applicants to avoid these limitations through artful claim drafting appears unwise.

The patent bar nonetheless proved attentive to the lessons of Diehr. Technologists proved increasingly adept at claiming newly formulated mathematical equations alongside some sort of physical manifestation. In response, the Court of Customs and Patent Appeals formed the two-part Freeman- Walter-Abele test. The court originally articulated this test in 1978 in In re Freeman, [FN102] and later refined the test in 1980 in In re Walter. [FN103] Following the Supreme Court's issuance of its Diehr decision, [FN104] the court further modified the standard in 1982 in In re Abele. [FN105] As later described by the Court of Appeals for the Federal Circuit:

> It is first determined whether a mathematical algorithm is recited directly or indirectly in the claim. If so, it is next determined whether the claimed invention as a whole is no more than the algorithm itself; that is, whether the claim is directed to a mathematical algorithm that is not applied to or limited by physical elements or process steps. Such claims are nonstatutory. However, when the mathematical algorithm *1153 is applied in one or more steps of an otherwise statutory process claim, or one or more elements of an otherwise statutory apparatus claim, the requirements of section 101 are met. [FN106]

The Federal Circuit employed the Freeman-Walter-Abele test both to reject [FN107] and allow [FN108] various applications as patentable subject matter. But its decisions demonstrated an increasingly permissive tenor, and a glance through the Patent Office Gazette showed a growing number of issued patents directed towards computer-related inventions.

Emboldened by the growing acquiescence of the courts and the Patent Office, [FN109] applicants eventually abandoned even the pretext of tying the mathematics to a traditionally industrial process such as curing rubber. Rather, the tangible thing upon which patentability was keyed was the combination of a computer and the software-driven electrical signals employed to instruct it. Because general purpose computers could be conceived as special purpose computers once instructed by software, virtually any fragment of software code could be viewed as statutory subject matter. [FN110]

Although this reasoning had been impliedly rejected in Benson, it met with great success in the Federal Circuit's en banc decision in In re Alappat. [FN111] There, the court considered a claimed apparatus useful for generating smooth and continuous lines for display on an oscilloscope. [FN112] Alappat's invention completed various mathematical computations in order to convert so-called "vector list data" into "pixel illumination intensity data"; that is, it converted one set of numbers into another set of numbers. [FN113] The majority held that the claimed invention comprised statutory

subject matter:

*1154 Although many, or arguably even all, of the means elements recited in claim 15 represent circuitry elements that perform mathematical calculations, which is essentially true of all digital electrical circuits, the claimed invention as a whole is directed to a combination of interrelated elements which combine to form a machine for converting discrete waveform data samples into anti-aliased pixel illumination intensity data to be displayed on a display means. This is not a disembodied mathematical concept which may be characterized as an "abstract idea," but rather a specific machine to produce a useful, concrete, and tangible result. [FN114]

The en banc court also quickly distinguished Maucorps and Meyer. [FN115] According to the court in Alappat, "Maucorps dealt with a business methodology for deciding how salesmen should best handle ... customers and Meyer involved a 'system' for aiding a neurologist in diagnosing patients." [FN116] Thus, the Allapat court concluded that "neither of the alleged "inventions' in those cases falls within any § 101 category." [FN117]

Reconciling Alappat with Benson appears difficult. Both inventions concerned data transformations performed by a computer using mathematical calculations. Yet, according to the Federal Circuit, the Benson Court had instead attempted to express the concept that "certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection." [FN118] That the applicant in Benson could have circumvented the Supreme Court's objection simply by naming one practical application for his algorithm seems quite implausible, particularly since the Court took pains to catalogue some of the many uses of that algorithm in its opinion. [FN119]

After Alappat, the long-running saga concerning the patentability of computer-related inventions seemed of little more than historical interest. Seemingly, any applicant who drafted patent claims within the strictures of the vitiated physicality standard could obtain a patent on *1155 nearly any data-processing technique. That the advance was found not in computer circuitry or programming techniques was beside the point; so long as the technique could be performed by a computer and was so characterized, then a patent could issue.

Given that many such techniques are only practically realizable when performed on a computer, this minimal stricture was one many applicants could live with. Yet few failed to realize that the artful claims drafting inspired by Diehr and Alappat amounted to little more than a charade. [FN120] Although a robust physical transformation requirement was itself quite defensible, its hobbled remnant seemed only to encourage contorted claims drafting. [FN121] Some jurists seemed willing to abandon the requirement of physicality in favor of a more expansive vision of patentability, as suggested by Judge Newman's view in a 1994 dissent that:

[A] statutory "process" is limited only in that it must be technologically useful.... All mathematical algorithms transform data, and thus serve as a process to convert initial conditions or inputs into solutions or outputs, through transformation of information.... The test is simply whether the mathematical formula ... is all that is claimed, or whether the procedures involving the specified mathematics are part of a useful process. When the latter requirement is met the subject matter is statutory. [FN122]

Only four years would elapse before a view of statutory subject matter that embraced the "transformation of information" would make its way from the dissent to the majority. The Federal Circuit's decision in State Street Bank & Trust Co. v. Signature Financial Group, Inc. marked the inevitable resolution of the conflict between the venerable case law on business methods and more recent developments on computer-related inventions. [FN123]

*1156 C. Computer-Implemented Business Methods

Signature Financial Group held the patent at suit in State Street. [FN124] Directed to a "Data Processing System for Hub and Spoke Financial Services Configuration," it described a data-processing system for implementing an investment structure known as a "Hub and Spoke" system. [FN125] This system allowed individual mutual funds ("Spokes") to pool their assets in an investment portfolio ("Hub") organized as a partnership. [FN126] According to the patent, this investment regime provided the advantageous combination of economies of scale in administering investments coupled with the tax advantages of a partnership. [FN127]

Maintaining a proper accounting of this sophisticated financial structure proved difficult. The complexity of the calculations made the use of a computer a virtual necessity. [FN128] Signature's patented system purported to allow administrators to monitor financial information *1157 and complete the necessary calculations. [FN129] In addition, it tracked "all the relevant data determined on a daily basis for the Hub and each Spoke, so that aggregate year end income, expenses, and capital gain or loss can be determined for accounting and tax purposes for the Hub and, as a result, for each publicly traded Spoke." [FN130] Crucially, Signature's invention marked no advance in computer technology or mathematical calculations. The basis for patentability was the uniqueness of the investment package Signature claimed in its patent. [FN131]

Following issuance of the patent, Signature entered into licensing negotiations with a competitor, State Street Bank, that ultimately proved unsuccessful. [FN132] State Street then brought a declaratory judgment action against Signature, seeking the invalidity of the patent. [FN133] The district court granted summary judgment in favor of State Street under two alternative grounds. [FN134] First, the court applied the Freeman-Walter-Abele test, [FN135] concluding that:

> At bottom, the invention is an accounting system for a certain type of financial investment vehicle claimed as [a] means for performing a series of mathematical functions. Quite simply, it involves no further physical transformation or reduction than inputting numbers, calculating numbers, outputting numbers, and storing numbers. The same functions could be performed, albeit less efficiently, by an accountant armed with pencil, paper, calculator, and a filing system. [FN136]

The court then buttressed its holding by turning to "the long-established principle that business 'plans' and 'systems' are not patentable." [FN137] The court judged that "patenting an accounting system necessary to carry on a certain type of business is tantamount to a patent on the business itself." [FN138] Thus, because the court found that "abstract ideas are not patentable, either as methods of doing business or as mathematical algorithms," the patent was held to be invalid. [FN139]

*1158 On appeal, the United States Court of Appeals for the Federal Circuit reversed in

a magisterial opinion. [FN140] Writing for a three-judge panel, Judge Rich found the patent claimed not an abstract idea but a programmed machine that produced a "useful, concrete, and tangible result." [FN141] Because the invention achieved a useful result, it constituted patentable subject matter even though its result was expressed numerically. [FN142] According to the court, "[t]he question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to--process, machine, manufacture, or composition of matter--but rather on the essential characteristics of the subject matter, in particular, its practical utility." [FN143] The court further trumpeted that:

> 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"--a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades. [FN144]

The Federal Circuit then turned to the district court's business methods rejection, opting to "take [the] opportunity to lay this ill-conceived exception to rest." [FN145] According to Judge Rich, restrictions upon patents for methods of doing business were ill-conceived from the start and no longer the law under the 1952 Patent Act. [FN146] Following issuance of the State Street opinion, methods of doing business were to be subject only to the same patentability analysis as any other sort of process. [FN147]

State Street is a curious opinion on a number of fronts. First, the court's characterization of the patented invention as generating a "final share price" appears inaccurate. [FN148] Neither the term "final share price" nor its reasonable approximation appears in any of Signature's *1159 claims, which are instead directed towards the processing of data relating to portfolio income, expenses and net gain or loss. [FN149] This interpretation seems especially odd in light of an earlier opinion by Judge Rich, In re Iwahashi, which admonished that the precedents have "held some claims statutory and other claims nonstatutory, depending entirely on what they said." [FN150]

The State Street court also squarely stated that the district court had erred by applying the Freeman-Walter-Abele test. [FN151] According to the court, "[a]fter Diehr and Chakrabarty, the Freeman-Walter-Abele test has little, if any, applicability to determining the presence of statutory subject matter." [FN152] As a matter of chronology, this statement is plainly false: the Supreme Court issued Chakrabarty in 1980 [FN153] and Diehr in 1981. [FN154] The Court of Customs and Patent Appeals authored Abele in 1982. [FN155]

This aberrant reinterpretation of Diehr and Chakrabarty does a disservice to the many Federal Circuit opinions that have applied the Freeman- Walter-Abele test in patent eligibility determinations. [FN156] Moreover, it misreads the Chakrabarty decision. In Chakrabarty, the Court expressly stated that a "claim for an improved method of calculation, even when tied to a specific end use, is unpatentable subject matter under § 101." [FN157] This standard appears to provide ample basis for striking down Signature's claimed ""system," which does nothing more than maintain the accounting books for a particular financial product.

In addition, the State Street court failed to acknowledge fully Maucorps and Meyer, as well as the manner in which those cases had been treated in Alappat. [FN158] Each of

those opinions rejected claims analogous to those of Signature's patent. [FN159] The Federal Circuit declined to follow these decisions, stating only that "closer scrutiny of these cases reveals that the claimed inventions in both Maucorps and Meyer were rejected as abstract ideas under the mathematical algorithm exception, not the *1160 business method exception." [FN160] But this distinction tells us only that the district court's first basis for invalidating Signature's patent should have been affirmed. It also fails to inform us why the statement of the en banc court in Alappat that "a business methodology" does not fulfill the strictures of § 101 is no longer the law. [FN161]

In perhaps the most telling line of the opinion, the State Street court noted that the key inquiry concerning statutory subject matter involves "the essential characteristics of the subject matter, in particular, its practical utility." [FN162] This remark by the court collapses the subject matter inquiry into another patentability requisite, that of utility. The utility standard has always been a minimal one, requiring only that the invention confer a "specific benefit ... in currently available form." [FN163] The difficulty with this approach is that, since the early nineteenth century, the utility standard has been understood to present a distinct, additional hurdle to patentability. [FN164] This dramatic reinterpretation of the statute reduces the statutory categories of patentable subject matter to little more than claim-formatting protocols. [FN165] As a result, section 101 seemingly bars few, if any, applications for patent. After State Street, it is hardly an exaggeration to say that if you can name it, you can claim it. [FN166]

At bottom, the Federal Circuit also said much more than necessary with regard to methods of doing business. The claims of the patent were not directed to methods at all, but to computer hardware programmed to perform certain calculations. [FN167] In fact, the court noted that the patent application as originally filed included method claims. [FN168] But the applicant had abandoned them following examiner concerns over patentable subject matter. [FN169] Given the absence of *1161 method claims in the patent at suit-- not due to happenstance but because of their knowing deletion by the applicant--this portion of the State Street opinion may amount to nothing more than dicta.

Thus, enthusiastic commentators may have read too much into the State Street opinion. [FN170] Still, each issue of the Patent Office Gazette seems to include another patented business method. [FN171] For one example of recent Patent Office work product, consider the following claim:

> A method for remodeling an existing building, said method comprising: cataloging design ideas that utilize predetermined building products; presenting the design ideas to a client; allowing the client to select a design idea ... [and] *1162 preparing a visual image ... representing the building remodeled with the design idea selected by the client. [FN172]

Wholly divorced from particular artifacts, this claim broadly appropriates an architectural services technique. [FN173] Recently issued Patent Office Guidelines further suggest that other business, artificial intelligence and mathematical processing applications are firmly within the grasp of the patent system. [FN174]

Of course, the task of leading the courts on patentability standards falls to the Patent Office. [FN175] In some sense, State Street merely presents the latest in a series of cases confirming Patent Office practice regarding the subject matter appropriate for patenting. But in many ways, State Street presents the most disturbing episode yet. It is one thing for courts to place biotechnologies and computer-related inventions within the patent

system, but quite another to hold that business methods may be patented. One need only recall the techniques of the Hanseatic League [FN176] or the theory of mercantilism [FN177] to realize that such methods are far older than the patent system itself. Yet only recently has it been suggested that this sort of practical knowledge may be appropriated by way of the patent system. [FN178] The remainder of this Article discusses the *1163 appropriate range of patentable subject matter, next exploring the expansive patenting opportunities suggested by State Street.

II. THE EXTENT OF THE TECHNOLOGICAL ARTS

That the dialogue of patent law itself scarcely limits the possibilities of patenting presents a source of concern. If the only remaining restraints upon patentable subject matter are the lenient strictures of novelty or utility, then the pretensions of the patent system have expanded vastly beyond its traditional province of industrial technologies. [FN179] Although the patent system has caught up with current technology, it has done little to refine its sense of its own subject matter other than to say that patents properly canvas the entire waterfront of technique. In the regime of patents, technology has become not merely artificial object or industrial activity, but the entire body of human knowledge unencumbered by further qualification.

Among the more reviled Patent Office grants has been its 1968 patent on a method of swallowing a pill. [FN180] Now we need scant imagination to envision patents on corporate ingestion of poison pills as well. With business and medical techniques [FN181] firmly under wing, and patents on sports methods [FN182] and procedures of psychological analysis [FN183] trickling out of the Patent Office, patents appropriating almost any sort of communicable practice seem easily attainable. Claims to methods within the disciplines of sociology, political science, economics and the law appear to present only the nearest frontier for the regime of patents. Under increasingly permissive Federal Circuit case law, techniques within such far-flung disciplines as language, [FN184] the fine *1164 arts [FN185] and theology [FN186] also now appear to be within the realm of patentability.

We have good reason to doubt whether such innovations lie within the "useful Arts," the constitutional stricture concerning patentable subject matter. [FN187] The sparse materials we possess regarding this term suggest that it is unlikely the Framers saw every created thing as encompassed within it. [FN188] They undoubtedly contemplated the industrial, mechanical and manual arts of the late eighteenth century, in contrast to the seven "liberal arts" and the four "fine arts" of classical learning. [FN189] In addition, the Framers were undoubtedly aware of the English experience leading to the Statute of Monopolies. [FN190] The principal aim of that legislation was to proscribe grants of monopolies except for any letters patent providing the exclusive right "of the sole working or makinge of any manner of New Manufactures within this Realme, to the true and first Inventor." [FN191] In a passage made particularly worthy of consideration given the State Street decision, in 1951, the Court of Customs and Patent Appeals explained that the inclusion of the patent and copyright clause in the Constitution "doubtlessly was due to the fact that those who formulated the Constitution were familiar with the long struggle over monopolies so prominent in English *1165 history, where exclusive rights to engage even in ordinary business activities were granted so frequently by the Crown

...." [FN192]

One can properly question whether the State Street panel respected the policy concerns that animated the Statute of Monopolies. Yet, in fairness to the United States Court of Appeals for the Federal Circuit, articulation of a useful typology between technology and other aspects of human culture has proven exceptionally difficult. Human engagement with the artificial is now so complete that distinguishing things that are technological from those that are not has perplexed not only the courts, but even epistemologists and the most accomplished of technological observers. [FN193]

Economic analysis may offer some suggestions about the propriety of patents within particular areas of endeavor. Following State Street, economists may be able to tell us whether the patent system would benefit or harm particular industrial sectors by influencing such factors as the engagement in unproductive activity, rate of innovation or market concentration. Whether an economic analysis would recommend expansion of the patent system to include the financial services industry is uncertain. In-house use of financial products appears to be extremely difficult to track, for the only observable throughput consists of profits and losses on investor balance sheets. [FN194] The policing of financial services patents would also require costly infringement searches--just the sort of activity a sound patent system should discourage.

Economists might also express concerns over the similarities between the claims of Signature's patent and portions of the Internal Revenue Code. [FN195] The individual who drafted Signature's claims was keenly aware of tax law, for portions of the claim read word-for-word with the pertinent tax statute and regulations. This attempt at private appropriation of the tax laws brings to mind efforts to claim copyright to jump citations. [FN196] The commentators who expressed concerns over this use of the copyright laws would undoubtedly be more deeply *1166 troubled by Signature's use of the more robust patent right. [FN197] If, as the Federal Circuit noted in State Street, the only practical tax code compliance mechanism for sophisticated financial products consists of computerized accounting, [FN198] then economists may well possess the best set of tools for predicting the impact of patents resembling the Signature patent.

The difficulties with such attempted analyses should be apparent. Legal economists simply possess no experience with patents of this sort and appear disinclined to seek out empirical evidence that might sustain their analysis. Lacking any data whatsoever as to the potential effect of the patent system in the fields of finance and other disciplines, economic evaluation of this issue can often be reduced to thought experiments offered in the same vein as traditional legal analyses. Although we should be grateful for whatever insights logical reasoning might provide regarding, for example, the downward- sloping demand curve, so too should we call for data-gathering and refinement when economic analysis is applied to the discipline of intellectual property. [FN199]

This Article instead draws support from comparative legal studies and that body of thinking referred to as the philosophy of technology. Such an approach requires a sympathetic reading of previous attempts to explain the place of technological activities within the whole of human endeavor. Although not the place to develop a comprehensive metaphysics of human undertakings, this Article does attempt to apply this learning to consider whether any technique that achieves pragmatic results should be patentable.

In doing so, this Article follows the tack of many courts by employing the word "technology" synonymously with the constitutional term "useful Art." [FN200] Although

not in common use at the time the Constitution was written, the term "technology" has eclipsed the "useful Arts" *1167 as indicating disciplines concerned with practical, utilitarian activity. Derived from the Greek word "techne," [FN201] the word "technology" did not appear in English documents until the start of the seventeenth century. [FN202] A 1706 dictionary defined "technology" as "a Description of Arts, especially the Mechanical," suggesting the identity of these terms. [FN203] The term ""technology" is not only less cumbersome, it also promotes the application of a diversity of thought about this most dominant aspect of contemporary society.

A. From Applied Science to Rational Action

As the first English work to employ the term "technology" in its title, Jacob Bigelow's 1829 Elements of Technology serves as a good starting point for exploring the meaning of that term. Bigelow defined technology as "the principles, processes, and nomenclatures of the more conspicuous arts, particularly those which involve applications of science." [FN204] Bigelow's view of technology as applied science remains popular today, enlisting such supporters as Joseph Henry, [FN205] Vannevar Bush [FN206] and John Kenneth Galbraith. [FN207] Even the Patent Office has adopted this position, defining technology as "the application of science and engineering to the development of machines and procedures in order to enhance or improve human conditions, or at least to improve human efficiency in some respect." [FN208]

But the simple view of technology as applied science cannot withstand a sustained analysis. Historical technologists constructed artifacts ranging from arches to airplanes without any systematic knowledge of statistics or aerodynamics. [FN209] Contemporary scientific disciplines from astronomy to particle physics further suggest that this definition is skewed, for they rely so heavily upon instrumental technologies that they could fairly be described as applied technologies. [FN210] Additionally, historians have demonstrated that overreliance upon scientific knowledge *1168 has sometimes hindered technological development, as successful product design proceeds more often from "bottom-up" development than "top-down" extension of scientific theories. [FN211]

Last, this position fails to appreciate the extraordinary differences between the tools, attitudes and experimental methods of scientific and engineering practice. [FN212] Granted, some of the theoretical tools used in engineering design are derived from science, but many are not. In particular, the set of idealized artifacts, technical skills and pragmatic considerations indigenous to engineering practice have little place in scientific endeavors. Technology is much more than applied scientific knowledge--it is itself a distinct form of knowledge. [FN213]

Dissatisfied with a science-based definition, individuals have sought other bases for understanding the technological realm. In an era of intensive individual interaction with the artificial, we should not be surprised to find exceptionally broad definitions of what comprises the technological realm. Dictionaries define technology as "bodies of skills, knowledge, and procedures for making, using and doing useful things" [FN214] or "systematic knowledge and action, usually of industrial processes but applicable to any recurrent activity." [FN215] Essayist Daniel Bell tells us that "[t]echnology is the instrumental ordering of human experience within a logic of efficient means." [FN216] Commentator Frederick Ferre would go further, defining technology as the "practical

implementations of intelligence." [FN217] Furthermore, in concluding that individual methods of media communications present their own messages, Marshall McLuhan noted that:

> [I]t makes no difference whether one considers as artifacts ... things of a tangible "hardware" nature such as bowls and clubs or forks and spoons, or tools and devices and engines, railways, spacecraft, radios, computers and so on; or things of a "software" nature such as theories or laws of science, philosophical systems, ... forms or styles in painting or poetry or *1169 drama or music, and so on. All are equally artifacts, all equally human. [FN218]

Paradigmatic of this embracing vision of technology is the discipline of cybernetics. [FN219] Since its emergence from early research in neurophysiology and gradual expansion into information theory and artificial intelligence, cybernetics has considered its subject matter "the domain of all possible machines." [FN220] Disinterested in whether a machine is ""electronic, mechanical, neural, or economic," cybernetics pursues the goal of communication and control of any regular, determinate or reproducible behavior. [FN221] The cybernetic vision of a device as a series of linked information stages expands the possibilities of technological knowledge to dizzying heights. Ultimately, cybernetics offers nothing less than "the framework on which all individual machines may be ordered, related, and understood" [FN222]--a unified theory of material, social and mental phenomenon. [FN223]

The view of patentable subject matter expressed in State Street fairly reflects these developments in our philosophy of technology. [FN224] Judging methods of doing business as within the ambit of the patent system also presents a pretentious view of technological activity, one that has come to reject a scientific backdrop and instead conclude that the term "technology" connotes any form of rational human action. Any technique for achieving efficiency in any sphere of human endeavor appears amenable to patenting, so long as that method is communicable and capable of achieving a useful result.

Yet few of us would suppose that inventions within the domain of business, law or fine arts constitute technology, much less patentable technology. The extreme inclusiveness of the field of cybernetics hardly reflects mainstream notions of technology. Its constructions of technology often amount to little more than provocative slogans that conflate all forms of knowledge and that assume all human endeavors are susceptible to rational manipulation. Other definitions appear to suffer from their conciseness, presenting extreme views of technological *1170 phenomenon. [FN225] Still others are purposive, reflecting an effort to subject technological issues to philosophical inquiry, or, even worse, contemporary society to withering commentary. [FN226]

Surely we can articulate a more refined sense of that set of actions and objects that we might judge as technological in character. [FN227] A reasoned epistemology of human activity that reflects both our sense of the technological order and the traditions of the patent system would allow us to better define those subject matters that can be patented and those that can not. This Article next takes up this effort, turning to several discussions of the ontic dimension of technology.

B. Toward a Refined View of Technology

As a central aspect of modern life, technology has attracted a justifiable amount of concern and commentary. Yet divergence concerning the scope of this phenomenon has often hindered discourse. The fields of engineering, epistemology, sociology, anthropology and phenomenology have lent "technology" meanings that range from artifacts, to knowledge, to sociotechnical systems of manufacture and use. [FN228] Despite the ubiquity of technology, no recognized taxonomy of technological characteristics exists.

Perceptive commentators have attempted to lend congruence and structure to this dialogue by unpacking the term "technology." [FN229] A review of this literature holds promise for the patent system as well. As the principal legal response to technological change, the regime of patents has suffered from its inability to develop a coherent sense of its own subject matter. This Article turns first to Robert McGinn's sustained effort to define the technological realm.

In several publications addressing technology policy, McGinn has consistently identified technology as a manifestation of human culture *1171 that takes its place alongside art, sport, philosophy and other endeavors. [FN230] Technology is not the same as these activities, however, and may be distinguished by several traits. In an early article, What is Technology?, McGinn observed that technological activity is a purposive, methodological enterprise that fabricates or constitutes material outcomes. [FN231] According to McGinn, technology should also be seen as a resource- based and resource-expending endeavor that necessarily utilizes or generates knowledge. He further suggests a rubric of "material product-making or object- transforming activity" to distinguish that which is technological. [FN232]

McGinn and his colleague, N. Bruce Hannay, further developed this analysis by assessing technology in terms of its content and form. Hannay and McGinn judged the content of technology to be "the complex of knowledge, methods, and other resources used in making a particular kind of product or in creating a particular procedural system." [FN233] That technology could be used to manufacture products seems straightforward, but some ambiguity surrounds their sense of a "procedural system." Do they wish to connote discrete production techniques or do they mean to invoke the entire social and physical environment that surrounds the making of a particular kind of product? While proceeding to describe the systems context of modern technologies, Hannay and McGinn suggest the former:

> Many products of modern technology, whether exhibiting interior systematic complexity or not, are intimately intertwined with, if not embedded in, complex sociotechnical support systems on which their manufacture, use, and maintenance depend, for example, telephones and cars. To purchase such items is to gain admission into a web of complex sociotechnical systems. To buy a car is, in a real sense, to buy into a complex road, energy supply, parts distribution, maintenance, registration, insurance, police, and legal systems [sic]. [FN234]

To Hannay and McGinn, then, the fact that technologies are inevitably embedded in cultural contexts does not render all human endeavors into technologies themselves.

*1172 Hannay and McGinn also identified several aspects of the form of technology that contrast it with other human activities. The inputs to technological processes consist of raw or already processed material along with bodies of information. Technology involves knowledge of the properties of its input resources, along with energy,

information, tools and perceptual and neuromuscular skills, to generate material products and procedural systems. The function of technology is the production, management and use of material objects, and the control and enhancement of other forms of human activity. Technology is thus concerned with design, fabrication and transformation. [FN235]

Technology may also be distinguished by its environmental context. As described by Hannay and McGinn:

> [T]echnology differs from other activity-forms in that the natural environment--both in respect to the meteorological and creature-related threats it poses to human survival, and the spatiotemporal obstacles it presents to human desires for communication and transport--is a factor that more powerfully and more directly conditions technology than is the case with other cultural forms, for example, religion and art. [FN236]

Hannay and McGinn summarized their reasoning by characterizing technology "as that form of cultural activity devoted to the production or transformation of material objects, or the creation of procedural systems, in order to expand the realm of practical human possibility." [FN237]

The views of Paul W. DeVore about the nature of technology, developed in his eponymous textbook, complement those of McGinn. [FN238] DeVore, like McGinn, differentiates technological pursuits from other spheres of human activity, noting that:

> The character of thinking involved in creating a philosophical position, a new religion, or an alternate form of government is different from the character of thinking involved in technological activities. Thinking in technology is problem specific and environmentally specific, concerned with efficiency and the relationship of elements in the behavior of a total system. [FN239]

*1173 DeVore distinguishes technological knowledge from other types of knowledge. Whereas non-technological knowledge has as its purpose the creation of ideological and/or social systems, technological knowledge is directed at adapting the physical environment to the needs of its users. [FN240] DeVore also stresses that technology can only be understood within the social milieu in which it is situated. Yet he distinguishes technology from "the associative, ideological and environmental systems of society" and studies the relationship between technology and other disciplines. [FN241]

While contrasting technology and science, DeVore notes that the goal of technology is "to create new and useful products, devices, machines or systems." [FN242] Technological pursuits differ from scientific pursuits in that in the former, design is the key component for resolving problems of materials, energy, information and control. Examples of such technological tools include machines, techniques and technical systems of production, transportation and communication. [FN243]

Carl Mitcham has also recently engaged in a comprehensive discussion of the nature of technology. [FN244] Building on the analysis of McGinn and his predecessors, Mitcham develops a framework for philosophical analysis that explores technology as manifested in objects, knowledge, activity and volition. [FN245] Most useful here is his development of a philosophy of action that embraces technology. In a discussion oriented toward patentable processes, development of the sense of technology as a behavioral engagement holds great potential for refining an ontology of technology. Although the term "technology" etymologically implies knowledge, and is perhaps most routinely conceptualized in physical terms, the meaning of technology is only realized through

doing. For only technological activity allows individuals to effect change in their environment by applying knowledge to create or use physical artifacts. [FN246]

Mitcham identifies such paradigmatic technological activities as "crafting, inventing, designing, manufacturing, working, operating and maintaining." [FN247] To Mitcham, the essence of invention--that all- important term in patent law--is "the concrete transformation of materials, *1174 [which makes] an imagined transformation physically real." [FN248] He contrasts engineering design with artistic creation:

> Art also is concerned with imagining, but its images cannot be quantitatively analyzed--they are not subject to any well-developed calculus. Thus art, in contrast to engineering, appears as both more intuitive and more dependent on the senses. Although artists too are concerned to design [sic] artifacts, they necessarily do so in drawings and models that remain much closer in their reality to the final product. Compare, for instance, a Rembrandt sketch for [sic] a painting with an engineering drawing of a building. Even the Rembrandt sketch is art; the engineering drawing is simply thrown away. [FN249]

Mitcham would also distinguish between technology and technique. He suggests that technology emphasizes the rational manipulation of external artifacts, while technique concerns the training of the human body and mind. [FN250] Thus, we can speak of the technique of hitting a baseball or organizing a political party, but not of its "technology." Although technique contains unrationalized components, technology is concerned with the conscious articulation of rules and principles. To Mitcham, the core of the technological project concerns the "desire to transform the heuristics of technique into [[the] algorithms of practice." [FN251]

Mitcham also cautions against viewing all human behavior as technology. While exploring the possibilities of technological usings, he notes that:

> [H]uman activities that have a self-contained quality about them, such as looking at a painting, reading a book, or playing the violin, seem most incorrectly described simply as use; indeed, to do so is common only when the user has missed the point of the objects concerned, that is, has failed to engage them in the proper manner. If a person [were] described as "using a book" one would be likely to think that he was doing something other than reading it--sitting on it, maybe. [FN252]

*1175 A review of commentators such as McGinn, DeVore and Mitcham illustrates that we can achieve a structured definition of technology. Although embedded in social systems, technology is an endeavor that both intuition and sustained analysis would distinguish from other aspects of human society. In brief, technology may be characterized as knowledge that is applied toward material enterprise, guided by an orientation to the external environment and the necessity of design. In the next Part, this Article attempts to apply these studies to the patent project, moving from a characterological to a definitional strategy.

III. STATUTORY SOLUTIONS TO PATENTABLE SUBJECT MATTER

Contemporary thought demonstrates that we can achieve a refined sense of that set of activities that are properly conceived of as technological. Yet applying this learning to the patent project is by no means straightforward. This Article reviews two possible mechanisms for affirming our sense of the technological in patent law. The first is piecemeal in character. As exemplified by the recent United States experience regarding

patents on methods of medical treatment, we might selectively prohibit patenting or constrain the remedies available to patentees in certain areas of endeavor. Another possibility is the adoption of an essentialist definition that more completely captures our sense of technology. Taking as its touchstone the so-called ""industrial application" standard prevalent in the world's patent statutes, this Article also explores the possibility of incorporating this standard in United States patent law.

A. Patents and the Professions: The Medical Experience

A broad sense of patentable subject matter raises concerns not only about the proper scope of the technology, but also about the range of professionals who might seek protection of the patent system. Because the patent law is bounded by the requirement of non-obviousness, it concerns knowledge that exceeds the state of the art. [FN253] In contemporary society this sort of knowledge is held not just by followers of particular occupations, but by members of many different professions. A broad view of patentable subject matter arguably makes certain shared characteristics of the so-called "liberal professions" (law, medicine, teaching and the ministry) amenable to patenting: the use *1176 of raw materials as an integral part of systematic learning, the practical application of learning and the reliance on communicable techniques. [FN254]

Other professional norms, however, suggest that these traditionally patent- free professions may resist the prospect of extensive appropriation of their techniques. Patents have the potential to constrain professionals in the exercise of autonomous responsibility in their practices. Furthermore, the ability of a profession to serve the public good may also be affected by patenting, which could alter the willingness of professionals to disseminate and put into practice new learning. Most significantly, the tendency of professions to organize suggests that a vocal and established lobby will be on hand to debate the place of patenting within particular professional communities. [FN255]

The patent system has experienced this phenomenon before. For decades, medical practitioners have obtained patents on methods of medical treatment ranging from administering insulin to treating cancer. [FN256] Although traditionally few patentees had attempted to enforce such patents, [FN257] in the early 1990s, Dr. Samuel Pallin alleged that another physician had infringed his patent for a cataract surgery procedure. [FN258] The lawsuit led to a raging debate that questioned the impact of patents on medical ethics, patient care and professional autonomy. Although some urged that such patents offered individuals incentives to invent and disclose new medical methods, others pointed to the possibility that patents might restrict access to life- saving techniques, lead to invasions of patient privacy and override the culture of disclosure and peer review that pervades the medical community. [FN259]

Following the condemnation of patents on methods of medical treatment by the American Medical Association House of Delegates, Congress reacted by amending the Patent Act. As codified in § 287(c), the new statute deprives patentees of remedies against medical practitioners engaged in infringing ""medical activity." [FN260] Although the Patent *1177 Office may still issue patents on medical methods, the inability of such instruments to provide their owner with any relief essentially renders them unenforceable. [FN261] The response of the medical establishment may serve as a good predictor of the reaction of other professions that are newcomers to the patent

system. Already, members of the business community have expressed disbelief at the large number of patented business methods issuing from the Patent Office, particularly those concerning Internet business models. [FN262] Whether business and other professionals will, like physicians, possess the wherewithal to persuade Congress to create particularized patent-free spheres of activity remains to be seen. Few occupations are as well-organized, imbued with a sense of profession and capable of employing the rhetoric of public service as the practice of medicine.

But a more forceful impediment to further amendments of the patent statute is not practical but, rather, legal in character. Among the requirements of the TRIPS Agreement, a component of the recently executed World Trade Organization treaty, is that "patents shall be available and patent rights enjoyable without discrimination as to ... the field of technology." [FN263] That agreement goes on to provide that signatories may exclude from patentability "diagnostic, therapeutic and surgical methods for the treatment of humans or animals." [FN264] Under a strict reading of the TRIPS Agreement, § 287(c) presents a violation of this agreement: signatories may deny such patents altogether but once issued, may not refuse to grant such patent holders the full panapoly of rights and remedies available to other patentees.

Of course, this argument is rather technical. Recalling the maxim non debit cui plus licet, quot minus est non licere--a form of the maxim "the greater includes the lesser"--the holders of medical method patents may not feel particularly aggrieved. [FN265] This is not so, however, for *1178 inventors in other disciplines. The solution reached in § 287(c) will likely remain unique to the medical community. Piecemeal legislation in response to an increasingly receptive patent system is an inadequate solution. We must seek other mechanisms for obtaining sound parameters of patentable subject matter. This Article turns to this task next, seeking a more refined view of technological activity from comparative legal analysis.

B. Industrial Application

A second method of limiting the scope of patent eligibility to the technological would be for Congress to add an essentialist definition into our patent statute. In this regard, we can receive guidance from two of the world's great patent statutes: the European Patent Convention [FN266] and the Japanese Patent Act. [FN267] Each of these laws requires that inventions be susceptible to so-called "industrial application" in order to qualify for or receive patent protection. [FN268] Concise, proven and compatible with the TRIPS Agreement, the industrial applicability requirement provides an apt way to limit the patent system to what we understand to be technological.

The requirement that potential patents have an industrial application has long been part of German patent law. As originally conceived, patentable technologies were limited to those which involved the treatment or processing of raw materials through mechanical or chemical means. [FN269] The requirement has been more recently held to require a "technical rule for the control of natural forces," [FN270] or, stated somewhat differently, "a teaching for systematic activity using controllable natural forces for the attainment of a causally predictable result." [FN271]

*1179 Currently, the European Patent Convention presents the most fulsome articulation of the industrial applicability standard. Article 52 of the European Patent

Convention stipulates that the following shall not be considered patentable inventions: "(a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information." [FN272] Article 57 of the European Patent Convention goes on to provide that "[a]n invention shall be considered as susceptible of industrial application if it can be made or used in any kind of industry, including agriculture." [FN273] In its Examination Guidelines, the European Patent Office describes Article 57 as a reinforcing provision that excludes from patentability few inventions not set forth in Article 52. [FN274]

That Article 52 expressly excludes "programs for computers" may seem implausible to many, especially those familiar with the European Patent Office Gazette. In fact, the European Patent Office has drawn a distinction between computer software per se and its application towards the resolution of technical problems, excluding from patentability only the former class of inventions. [FN275] Thus, such inventions as manufacturing control software, signal processing and CAD/CAM systems have been held patentable. [FN276] The European Patent Office has also granted claims relating to computer functionality, including programs such as memory management, data organization and operating systems. [FN277] Computer-related inventions relating to such matters as processing text [FN278] or learning to play a keyboard instrument, [FN279] however, have been rejected as lacking a technical effect.

The Japanese Patent Office has also issued extensive guidelines on the industrial application requirement. [FN280] That agency views the requirement of industrial application as complementing the Japanese *1180 Patent Act's definition of a statutory invention--that is, the "creation of technical ideas utilizing natural laws." [FN281] Inventions claiming discoveries or natural laws, personal skill, the simple presentation of information, aesthetic creations and matter contrary to natural laws are all considered non-statutory. [FN282]

The Japanese Patent Office Guidelines also identify a number of inventions that fail to fulfill the standard of industrial application. Methods of medical treatment and inventions so unworkable as to be utterly incapable of practical deployment fall within this category. [FN283] In addition, the Japanese Patent Office also denies patentability to inventions that are not susceptible to mass marketing. Among such inventions are those limited to individual use, such as a method of smoking a cigarette. [FN284]

Although the European and Japanese patent systems share the industrial applicability requirement, the possibility that this standard comports with the informed views of technological philosophy does not appear promising at first glance. Patent laws and regulations lack the quality of disciplined reflection apparent in the writings of technological philosophy. Indeed, the pronunciative and succinct nature of these administrative texts contrasts strongly with the sustained and reasoned discussion of other observers in delimiting that which is technological.

But despite the different purposes and perspectives of these authors, the industrial application standard appears very much in keeping with the characterizations of technology offered by contemporary technological thinking. In essence, both regimes recognize their own subject matter by its distinguishing traits: production or transformation of artifacts; interaction with the external environment; systematic manipulation of physical forces; and focus upon design. Technological activities expend

resources and knowledge in order to fabricate or modify products, or to develop procedural systems. Finally, technology presents a form of rational and systematic knowledge, oriented towards efficiency and capable of being assessed through objective criteria. [FN285]

*1181 As in other contexts, to include some things is to exclude others. The touchstone of industrial application would exempt from the patent system matters of social observation or human behavior. Along with techniques from economics, psychology and the social sciences, methods of doing business would also fail to meet the requirement of industrial applicability. Business methods may be amenable to reasoned analysis and intended to make business practices more efficient, but they are not transformative in character. They do not manipulate physical forces to achieve the production or transformation of material objects. Business methods engage economic principles rather than the laws of physics, chemistry or biology. They do not comprise technology and should not be within the grasp of the patent system.

The industrial application standard would also remove matters of aesthetics or personal skill from the patent system. Culturally and historically, we would not include endeavors in such fields as athletics, dance or surgery as technological, and neither should our patent system. To view these things as technology, as Mitcham suggests, is awkward and inappropriate. [FN286] The skills and techniques involved in swinging baseball bats, performing dance steps or dressing wounds call for the manipulation of external objects; these aspects of human society are principally acquired through personal experience. They do not involve the creation or transformation of material objects and are not repeatable in an industrial sense. We also lack objective mechanisms necessary for evaluating this subject matter in terms of the requisites of patentability.

The bearing of the industrial application standard towards claims drafted in artifact format appears more complex. The State Street opinion provides a fine example of this difficulty, for the claims at issue there were drafted not in method format, but in terms of a "data processing system" consisting of hardware elements. [FN287] This orientation towards artifacts proved to be particularly deft claim drafting, for the Federal Circuit depended heavily on this characterization and repeatedly spoke of Signature's invention as a ""machine" within the grasp of the patent statute. [FN288] A machine, unlike a pure process claim directed towards a business method, would at first blush appear susceptible to industrial application. Yet if our sense of patent eligibility becomes wholly subject to artful claim drafting, we have little hope of confining the patent system to the technological. [FN289]

*1182 Although the patent law of the United Kingdom reflects the European Patent Convention's requirement of industrial application, the decision of the United Kingdom Patent Courts in Merrill Lynch presents a sensible resolution. [FN290] In that case, the application at issue, directed toward an automatic securities trading system, was analogous to the patent application in State Street. Merrill Lynch's application described a computerized system that allowed customers to buy and sell stocks. The patent claims were set forth in functional terms, reciting a data processing system for enabling a securities trading market. [FN291]

Following a rejection of the application by the examiner, Merrill Lynch requested a hearing at the United Kingdom Patent Office. The principal examiner affirmed the rejection in reasoning that appears fully applicable to the facts in State Street:

If the task performed is non-technical, for example a mathematical calculation or a business method, then the mere fact that it is being performed by a suitable machine, whether or not this involves a program, does not of itself provide a technical feature. I consider this to be a logical extension of the generally accepted view that there is no invention in merely stating that a known manual function is performed automatically even if this is expressed in terms of "means" for performing the essential parts of the function.

I consider that the "means" specified ... relate to features which either would be present in a conventional business computer system or define essential features required for the performance of the business method. Consequently this claim contains nothing which could be considered to constitute a new technical structure or to produce a technical effect .... I conclude therefore that this claim does not constitute a patentable invention. [FN292]

The United Kingdom Patent Court affirmed the ruling on appeal. [FN293] Applying Article 52 of the European Patent Convention, the court noted the argument of counsel that:

whether a patent could be obtained for a computer program, itself novel and not obvious, would be a matter of drafting, *1183 depending on the form of claim drafted. If claimed as a computer program it would not be patentable as excluded under [Article 52]; but a computer programmed to carry out that program would be patentable even though a conventional computer operating in a conventional manner when carrying out the various steps of the program. That seems to me to be a result that cannot have been intended by Parliament. [FN294]

Similar analysis should apply to "system" claims drafted to convey the sense of a hardware embodiment. If we mean to exclude methods of doing business from the regime of patents, then we should also reject claims reciting computerized methods where the only patentable teaching lies in the realm of business rather than technology. To do otherwise is to exalt form over substance, an argument that has been made extensively elsewhere. [FN295]

The United States Patent Office recently issued Software Guidelines that appear to urge similar results. The Guidelines recognize that because "[t]here is always some form of physical transformation within a computer because a computer acts on signals and transforms them during its operation and changes the state of its components during the execution of a process," such activity alone is not determinative. [FN296] The Guidelines instead provide that the "utility of an invention must be within the 'technological' arts" for it to be patentable, pointing to the familiar requirements of physical transformation and practical application. [FN297] Based on this and other text within the Guidelines, at least one commentator concluded that the Guidelines would render most computer-implemented business methods unpatentable. [FN298]

The Patent Office Deputy Commissioner, however, took a different position and found the Federal Circuit's State Street opinion to have "ratified the validity of the approach taken" in the Guidelines. [FN299] Given the "Delphic" character of the Guidelines [FN300] and their inability to dictate *1184 examiner decisions, [FN301] overreliance on the Guidelines seems inappropriate. The fact remains that the Patent Office has experienced a "boom" in applications claiming business methods and, following State Street, appears obliged to allow them to mature into allowed patents. [FN302]

A legislative approach appears the best possibility for reminding the patent system that not everything we do is technological. Congress would do well to import the requirement of industrial applicability into United States patent law. This touchstone not only parallels much of the teachings of contemporary thought concerning technology, it would provide a proven criterion that already affects the majority of the world's issued patents. Not only does the TRIPS Agreement expressly allow signatories to impose this requirement, [FN303] its adoption would move the United States further in the direction of global patent harmonization. [FN304]

Of course, no claim can be made that industrial application would offer a panacea for our patent eligibility ills. The European Patent Office has arguably drifted from the reasoning of Merrill Lynch in a handful of recent opinions involving computer-implemented methods. [FN305] Similarly, the Japanese Patent Office seems favorably disposed towards the patenting of known computer hardware that does no more than process data in a novel way. [FN306] But adoption of the industrial application standard here would render the current patentability debate *1185 a far more sober one. Rather than remain paralyzed by the complex issues surrounding the patentability of computer-related inventions, we should recognize that a broader movement is afoot. The stewards of our patent system ought to consider informed responses to our increasingly ambitious scope of patenting, rather than rely upon the patent bar to stage an informed debate on the appropriate vision of patentable subject matter.

CONCLUSION

Each issue of the Patent Office Gazette seems to include proprietary processes from an unlikely collection of disciplines. Although we once might have relegated these claims to some popular compilation of unusual patents, [FN307] the Federal Circuit opinion in State Street has imbued them with newfound vitality. With the Patent Office open for patents on business methods, the frontiers of the patent system appear virtually without limit. The patent system now seems poised to impact callings ranging from the arts, to the social sciences, to the law itself.

There is much to commend the adoption of the standard of industrial application in the United States patent law. Our patent law should comport with our perception of what technology is, not defy it. Restoring a patentability standard firmly grounded in industrial applicability, rather than equating technology with anything artificial, would enable us to maintain the integrity of our current patent system. Moreover, it would enable us to respect the boundary between the whole expression of our humanity and that small part of it that is properly called technological. [FN308] However central to contemporary life and worthy of nurturing through the patent system, technology is but one manifestation of the human experience.

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[FN1]. The United States Patent and Trademark Office is the proper designation for this office. See 35 U.S.C. § 1 (1994).

[FN2]. See U.S. PATENT AND TRADEMARK OFFICE, EXAMINER HANDBOOK TO THE U.S. PATENT CLASSIFICATION SYSTEM (1998), available at <<http://www.uspto.gov/web/offices/pac/dapp/sir/co/examhbk/index.html>> ("The U.S. Patent Classification system provides for the storage and retrieval of every patent document that a patent examiner needs to review when examining patent applications. Therefore, in the aggregate, the system must be exhaustive of all patentable subject matter under patent laws.").

[FN3]. "Method of putting," U.S. Patent No. 5,616,089.

[FN4]. "Drugs and methods for treating diseases," U.S. Patent No. 5,456,663.

[FN5]. "System and method for implementing and administering a mortgage plan," U.S. Patent No. 4,876,648.

[FN6]. 149 F.3d 1368 (Fed. Cir. 1998), cert. denied, 119 S. Ct. 851 (1999).

[FN7]. The United States Court of Appeals for the Federal Circuit, created by the Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, § 101, 96 Stat. 25 (1982) (codified in various sections of 28 U.S.C.), possesses exclusive jurisdiction over appeals in patent acquisition and infringement cases.

[FN8]. See 149 F.3d at 1370.

[FN9]. See id. at 1375.

[FN10]. See Jonathan Bick, Adapting Process Patents to Cyberspace, N.Y. L.J., Nov. 19, 1998, at 1; Carol B. Oberdorfer, Patents: 'Boom' in Business Method Patent Filings Has Followed 'State Street' Ruling, PTO Says, Trademark & Copyright Daily (BNA), No. 57, at 115 (Dec. 10, 1998) (reporting PTO Deputy Commissioner Dickinson's prediction that the office will issue approximately 300 business method patents in 1999) [hereinafter 'Boom' in Business Method Filings]; Mark Walsh, Internet Companies Seek Protection: Apply For Patents to Guard Technology, But Litigation May Slow Commerce, CRAIN'S N.Y. BUS., Dec. 21, 1998, at 3.

[FN11]. See U.S. Const. art. I, § 8, cl. 8. This provision provides both for copyright legislation to promote the development of "Science" by "Authors," as well as for patent legislation to promote the development of the "useful Arts" by "Inventors." See In re

Bergy, 596 F.2d 952, 958 (C.C.P.A. 1979), aff'd sub nom. Diamond v. Chakrabarty, 447 U.S. 303 (1980) ("the constitutionally-stated purpose of granting patent rights to inventors for their discoveries is the promotion of progress in the 'useful Arts,' rather than in science.").

[FN12]. See Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) ("The exclusive right, constitutionally derived, was for the national purpose of advancing the useful arts--the process today called technological innovation."); In re Waldbaum, 457 F.2d 997, 1003 (C.C.P.A. 1972) (Rich, J., concurring) ("The phrase 'technological arts,' as we have used it, is synonymous with the phrase 'useful arts' as it appears in Article I, Section 8 of the Constitution."); see generally In re Musgrave, 431 F.2d 882 (C.C.P.A. 1970).

[FN13]. See 35 U.S.C. § 101 (1994) (section entitled "Inventions patentable").

[FN14]. See id. § 100(b).

[FN15]. See Pamela Samuelson, Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions, 39 EMORY L.J. 1025, 1033-34 (1990) (urging that the extent of patentable subject matter should not be understood to overlap with the ordinary, and exceptionally broad, meaning of the term "process").

[FN16]. The patentee of an invention has the exclusive right to make, use, sell, offer to sell or import into the United States the patented invention. See 35 U.S.C. § 271(a) (1994).

[FN17]. See MARTIN J. ADELMAN ET AL., PATENT LAW 860-61 (1998).

[FN18]. See Rebecca S. Eisenberg, Patents and the Progress of Science: Exclusive Rights and Experimental Use, 56 U. CHI. L. REV. 1017, 1023 (1989); Rebecca S. Eisenberg, Proprietary Rights and the Norms of Science in Biotechnology Research, 97 YALE L.J. 177, 222 (1987).

[FN19]. See generally Note, Is the Patent Misuse Doctrine Obsolete?, 110 HARV. L. REV. 1922 (1997); Mark A. Lemley, Comment, The Economic Irrationality of the Patent Misuse Doctrine, 78 CAL. L. REV. 1599 (1990).

[FN20]. See generally Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, LEGAL INSTRUMENTS--RESULTS OF THE URUGUAY ROUND vol. 31; 33 I.L.M. 81 (1994) [hereinafter TRIPS Agreement].

[FN21]. See TRIPS Agreement § 5, art. 27(1).

[FN22]. See 21 Jam. I, ch. 3 (1624); see generally Chris R. Kyle, But a New Button to an Old Coat: The Enactment of the Statute of Monopolies, 19 J. LEGAL HIST. 203 (1998).

[FN23]. The Statute prohibited the Crown from granting monopolies except "to the true and first Inventor and Inventors" of "any manner of new Manufacture within this Realme ...." 21 Jam. I, ch. 3, § 6.

[FN24]. See Crane v. Price, 134 Eng. Rep. 239, 248 (1842) (per curiam).

[FN25]. Maeder v. Busch, (1938) 59 C.L.R. 684, 696.

[FN26]. National Research Dev. Corp. v. Commissioner of Patents (1959) 102 C.L.R. 252, 277.

[FN27]. Boulton v. Bull, 126 Eng. Rep. 651, 661 (1795).

[FN28]. See U.S. Const. art. I, § 8, cl. 8 (authorizing Congress "[t]o 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.").

[FN29]. 35 U.S.C. § 101 (1994).

[FN30]. Id. § 100(b).

[FN31]. Expanded Metal Co. v. Bradford, 214 U.S. 366, 383 (1909).

[FN32]. Cochrane v. Deener, 94 U.S. 780, 787-88 (1877).

[FN33]. Corning v. Burden, 56 U.S. (15 How.) 252, 268 (1853).

[FN34]. See Donald S. Chisum, The Future of Software Protection: The Patentability of Algorithms, 47 U. PITT. L. REV. 959, 963 (1986) (noting the problems encountered in interpreting the meaning of "process"). Earlier treatments can be found in Herman Berman, Method Claims, 17 J. PAT. OFF. SOC'Y 713, 719 (1935); see generally William B. Whitney, Patentable Processes, 19 HARV. L. REV. 30 (1905).

[FN35]. See, e.g., Metallizing Eng'g Co. v. Kenyon Bearing & Auto Parts, 153 F.2d 516 (2d Cir. 1946).

[FN36]. See Process Patents Amendment Act of 1988, Pub. L. No. 100-418, §§ 9001-9007, 102 Stat. 1107 (codified in various sections of 35 U.S.C.). See generally Eli Lilly & Co. v. American Cyanamid Co., 82 F.3d 1568 (Fed. Cir. 1996); W. Bradley Haymond, The Process Patent Amendments Act of 1988: Solving An Old Problem, But Creating New Ones, 1989 BYU L. REV. 567; Glenn E.J. Murphy, Note, The Process Patent Amendments Act of 1988, 9 J.L. & COM. 267 (1989).

[FN37]. See, e.g., American Med. Sys., Inc. v. Medical Eng'g Corp., 6 F.3d 1523 (Fed. Cir. 1993).

[FN38]. See Samuelson, supra note 15, at 1033.

[FN39]. Diamond v. Diehr, 450 U.S. 175, 182 (1981) (quoting S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952)). But see DONALD S. CHISUM, PATENTS: A TREATISE ON THE LAW OF PATENTABILITY, VALIDITY AND INFRINGEMENT § 1.01, at 1-6 (1999) ("Theoretical or abstract discoveries are excluded as are discoveries, however practical and useful, in non-technological arts, such as the liberal arts, the social sciences, theoretical mathematics, and business and management methodology."); Giles S. Rich, Principles of Patentability, 28 GEO. WASH. L. REV. 393, 393- 94 (1960) ("Of course, not every kind of an invention can be patented. Invaluable though it may be to individuals, the public, and national defense, the invention of a more effective organization of the materials in, and the techniques of teaching a course in physics, chemistry, or Russian is not a patentable invention .... Also outside that group is one of the greatest inventions of our times, the diaper service.")

[FN40]. See generally Geo. E. Tew, Method of Doing Business, 16 J. PAT. OFF. SOC'Y 607 (1934); E. Robert Yoches & Howard G. Pollack, Is the "Method of Doing Business" Rejection Bankrupt?, 3 FED. CIR. B.J. 73 (1993).

[FN41]. See Chisum, supra note 34, at 964-71.

[FN42]. Rubber-Tip Pencil Co. v. Howard, 87 U.S. (20 Wall.) 498, 507 (1874).

[FN43]. Mackay Radio & Tel. Co. v. Radio Corp. of Am., 306 U.S. 86, 94 (1939).

[FN44]. Gottschalk v. Benson, 409 U.S. 63, 67 (1972).

[FN45]. See 17 U.S.C. § 102(b) (1994).

[FN46]. Ex parte Abraham, 1869 Dec. Comm'r Pat. 59, 59.

[FN47]. United States Credit Sys. Co. v. American Credit Indem. Co., 53 F. 818, 819 (S.D.N.Y. 1893).

[FN48]. In re Moeser, 27 App. D.C. 307, 310 (1906).

[FN49]. 160 F. 467 (2d Cir. 1908).

[FN50]. See State Street Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368, 1376 (Fed. Cir. 1998), cert. denied, 119 S. Ct. 851 (1999) (noting that Hotel Security Checking is "the case frequently cited as establishing the business method exception to statutory subject matter"); Rinaldo Del Gallo, III, Are "Methods of Doing Business" Finally Out of Business as a Statutory Rejection?, 38 IDEA 403, 405 (1998).

[FN51]. See 160 F. at 467.

[FN52]. See id. at 467-68.

[FN53]. See id. at 471.

[FN54]. Id. at 469.

[FN55]. 1894 Dec. Comm'r Pat. 36, 38.

[FN56]. See Rand, McNally & Co. v. Exchange Scrip-Book Co., 187 F. 984, 986 (7th Cir. 1911).

[FN57]. See, e.g., Turner, 1894 Dec. Comm'r Pat. 36, 38.

[FN58]. See In re Bernhart, 417 F.2d 1395, 1398 (C.C.P.A. 1969); In re Jones, 373 F.2d 1007, 1012 (C.C.P.A. 1967); see generally Morton C. Jacobs, Note, The Patentability of Printed Matter: Critique and Proposal, 18 GEO. WASH. L. REV. 475 (1950).

[FN59]. See generally In re Bolongaro, 62 F.2d 1059 (C.C.P.A. 1933).

[FN60]. See generally In re Sterling, 70 F.2d 910 (C.C.P.A. 1934).

[FN61]. See generally In re Patton, 127 F.2d 324 (C.C.P.A. 1942).

[FN62]. Cincinnati Traction Co. v. Pope, 210 F. 443, 446 (6th Cir. 1913).

[FN63]. See 17 U.S.C. §§ 101, 102(a) (1994). See also Wendy J. Gordon, An Inquiry into the Merits of Copyright: The Challenges of Consistency, Consent, and Encouragement Theory, 41 STAN. L. REV. 1343, 1380-82 (1989).

[FN64]. The bookshelves groan under the weight of numerous articles discussing the early interaction between computer technologies and the patent system, as well as the subsequent debate over the patenting of computer-related inventions. For more recent publications on this topic, see Stephen G. Kunin, Patentability of Computer Related Inventions in the United States Patent and Trademark Office, 77 J. PAT. & TRADEMARK OFF. SOC'Y 833 (1995); Pamela Samuelson et al., A Manifesto Concerning the Legal Protection of Computer Programs, 94 COLUM. L. REV. 2308 (1994); Brian Richard Yoshida, Claiming Electronic and Software Technologies: The Effect of the Federal Circuit Decisions in Alappat, Warmerdam, and Lowry on the Claiming of Mathematical Algorithms and Data Structures, 45 BUFF. L. REV. 457 (1997); Maximilian R. Peterson, Note, 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).

[FN65]. 409 U.S. 63 (1972).

[FN66]. See id. at 65.

[FN67]. See id. at 65-67.

[FN68]. See id. at 65.

[FN69]. See id. at 68.

[FN70]. Benson, 409 U.S. at 68.

[FN71]. See id. at 73.

[FN72]. Id. at 70.

[FN73]. See id. at 65.

[FN74]. See id.

[FN75]. Benson, 409 U.S. at 71-72.

[FN76]. See id.

[FN77]. See id.

[FN78]. See Richard H. Stern, Tales from the Algorithm War: Benson to Iwahashi, It's Deja Vu All Over Again, 18 AM. INTELL. PROP. L. ASS'N Q.J. 371, 382 (1991).

[FN79]. See 609 F.2d 481, 482 (C.C.P.A. 1979).

[FN80]. See id. at 482-83.

[FN81]. Id. at 486.

[FN82]. See 688 F.2d 789, 794 (C.C.P.A. 1982).

[FN83]. See id. at 790-92.

[FN84]. See id. at 793.

[FN85]. See id. at 791-92.

[FN86]. See id. at 794.

[FN87]. See, e.g., In re Deutsch, 553 F.2d 689, 693 (C.C.P.A. 1977); In re Chatfield, 545

F.2d 152, 159 (C.C.P.A. 1976).

[FN88]. 447 U.S. 303 (1980).

[FN89]. See id. at 305-06.

[FN90]. See id. at 314-15.

[FN91]. Id. at 316.

[FN92]. See Bertrand Russell & F.C. Copleston, A Debate on the Existence of God, in BERTRAND RUSSELL ON GOD AND RELIGION 123, 131 (Al Seckel ed., 1986).

[FN93]. 450 U.S. 175 (1981).

[FN94]. See id. at 177.

[FN95]. See id. at 178-79.

[FN96]. See id. at 177-78.

[FN97]. See id. at 179-80.

[FN98]. Diehr, 450 U.S. at 180-81.

[FN99]. See In re Diehr, 602 F.2d 982 (1979).

[FN100]. Diehr, 450 U.S. at 177, 192-93.

[FN101]. Id. at 187.

[FN102]. See 573 F.2d 1237 (C.C.P.A. 1978).

[FN103]. See 618 F.2d 758 (C.C.P.A. 1980).

[FN104]. See supra notes 93-101 and accompanying text.

[FN105]. See 684 F.2d 902 (C.C.P.A. 1982).

[FN106]. Arrhythmia Research Tech., Inc. v. Corazonix Corp., 958 F.2d 1053, 1058 (Fed. Cir. 1992).

[FN107]. See In re Grams, 888 F.2d 835, 840 (Fed. Cir. 1989).

[FN108]. See In re Iwahashi, 888 F.2d 1370, 1374-75 (Fed. Cir. 1989).

[FN109]. See generally Arrhythmia, 958 F.2d 1053; Iwahashi, 888 F.2d 1370. But see generally Grams, 888 F.2d 835.

[FN110]. This argument had met with success in In re Bernhart, 417 F.2d 1395, 1400 (C.C.P.A. 1969). See also In re Prater, 415 F.2d 1393, 1404 n.29 (C.C.P.A. 1969).

[FN111]. 33 F.3d 1526 (Fed. Cir. 1994) (en banc). See generally Sang Hui Michael Kim, In re Alappat: A Strict Statutory Interpretation Determining Patentable Subject Matter Relating to Computer Software?, 13 J. MARSHALL J. COMPUTER & INFO. L. 635 (1995); W. Wayt King, Jr., The Soul of the Virtual Machine: In re Alappat, 2 J. INTELL. PROP. L. 575 (1995); John A. Burtis, Comment, Towards a Rational Jurisprudence of Computer-Related Patentability in Light of In re Alappat, 79 MINN. L. REV. 1129 (1995).

[FN112]. See Alappat, 33 F.3d at 1537.

[FN113]. Id. at 1537-39.

[FN114]. Id. at 1544.

[FN115]. See id. at 1541. See also Maucorps, 609 F.2d at 481; Meyer, 688 F.2d at 789; supra notes 79-86 and accompanying text.

[FN116]. Alappat, 33 F.3d at 1541.

[FN117]. Id.

[FN118]. Id. at 1543.

[FN119]. See supra notes 70 and accompanying text.

[FN120]. See Alappat, 33 F.3d at 1564 (Archer, C.J., dissenting).

[FN121]. See generally John R. Thomas, Of Text, Technique, and the Tangible: Drafting Patent Claims Around Patent Rules, 17 J. MARSHALL J. COMPUTER & INFO. L. 219 (1998).

[FN122]. In re Schrader, 22 F.3d 290, 297 (Fed. Cir. 1994) (Newman, J., dissenting).

[FN123]. See 149 F.3d 1368 (Fed. Cir. 1998), cert. denied, 119 S. Ct. 851 (1999). Also of note was the district court opinion in Paine, Webber, Jackson & Curtis, Inc. v. Merrill Lynch, Pierce, Fenner & Smith, Inc., 564 F. Supp. 1358, 1364, 1369 (D. Del. 1983) (holding that Merrill Lynch's claimed "system for processing and supervising a plurality of composite subscriber [[investment] accounts" comprised "statutory subject matter because the claims allegedly teach a method of operation on a computer to effectuate a business activity."). Paine, Webber is discussed in Samuelson, supra note 15, at 1120-21.

[FN124]. See 149 F.3d at 1370. See also "Data processing system for hub and spoke financial services configuration," U.S. Patent No. 5,193,056. The first claim of the '056 patent provided:

1. A data processing system for managing a financial services configuration of a portfolio established as a partnership, each partner being one of a plurality of funds, comprising: (a) computer processor means for processing data; (b) storage means for storing data on a storage medium; (c) first means for initializing the storage medium; (d) second means for processing data regarding assets in the portfolio and each of the funds from a previous day and data regarding increases or decreases in each of the funds, [sic] assets and for allocating the percentage share that each fund holds in the portfolio; (e) third means for processing data regarding daily incremental income, expenses, and net realized gain or loss for the portfolio and for allocating such data among each fund; (f) fourth means for processing data regarding daily net unrealized gain or loss for the portfolio and for allocating such data among each fund; and (g) fifth means for processing data regarding aggregate year-end income, expenses, and capital gain or loss for the portfolio and each of the funds.

Interestingly, Signature's claim fails to recite how the various means elements interact with each other, either functionally or structurally. See ADELMAN ET AL., supra note 17, at 645 (noting this familiar requirement of claims drafting). The claim appears to recite a mere aggregation not in conformity with the second paragraph of 35 U.S.C. § 112 (1994). See In re Worrest, 201 F.2d 930, 934 (C.C.P.A. 1953) (defining an unpatentable aggregation as "a device having two or more unrelated, independent units or elements, each of which performs its function separately, uninfluenced by and indifferent to the action of the other units. There is no essential or inherent correlation, or cooperation, or coordination of elements which mutually contribute to a common purpose or result, other than mere convenience due to juxtaposition or collection of the units in a common setting.").

[FN125]. See State Street, 149 F.3d at 1370.

[FN126]. See id.

[FN127]. See id.

[FN128]. See id. at 1371.

[FN129]. See id.

[FN130]. State Street, 149 F.3d at 1371.

[FN131]. See U.S. Patent No. 5,193,056.

[FN132]. See 149 F.3d at 1370.

[FN133]. See State Street Bank & Trust Co. v. Signature Fin. Group, Inc., 927 F. Supp.

502, 504 (D. Mass. 1996).

[FN134]. See id. at 512-16.

[FN135]. See id. at 512-15.

[FN136]. Id. at 515.

[FN137]. Id.

[FN138]. State Street, 927 F. Supp. at 516.

[FN139]. Id.

[FN140]. See State Street, 149 F.3d at 1377.

[FN141]. Id. at 1373 (quoting Alappat, 33 F.3d at 1544).

[FN142]. See id. at 1375.

[FN143]. Id.

[FN144]. Id. at 1373.

[FN145]. See State Street, 149 F.3d at 1375.

[FN146]. See id.

[FN147]. Id.

[FN148]. See id.

[FN149]. See supra note 124.

[FN150]. 888 F.2d 1370, 1374 (Fed. Cir. 1989). For more on Iwahashi, see Thomas, supra note 121, at 258-59.

[FN151]. See 149 F.3d at 1373.

[FN152]. Id. at 1374.

[FN153]. 447 U.S. 303 (1980).

[FN154]. 450 U.S. 175 (1981).

[FN155]. 684 F.2d 902 (C.C.P.A. 1982).

[FN156]. See, e.g., Arrhythmia Research Tech., Inc. v. Corazonix Corp., 958 F.2d 1053, 1058 (Fed. Cir. 1992); In re Grams, 888 F.2d 835, 839-40 (Fed. Cir. 1989).

[FN157]. 447 U.S. 303, 315 (1980) (quoting Parker v. Flook, 437 U.S. 584, 595 n.18 (1978)).

[FN158]. See State Street, 149 F.3d at 1374-75; supra notes 79-86, 115-17 and accompanying text.

[FN159]. See supra notes 79-86 and accompanying text.

[FN160]. State Street, 149 F.3d at 1376.

[FN161]. See Alappat, 33 F.3d at 1541; supra note 118 and accompanying text.

[FN162]. State Street, 149 F.3d at 1375.

[FN163]. Brenner v. Manson, 383 U.S. 519, 534 (1966). See also In re Brana, 51 F.3d 1560, 1568 (Fed. Cir. 1995); see generally Michelle L. Johnson, Comment, In re Brana and the Utility Examination Guidelines: A Light at the End of the Tunnel?, 49 RUTGERS L. REV. 285 (1996); Andrew T. Kight, Note, Pregnant with Ambiguity: Credibility and the PTO Utility Guidelines in Light of Brenner, 73 IND. L.J. 997 (1997).

[FN164]. See Bedford v. Hunt, 3 F. Cas. 37, 37 (C.C.D. Mass. 1817) (No. 1,217); Lowell v. Lewis, 15 F. Cas. 1018, 1019 (C.C.D. Mass. 1817) (No. 8,568).

[FN165]. See supra note 38 and accompanying text.

[FN166]. See Robert P. Merges, Commercial Success and Patent Standards: Economic Perspectives on Innovation, 76 CAL. L. REV. 805, 811-12 (1988) (noting that the utility requirement has "devolved over the years into a rather minimal obstacle to obtaining a patent.").

[FN167]. State Street, 149 F.3d at 1371-72.

[FN168]. See id. at 1371.

[FN169]. See id.

[FN170]. See, e.g., Leigh Buchanan, Can You Actually Patent a Business Model? A Recent Decision from the Patent and Trademark Office Says You Can. And That Isn't Good News for Entrepreneurs, INC., Nov. 1, 1998, at 83; It Was My Idea, THE ECONOMIST, Aug. 15, 1998, at 54 (interpreting State Street to hold that "business models are generally patentable if they are unique--just like any other invention that is 'new and useful"D¢=EQP:0184¢='); Edith Updike, What's Next--A Patent For The

401(k)?, BUS. WK., Oct. 26, 1998, at 104.

The more recent opinion in AT&T Corp. v. Excel Communications, Inc. suggests that the Federal Circuit has taken an expansive reading of State Street. See 172 F.3d 1352 (Fed. Cir. 1999). That appeal arose from an infringement suit in the United States District Court for the District of Delaware. See id. at 1353. District Court Judge Robinson had described the patent-in-suit as "claiming an invention whereby certain information that is already known within a telecommunications system (the [long-distance service carriers] of the originating and terminating subscribers) is simply retrieved for an allegedly new use in billing." AT&T Corp. v. Excel Communications, Inc. 1998 U.S. Dist. LEXIS 5346 at *20 (Mar. 27, 1998). Without the benefit of the Federal Circuit's State Street opinion, the district court held that "a change in the data's format should not serve to convert non-patentable subject matter into patentable subject matter." See id. at *22. The Federal Circuit reversed on appeal, concluding that the claimed invention "[fell] comfortably within the broad scope of patentable subject matter under s. 101." AT&T, 172 F.3d at 1361. The court described the State Street formulation of patent eligibility as holding "that a mathematical algorithm may be an integral part of patentable subject matter such as a machine or process if the claimed invention as a whole is applied in a 'useful' manner." Id. at 1357.

The AT&T opinion confirms that the test of patentability has been reduced to the inquiry into whether an invention produces a "tangible, useful, result." See id. at 1361.

[FN171]. See supra note 10. An extremely interesting question is whether the patent involved in the seminal opinion Markman v. Westview Instruments could itself be classified as a business method patent. 772 F. Supp. 1535 (E.D. Pa. 1991), aff'd 52 F.3d 967 (Fed. Cir. 1995), aff'd 517 U.S. 370 (1996). The Markman patent claimed an "inventory control and reporting system" for monitoring and reporting the status, location and movement of "inventory" in a dry-cleaning establishment. See Markman, 52 F.3d at 972. At trial, Markman asserted that the claim term "inventory" encompassed customer invoices and transaction totals which read on an accused device that tracked invoices, but not the location of laundry as it moved through the dry-cleaning process. See Markman, 772 F. Supp. at 1536-37. The district court disagreed, holding that the claim term "inventory" was restricted to "articles of clothing." See id. at 1537. Both the en banc Federal Circuit and Supreme Court upheld the latter interpretation. See Markman, 52 F.3d 967, aff'd, 517 U.S. 370. Had Markman prevailed, one wonders whether his claimed system of tracking money and claim slips should have been subject to scrutiny under § 101.

[FN172]. "Method for designing and illustrating architectural enhancements to existing buildings," U.S. Patent No. 5,668,736.

[FN173]. See id.

[FN174]. See UNITED STATES PATENT AND TRADEMARK OFFICE, EXAMINATION GUIDELINES FOR COMPUTER RELATED INVENTIONS, TRAINING MATERIALS DIRECTED TO BUSINESS, ARTIFICIAL INTELLIGENCE, AND MATHEMATICAL PROCESSING APPLICATIONS (last

modified Oct. 20, 1998) <<http://
www.uspto.gov/web/offices/pac/compexam/comguide.htm>>.

[FN175]. As Judge Mayer noted in Morton Int'l, Inc. v. Cardinal Chem. Co.:
Every year about 100,000 new patents are issued, resulting in well over 1,000,000 patents in force in this country at any time. These patents are issued by the Patent and Trademark Office clothed in a presumption of validity as a matter of law and of practicality. The Patent and Trademark Office, after all, consumes a tremendous annual budget, nearly a half billion dollars, and employs thousands of highly trained individuals working to insure that only deserving patents are issued. This court, on the other hand, might see only one hundred and fifty or so contested patents a year, including repeaters. We therefore see at most no more than 0.015% of the patents in force. (citations omitted) 5 F.3d 1464, 1472 (Fed. Cir. 1993) (Mayer, J., concurring)

[FN176]. See generally T.H. LLOYD, ENGLAND AND THE GERMAN HANSE, 1157-1611: A STUDY OF THEIR TRADE AND COMMERCIAL DIPLOMACY (1991); JOHANNES SCHILDHAUER, THE HANSA: HISTORY AND CULTURE (Katherine Vanovitch trans., 1985).

[FN177]. See generally LARS MAGNUSSON, MERCANTILISM: THE SHAPING OF AN ECONOMIC LANGUAGE (1994); LEONARD GOMES, FOREIGN TRADE AND THE NATIONAL ECONOMY: MERCANTILIST AND CLASSICAL PERSPECTIVES (1987).

[FN178]. In this regard, State Street holds particularly unsettling possibilities for inventors who maintained their business methods as trade secrets. Under the rule articulated by Judge Learned Hand in Metallizing Eng'g Co. v. Kenyon Bearing & Auto Parts, a firm that put a business method into commercial practice for more than one year, but maintained the method as a trade secret, is barred from obtaining a patent on the invention. See 153 F.2d 516, 520 (2d Cir. 1946). Moreover, third parties are free to patent the method. See D.L. Auld Co. v. Chroma Graphics Corp., 714 F.2d 1144, 1147 (Fed. Cir. 1983). Because business method innovators may have opted for trade secret protection based upon the traditional rule that such methods were unpatentable, a practical effect of State Street may be to convert the first inventors of business methods into infringers.

[FN179]. See supra notes 40-45 and accompanying text.

[FN180]. See "Method of swallowing a pill," U.S. Patent No. 3,418,999.

[FN181]. See infra notes 256-65 and accompanying text.

[FN182]. See generally Carl A. Kukkonen, III, Be a Good Sport and Refrain from Using My Patented Putt: Intellectual Property Protection For Sports Related Movements, 80 J. PAT. & TRADEMARK OFF. SOC'Y 808 (1998).

[FN183]. See "Character assessment method," U.S. Patent No. 5,190,458.

[FN184]. See "Method of using a created international language as an intermediate pathway in translation between two national languages," U.S. Patent No. 4,864,503; see also The Wired Diaries, 7.01 WIRED 97, 135 (1999) (attributing to Norman Fischer, Abbot, Green Gulch Farm Zen Center, the observation that "[t]he real technology--behind all of our other technologies-- is language. It actually creates the world our consciousness lives in.").

[FN185]. See "Method of high resolution silk screen printing," U.S. Patent No. 5,730,052. But see Greenewalt v. Stanley Co., 54 F.2d 195, 196 (3d Cir. 1931) ("We do not find authority in the law for the issuance of a patent for results dependent upon such intangible, illusory, and nonmaterial things as emotional or aesthetic reactions.").

[FN186]. See "System for allowing a person to experience systems of mythology," U.S. Patent No. 5,734,795.

[FN187]. See Vincent Chiappetta, Patentability of Computer Software Instruction as an "Article of Manufacture:" Software as Such as the Right Stuff, 17 J. MARSHALL J. COMPUTER & INFO. L. 89, 129-34 (1998).

[FN188]. See THE FEDERALIST No. 43, at 271-72 (James Madison) (Clinton Rossiter ed., 1961) ("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 the inventors. The public good fully coincides in both cases with the claims of individuals."). Madison's reference to contemporary British law hardly suggests a radical view of patentable subject matter.

[FN189]. See Robert I. Coulter, The Field of the Statutory Useful Arts, Part II, 34 J. PAT. OFF. SOC'Y 487, 494-96 (1952). "The seven historic 'liberal arts' were: grammar, logic (dialectics), rhetoric, arithmetic, geometry, music and astronomy[.] The four 'fine arts' were: painting, drawing, architecture and sculpture; to which were often added: poetry, music, dancing and drama." Id. at 494.

[FN190]. See Edward C. Walterscheid, To Promote the Progress of Useful Arts: American Patent Law and Administration, 1787-1836 (Part 2), 80 J. PAT. & TRADEMARK OFF. SOC'Y 11, 26-27 (1998).

[FN191]. 21 Jam. I, ch. 3, § 6.

[FN192]. In re Yuan, 188 F.2d 377, 380 (C.C.P.A. 1951) (emphasis added).

[FN193]. See CARL MITCHAM, THINKING THROUGH TECHNOLOGY: THE PATH BETWEEN ENGINEERING AND PHILOSOPHY 154-60 (1994).

[FN194]. See supra notes 125-31 and accompanying text.

[FN195]. See 26 U.S.C. § 706(d) (1994); Treas. Reg. § 1.704-1(b), (f) (1994) ("Determination of distributive share when partner's interest changes"); Richard Stern, Scope-of-Protection Problems with Patents and Copyrights on Methods of Doing Business 13-14 (unpublished manuscript, on file with the Boston College Law Review).

[FN196]. Jump citations provide the specific page on which a judicial opinion recites a desired point of law.

[FN197]. See generally Alfred C. Yen, The Danger of Bootstrap Formalism in Copyright, 5 J. INTELL. PROP. L. 453 (1998); Robin Lee Pedersen, Comment, West Publishing Co. v. Mead Data Central, Inc. (Lexis), 14 RUTGERS COMPUTER & TECH. L.J. 359 (1988); James H. Wyman, Comment, Freeing the Law: Case Reporter Copyright and the Universal Citation System, 24 FLA. ST. U. L. REV. 217 (1996).

[FN198]. See supra note 129 and accompanying text.

[FN199]. See George L. Priest, What Economists Can Tell Lawyers About Intellectual Property: Comment on Cheung, in 8 RESEARCH IN LAW AND ECONOMICS: THE ECONOMICS OF PATENTS AND COPYRIGHTS 19, 19-20 (John Palmer & Richard O. Zerbe, Jr., eds., 1986) ("The ratio of empirical demonstration to assumption in this literature [applying economic analysis to the field of intellectual property] must be very close to zero .... I do not believe that it is unfair to say that the ... literature ... of which I am aware [has] consisted of little more than assumptions. As a consequence, this literature has taught us almost nothing, nor has it guided research or thinking so that an approach with a firmer empirical base could be developed.").

[FN200]. See supra note 12.

[FN201]. See DON IHDE, PHILOSOPHY OF TECHNOLOGY: AN INTRODUCTION 26 (1993).

[FN202]. See MITCHAM, supra note 193, at 114-15.

[FN203]. See id. at 130.

[FN204]. JACOB BIGELOW, ELEMENTS OF TECHNOLOGY at v (1829).

[FN205]. See E.T. Layton, Jr., American Ideologies of Science and Engineering, 17 TECH. AND CULTURE 688, 691 (1976).

[FN206]. See SUBRATA DASGUPTA, TECHNOLOGY AND CREATIVITY 151 (1996).

[FN207]. See JOHN KENNETH GALBRAITH, THE NEW INDUSTRIAL STATE 12 (2d ed. 1971).

[FN208]. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478, 7479 n.7 (1996) [hereinafter Software Guidelines] (quoting COMPUTER DICTIONARY 384 (Microsoft Press, 2d ed. 1994)).

[FN209]. See GEORGE BASALLA, THE EVOLUTION OF TECHNOLOGY 27-28 (1988).

[FN210]. See IHDE, supra note 201, at 72-78.

[FN211]. See Ronald Kline, Science and Engineering Theory in the Invention and Development of the Induction Motor, 1880-1900, 28 TECH. & CULTURE 283 (1987).

[FN212]. See DASGUPTA, supra note 206, at 152-56; MITCHAM, supra note 193, at 199-204.

[FN213]. See MITCHAM, supra note 193, at 203; I.C. Jarvie, Technology and the Structure of Knowledge, in PHILOSOPHY AND TECHNOLOGY: READINGS IN THE PHILOSOPHICAL PROBLEMS OF TECHNOLOGY 54, 55 (Carl Mitcham & Robert Mackey, eds. 1972).

[FN214]. 15 INTERNATIONAL ENCYCLOPEDIA OF THE SOCIAL SCIENCES 576 (1968).

[FN215]. MCGRAW-HILL CONCISE ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY 1876 (3d ed. 1994).

[FN216]. DANIEL BELL, THE WINDING PASSAGE: ESSAYS AND SOCIOLOGICAL JOURNEYS, 1960-1980 at 20 (1980).

[FN217]. FREDERICK FERRE, PHILOSOPHY OF TECHNOLOGY 26 (1988).

[FN218]. MARSHALL MCLUHAN & ERIC MCLUHAN, LAWS OF MEDIA: THE NEW SCIENCE 3 (1998).

[FN219]. See generally NORBERT WIENER, CYBERNETICS, OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE (2d ed. 1961).

[FN220]. W. ROSS ASHBY, AN INTRODUCTION TO CYBERNETICS 2 (1956).

[FN221]. Id.

[FN222]. Id. at 2-3.

[FN223]. See MITCHAM, supra note 193, at 205; see also Allen Newell, Response: The Models Are Broken, The Models Are Broken!, 47 U. PITT. L. REV. 1023, 1025 (1986)

(collapsing distinctions between the study of human behavior and computer science).

[FN224]. See supra notes 140-47 and accompanying text.

[FN225]. See N. Bruce Hannay & Robert E. McGinn, The Anatomy of Modern Technology: Prolegomenon to an Improved Public Policy for the Social Management of Technology, 109 DAEDALUS 25, 26 (1980) ("The nascent field of technology studies is littered with unsuccessful attempts to capture and display the supposed Platonic essence of technology in a succinct phrase or two.").

[FN226]. See generally JACQUES ELLUL, THE TECHNOLOGICAL SOCIETY (John Wilkinson trans., 1964); HERBERT MARCUSE, ONE-DIMENSIONAL MAN: STUDIES IN THE IDEOLOGY OF ADVANCED INDUSTRIAL SOCIETY (1964); 1 LEWIS MUMFORD, THE MYTH OF THE MACHINE: TECHNICS AND HUMAN DEVELOPMENT (1966).

[FN227]. But see Rachel Laudan, Introduction to THE NATURE OF TECHNOLOGICAL KNOWLEDGE: ARE MODELS OF SCIENTIFIC CHANGE RELEVANT? 1, 5 (Rachel Laudan ed., 1984) (noting that attempts to demarcate technology from other activities are ""probably fruitless").

[FN228]. See PAUL W. DEVORE, TECHNOLOGY: AN INTRODUCTION 220-22 (1980); Michael Fores, Some terms in the discussion of technology and innovation, 6 TECH. & SOC'Y 56 (1970).

[FN229]. See Stephen J. Kline, What is Technology?, 1 BULL. SCI. TECH. & SOC'Y 215 (1988).

[FN230]. See ROBERT E. MCGINN, SCIENCE, TECHNOLOGY AND SOCIETY 16 (1991); Hannay & McGinn, supra note 225, at 26; Robert E. McGinn, What is Technology?, 1 RES. IN PHIL. AND TECH. 179, 180 (1978) [hereinafter McGinn, What is Technology?].

[FN231]. See McGinn, What is Technology?, supra note 230, at 180.

[FN232]. See id. at 181.

[FN233]. Hannay & McGinn, supra note 225, at 27.

[FN234]. Id. at 28.

[FN235]. See id. at 27.

[FN236]. Id.

[FN237]. Id.

[FN238]. See generally DEVORE, supra note 228.

[FN239]. Id. at 226.

[FN240]. See id. at 225.

[FN241]. Id. at 253.

[FN242]. Id. at 241.

[FN243]. See DEVORE, supra note 228, at 182-212.

[FN244]. See generally MITCHAM, supra note 193.

[FN245]. See id. at 157-60.

[FN246]. See id. at 209.

[FN247]. Id. at 210.

[FN248]. Id. at 216.

[FN249]. MITCHAM, supra note 193, at 230.

[FN250]. See id. at 236.

[FN251]. Id.

[FN252]. Id. at 232.

[FN253]. See 35 U.S.C. § 103(a) (1994).

[FN254]. See MIKE W. MARTIN & ROLAND SCHINZINGER, ETHICS IN ENGINEERING 156 (1983).

[FN255]. See id.

[FN256]. See "Drugs and methods for treating disease," U.S. Patent No. 5,456,663; "Method of administration of insulin," U.S. Patent No. 5,364,838; see generally William D. Noonan, Patenting Medical and Surgical Procedures, 77 J. PAT. & TRADEMARK OFF. SOC'Y 651 (1995).

[FN257]. See Chris J. Katopis, Patients v. Patents?: Policy Implications of Recent Patent Legislation, 71 ST. JOHN'S L. REV. 329, 354-55 (1997).

[FN258]. See Pallin v. Singer, Civ. No. 5:93-202, 1995 WL 608365 (D. Vt. May 1, 1995).

[FN259]. See Beata Gocyk-Farber, Note, Patenting Medical Procedures: A Search for a Compromise Between Ethics and Economics, 18 CARDOZO L. REV. 1527, 1544-51 (1997).

[FN260]. 35 U.S.C.A. § 287(c) (West Supp. 1999); see Gerald J. Mossinghoff, Remedies Under Patents on Medical and Surgical Procedures, 78 J. PAT. & TRADEMARK OFF. SOC'Y 789, 789 (1996).

[FN261]. See Gocyk-Farber, supra note 259, at 1528.

[FN262]. See, e.g., Bruce W. Foudree & Peter K. Trzyna, Patenting in Insurance Starts Shaping Up as Robust Discipline, NAT'L UNDERWRITER LIFE & HEALTH-FIN. SERVICES ED., Dec. 14, 1998; Richard A. Kaplan, Patenting Business Methods--A More Viable Option, 2 CHI. LAW. 7 (1999); Robert M. Kunstadt, Sneak Attack on U.S. Inventiveness, NAT'L L.J., Nov. 9, 1998, at A21; Teresa Riordan, E-commerce Patents Reopen Legal Questions from the Past; Debate: Should a Business Method Be Made Property?, CHI. TRIB., Jan. 11, 1999, at 2.

[FN263]. TRIPS Agreement, supra note 20, art. 27.

[FN264]. Id.

[FN265]. A more accurate translation of this phrase, attributed to the Roman jurist Ulpian, is: "He to whom the greater is lawful ought not to be debarred from the less as unlawful." BLACK'S LAW DICTIONARY 1052 (6th ed. 1990). The most famous use of the phrase in patent law occurred in Justice Holmes' noteworthy dissent in Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 519-20 (1917).

[FN266]. See Convention on the Grant of European Patents, 13 I.L.M. 268 (1974) (amended by Decision of the Administration Council of the European Patent Organization of Dec. 21, 1978) [hereinafter European Patent Convention]. The European Patent Convention creates a centralized mechanism for granting a set of national patents effective in the contracting states.

[FN267]. See Japanese Patent Act, Law No. 121 of 1959 (amended 1998), available at <<http://www.jpo-miti.go.jp/>> (indexed at "Outline of Industrial Property Systems": "Patent Law").

[FN268]. See European Patent Convention, supra note 266, art. 52; Japanese Patent Act, Law No. 121 of 1959, § 29(1).

[FN269]. See Rainer Moufang, Methods of Medical Treatment Under Patent Law, 24 INT'L REV. INDUS. PROP. & COPYRIGHT L. 18, 22 (1993).

[FN270]. A.E.K. v. Federal Patent Office, 15 INT'L REV. INDUS. PROP. & COPYRIGHT L. 82, 83 (1984) (reporting the September 21, 1982, opinion of the Swiss Supreme Court).

[FN271]. Gert Kolle, The Patentable Invention in the European Patent Convention, 5 INT'L REV. INDUS. PROP. & COPYRIGHT L. 140, 146 (1974).

[FN272]. European Patent Convention, supra note 266, art. 52.

[FN273]. Id. art. 57.

[FN274]. See GUIDELINES FOR EXAMINATION IN THE EUROPEAN PATENT OFFICE, Part C, at 40 (1994) ("Guidelines for Substantive Examination: Industrial Application").

[FN275]. See generally Sean J. Hackett, Patent Protection in Europe for Software Inventions, 479 PRAC. LAW INST./PAT. 889 (1997).

[FN276]. See VICOM, Decision T 208/84, 84-4, 84-6 (1986), reprinted in CHARTERED INSTITUTE OF PATENT AGENTS, EUROPEAN PATENTS HANDBOOK (2d ed. 1999).

[FN277]. See IBM, Decision T 6/83 (1988) ("Data Processor Network"), reprinted in CHARTERED INSTITUTE OF PATENT AGENTS, EUROPEAN PATENTS HANDBOOK (2d ed. 1999).

[FN278]. See Document Abstracting and Retrieving, Decision T 22/85 (1988), reprinted in CHARTERED INSTITUTE OF PATENT AGENTS, EUROPEAN PATENTS HANDBOOK (2d ed. 1999).

[FN279]. See BEATTIE, Decision T 603/89, 89-9 (1990), reprinted in CHARTERED INSTITUTE OF PATENT AGENTS, EUROPEAN PATENTS HANDBOOK (2d ed. 1999).

[FN280]. See JAPANESE PATENT OFFICE, IMPLEMENTING GUIDELINES FOR EXAMINATION OF INDUSTRIALLY APPLICABLE INVENTIONS (1997), available at <<http://www.jpo- miti.go.jp/>> (indexed in "Examination Information") [hereinafter JPO GUIDELINES].

[FN281]. See Japanese Patent Act, Law No. 121 of 1959, art. 2(1).

[FN282]. See JPO GUIDELINES, supra note 280, § 1.1 (section entitled "Non- statutory inventions").

[FN283]. See id. § 2.1(1) (section entitled "Methods for treatment of human body by

surgery or therapy and diagnostic methods practised on the human body"), § 2.1(3) (section entitled "Practically inapplicable inventions").

[FN284]. See id. § 2.1(2) (section entitled "Commercially inapplicable inventions").

[FN285]. See supra notes 228-52 and accompanying text.

[FN286]. See supra note 252 and accompanying text.

[FN287]. See supra notes 125-31 and accompanying text.

[FN288]. See supra note 144 and accompanying text.

[FN289]. See Thomas, supra note 121, at 257-61.

[FN290]. See Merrill Lynch Inc.'s Application, [1988] R.P.D. & T.M. 1, aff'd, [1989] R.P.D. & T.M. 561.

[FN291]. See id. at 8-9

[FN292]. Id. at 6.

[FN293]. See id. at 14.

[FN294]. Id. at 12.

[FN295]. See generally Stern, supra note 78. See also Richard H. Stern, Solving the Algorithm Conundrum: After 1994 In the Federal Circuit Patent Law Needs a Radical Algorithmectomy, 22 AM. INTELL. PROP. L. ASS'N Q.J. 167 (1994).

[FN296]. Software Guidelines, supra note 208, at 7484.

[FN297]. See id. at 7479.

[FN298]. See Del Gallo, supra note 50, at 425-27.

[FN299]. See generally Oberdorfer, supra note 10.

[FN300]. See Richard H. Stern, On Defining the Concept of Infringement of Intellectual Property Rights in Algorithms and Other Abstract Computer-Related Ideas, 23 AM. INTELL. PROP. L. ASS'N Q.J. 401, 408 n.17 (1995).

[FN301]. See Software Guidelines, supra note 208, at 7479 ("These Guidelines do not constitute substantive rulemaking and hence do not have the force and effect of law.").

[FN302]. See generally Oberdorfer, supra note 10.

[FN303]. See TRIPS Agreement, supra note 20, art. 27(1).

[FN304]. See HAROLD C. WEGNER, PATENT HARMONIZATION § 2300 (1993) (noting efforts to harmonize the definition of patentable subject matter via international agreement).

[FN305]. In particular see the controversial decision SOHEI, Decision T 769/92 (1994) ("General-purpose management system"), reprinted in CHARTERED INSTITUTE OF PATENT AGENTS, EUROPEAN PATENTS HANDBOOK (2d ed. 1999). The lengthy claims at issue before the European Patent Office Board of Appeal defined computer hardware, data storage files and a plurality of processing means for controlling the hardware and for storing, updating, reading and outputting the data. The patent application described the system as useful for financial and inventory management, and in particular construction management. Thus, the system might, for example, track the work to be done on a particular site within the construction industry.
According to the Board, the claimed invention involved technical considerations because it involved a novel use of different files to cause the computer to perform different tasks. Moreover, the Board noted that management of construction sites was comparable to the management of traditional manufacturing processes. The claimed invention could therefore not be considered a method of doing business excluded from patentability by the European Patent Convention. Although arguably quite a different case than Merrill Lynch, the reasoning of the SOHEI Board offers ample possibilities for artful claims drafters to overcome the restrictions upon patentable subject matter within the European Patent Convention.

[FN306]. See JPO GUIDELINES, supra note 280, § 2.2.1, (c)-2 (iii) (section entitled "Implementing guidelines for inventions in specific fields: Computer Software Related Inventions").

[FN307]. See, e.g., RICK FEINBERG, PECULIAR PATENTS: A COLLECTION OF UNUSUAL AND INTERESTING INVENTIONS FROM THE FILES OF THE U.S. PATENT OFFICE (1994).

[FN308]. The writings of Martin Heidegger suggest this concern. See Martin Heidegger, The Question Concerning Technology, in BASIC WRITINGS, 287, 308 (David Farrell Krell ed., 1977) ("As soon as what is unconcealed no longer concerns man even as object, but exclusively as standing-reserve, and man in the midst of objectlessness is nothing but the orderer of the standing-reserve, then he comes to the very brink of a precipitous fall, that is, he comes to the point where he himself will have to be taken as standing-reserve."); MARTIN HEIDEGGER, DISCOURSE ON THINKING 56 (John M. Anderson & E. Hans Freund trans., 1966) ("[T]he approaching tide of technological revolution in the atomic age could so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced as the only way of thinking.").
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