

Bilski and the Transformation of the Brain

By Jeffrey E. Young

In the Federal Circuit's en banc *Bilski*¹ decision, the "machine or transformation" test is offered as a way to assure that a patent on a process will not encroach upon territory prior Supreme Court precedent has marked off limits to patent protection under 35 U.S.C. § 101. And any comprehensive discussion of permitted patentable subject matter under 35 U.S.C. § 101 points out that "mental processes" are not patentable. In the *Bilski* decision and subsequent debate, the "mental process" prohibition tends to be taken as noncontroversial, its parameters as given. But neuroscientists consider the brain to be a machine, and mental functions to involve changes in brain structure. Can the "machine or transformation" test account for mental processes if they are implemented by a machine and involve transformation of physical structures? As the Supreme Court prepares to reconsider the law of patentable subject matter, answering this question becomes important. To assist in the analysis, this article compares a method of advertising to the method of medical treatment recently found patentable by the Federal Circuit in its *Prometheus* decision.²

The Bilski Test of Patentable Subject Matter for Method Claims

The Federal Circuit Court of Appeals, in *In re Bilski*,³ set out a two-part machine-or-transformation test for determining when a claimed process is patent-eligible under § 101. The test requires that the claimed process either (1) is tied to a particular machine or apparatus or (2) transforms a particular article into a different state or thing. The use of a specific machine or transformation of an article must impose meaningful limits on the claim's scope to impart patent-eligibility. Likewise, involvement of the machine or transformation in the claimed process must be more than insignificant extra-solution activity. Applying this test to bar from the patent system the inventor's method for identifying market participants and initiating balancing commodity transactions to hedge risk, the court found no tie to a machine and no transformation of a physical article.

A transformation to meet the test must be central to the purpose of the claimed process. Adding a noncentral data-gathering step to an algorithm is insufficient to convert that algorithm into a patent-eligible process, as it would not constitute a transformation of an article.

The purpose of the machine-or-transformation test is to prevent the preemption of fundamental principles. The court defined "fundamental principles" as used in the *Bilski* decision to mean "laws of nature, natural phenomena, and abstract ideas." Transformations or manipulations of public or private legal obligations or relationships, business risks, or other such "abstractions" cannot meet the second part of the test. The U.S. Patent and Trademark Office asserts that such subjects are non-eligible methods of "organizing human activity."⁴ Claims that are performed entirely in the human mind, or drawn to the application of human intelligence alone to solve practical problems, also are not patentable subject matter.

On the other hand, the *Bilski* decision noted:

the main aspect of the transformation test that requires clarification here is what sorts of things constitute "articles" such that their transformation is sufficient to impart patent-eligibility under § 101. It is virtually self-evident that a process for a chemical or physical transformation of physical objects or substances is patent-eligible subject matter.⁵

Furthermore, not all the individual process steps of a claim need be limited to a machine or transform an article because a patent claim is considered as a whole for eligibility under § 101.⁶

Thus, the *Bilski* court was comfortable with the patent-eligibility of processes that cause a chemical or physical transformation of physical objects or substances, but not those that apply human intelligence alone (in all of the required steps). But was the court considering an instance of a process causing a physical or chemical transformation of the human brain's neural circuits as a result of external "noninvasive" stimuli, such as advertising? How good a filter is the machine-or-transformation test for identifying subject matter that should not be patented?

Prometheus and the Patentability of Methods That Transform Human Tissue

Recently, in *Prometheus Laboratories, Inc. v. Mayo Collaborative Services*,⁷ the Federal Circuit held that a step of administering a drug to a person as a central part of a claimed method of treatment to ameliorate the effects of an undesired condition is always "transformative" of the human body, and therefore renders such a method claim eligible subject matter under the *Bilski* test. That the resulting transformation relies on natural processes within the body did not change this result. Nor did the presence in the patent claim of an additional "mental step" used to determine the need to change the dosage levels of the drug, although that "mental step" would not be patent-eligible per se. The purpose of administering the drug was central to the treatment method, and thus not a mere data-gathering step.

Notably, the court did not cite a need to know exactly how the body's natural processes metabolize the drug. The claim requires measuring the level of resulting metabolites in the body, and an expert witness testified that at the end of the process, the blood sample had changed. Previously, the Federal Circuit had decided cases involving patents on administering chemical compositions that transform human skin, affect hormone production, or inhibit a gene without any challenge to patent-eligibility.⁸ The Board of Patent Appeals and Interferences (BPAI) has considered surgery to be a manufacturing process, with reference to the transformation of human tissue by the application of "scientific" knowledge.⁹

A variety of methods that physically transform the human brain have been patented. One example is a method of irradiating diseased tissue with high-energy photons.¹⁰ Treatment methods with pharmaceuticals that alter brain chemistry are patented.¹¹

The holding of *Prometheus* should apply to find a claim containing any method step of a type that always transforms body tissue to be patent-eligible under the transformation prong of the *Bilski* test. Logically this conclusion should apply to steps that always transform brain tissue. The neuroscience on this point no longer can be ignored when utilizing concepts of mental process and human activity in formulating the patent laws.

The Neuroscience of Decision Making

The Nature of the Brain

As one eminent neuroscientist stated to the author without hesitation: “The brain is a machine.” It consists of circuits and networks of neurons connected by synapses that respond to stimuli and make decisions in ways we are far from understanding. Another neuroscientist, Emory University’s Dr. Gregory Berns, writes, rejecting any “mind-body dualism that separates human decision making from the messiness of the physical body” and asserting that the physical workings of the brain as a physical organ place limitations on the way we make decisions.¹² Thought, like flight, once considered mysterious and inscrutable, will eventually be revealed in chemical, electrical, and mechanical terms.

Linguist and cognitive scientist Dr. George Lakoff describes the brain as “a physical system” including complex circuits of neurons whose impact on how a person responds to a given situation depends generally on the strength of synapse connections between circuits within conceptual systems in the brain. Stimuli that activate a circuit A to fire synapse connections to circuit B may strengthen the synaptic connections between A and B, and inhibit utilization of weaker connections between A and another circuit C. Lakoff gives as an example a political message that activates a circuit A characterizing the idea of a “war on terror,” which tends to activate a circuit B characterizing a conservative worldview, and may inhibit activation of circuit C characterizing a progressive worldview.¹³ Lakoff also asserts that some ideas (e.g., morality, politics) are not abstract, but are embodied in the brain.¹⁴

Response to External Stimuli

Although external stimuli result in changes in brain structure, the structural changes cannot yet be measured directly with high resolution or clear connection to causative factors.¹⁵ However, interesting theories of how the brain processes input data are emerging.

Early experiments by Schultz disclosed that the same dopamine neurons initially found to fire when monkeys received a reward began to fire in response to a tone played before the monkeys received the reward. Then, in the early 1990s, Montague and Dayan noted that Schultz’s data fit an artificial intelligence model pioneered by Sutton and Barto, called the temporal difference reinforcement learning (TDRL) model. TDRL aims to teach a computer program rules and behaviors needed to achieve a goal. The software makes a prediction about an activity, compares it to an actual occurrence, then reinforces correct predictions or modifies its model of the activity in response to incorrect predictions. Schultz’s brain data were consistent with the same sort of prediction/response model.¹⁶

As Lehr puts it: “Dopamine neurons constantly generate patterns based upon experience. . . . [I]f predictions [represented by the patterns] ever prove incorrect, then the neurons immediately readjust their expectations.” The anomaly is remembered within a new pattern.¹⁷ Thus, external stimuli physically transform the brain to some degree.

Berns describes how the brain fits new stimuli into existing categories of experiences that are retained in neural circuits. He postulates that ongoing experiences and information about other people’s experiences modify these categorization circuits in the brain.¹⁸

Conscious and Unconscious Brain Function

Berns points out how the brain satisfies the need for efficiency in perceiving our surroundings by categorizing experiences and quickly fitting new stimuli into existing categories. Thus, we don’t see what actually strikes the visual receptors of our retinas (a massive processing task); we perceive our neural circuits’ best guess as to what we probably are seeing.¹⁹ These categorization circuits are powerful biological mechanisms.²⁰

Lakoff points out that “your brain makes decisions for you that you are not consciously aware of,” and he means more than your habitual daily routine. Lakoff contends that decisions on political issues, for example, are largely unconscious, citing estimates that 98 percent of human thought is unconscious and reflexive. Where Berns speaks in terms of categorization circuits, Lakoff refers to frames and narratives fixed in the neural circuits of our brains. He asserts that decisions are largely the product of how we unconsciously fit information into narratives and frames that are instantiated physically in our brains as a result of repetition or trauma, and linked by neural binding processes. Deeply embedded brain structures are not easily changed, and as a result we unconsciously make decisions “having only the choices defined by our brain’s frames and cultural narratives.”²¹

Berns explores how conscious biological mechanisms can be used to break through the grip of perceiving that to which we have become accustomed.²² But Berns asserts that iconoclastic thinking typically requires receiving a new piece of information or getting out of a comfortable environment. He notes: “Only when the brain is confronted with stimuli that it has not seen before, does it start to reorganize perception.” As an example, Berns cites Walt Disney’s first seeing still cartoon drawings projected on a theater screen, leading to Disney’s imagining movie animation.²³ Lakoff cautions that political debate will be controlled by the persuaders’ ability to trigger unconscious decision-making processes in their targets unless the latter exercise reflective cognition.²⁴

Here, it would appear, is a boundary of sorts between unconscious functions of the brain carried out through “efficiency traps” and “frames” that shape perception, and the

Jeffrey E. Young is a partner with Alston & Bird, LLP. He is the senior patent prosecution attorney in the firm’s Atlanta office. He is co-leader of the firm’s Business Method/E-Commerce Marketing Task Force and an IP representative on the firm’s Clean Tech Task Force. He can be reached at jeff.young@alston.com. The views expressed in this article are his own and are not necessarily those of Alston & Bird or its clients.

conscious influence we can assert through attention and will. For purposes of this article, the term “underlying brain function” will be applied to the underlying unconscious manner in which the human brain reacts to information or stimuli, and the little-understood physical processes by which the brain hardwires that reaction into neural circuitry. These are natural phenomena. On the other hand, the people who create the stimuli are at least one cause of the particular resulting structure in a brain. The term “conscious mental steps” will be applied to conscious thought by which people willfully create logic, particular communications, art, music, inventions, or the like, and thereby transform neural circuits in themselves or others.

Shaping or Predicting Behavior

Neuroscientists have suggested that understanding brain mechanisms holds out the potential for influencing behavior.²⁵ Berns suggests that governments can be more effective by learning whether political ideologies tap into people’s predisposition to fall into certain groups as a possible result of circuits in their brains.²⁶ Stanford’s Dr. Brian Knutson suggests that neuroeconomic findings might lead to structuring incentives to facilitate increased savings.²⁷

But Knutson also controversially suggests, based on fMRI (functional magnetic resonance imaging)²⁸ studies, that one can predict an individual’s purchase decisions based on activation

of distinct brain regions. In one such study, as a state-of-the-art fMRI device scans her brain’s activity, a subject views a monitor. A sequence of carefully selected and timed images appears, first a picture of a box of premium chocolates, then the box with a price, and then an opportunity to purchase or refuse the product. The fMRI device detects activity in one brain region while she views the chocolates, then in another region while she views the price, and in a third region with nonpurchases. Knutson’s team at Stanford runs logistic regressions on many such tests and concludes “the findings suggest that activation of distinct brain regions related to anticipation of gain and loss precedes and can be used to predict purchasing decisions” and “also suggest that even commonplace purchasing decisions can be deconstructed with methods adopted from psychology, economics, and neuroscience.”²⁹

Other neuroscientists disagree that such fMRI measurements allow prediction of decisions. Emory University neuroscientist Dr. Lori Marino, an fMRI expert, pointed out to the author that fMRI machines measure changes in the blood oxygen content of regions of the brain, so that Knutson’s measurements cannot adequately distinguish between many potential causes of the observed activation of a region of the brain, and may not accurately reflect the synapses that actually result in a purchase decision. Even Knutson points out that little is known about the physiological origin of the blood

Prometheus Medical Treatment Claim	Advertising Hypothetical Claim 1	Advertising Hypothetical Claim 2	Advertising Hypothetical Claim 3
1. Administering drug providing 6-TG to a subject with a disorder	1. Displaying by computer a series of images to a subject	1. Verbally communicating a series of messages to a subject	1. A subject visualizes a series of scenarios
<ul style="list-style-type: none"> Always transforms tissue Body processes metabolize the drug Central to the purpose of the method of treatment 	<ul style="list-style-type: none"> Always transforms neural circuits Brain processes respond by altering circuits Central to the purpose of the method of influencing purchases 	<ul style="list-style-type: none"> Always transforms neural circuits Brain processes respond by altering circuits Central to the purpose of the method of influencing purchases 	<ul style="list-style-type: none"> “Mental step” Always transforms neural circuits Brain processes respond by altering circuits Central to the purpose of the method of influencing purchases
2. Determining the level of 6-TG in the subject	2. Determining changes in brain activity by fMRI, and monitoring purchasing changes	2. Determining changes in brain activity by fMRI, and monitoring purchasing changes	2. Determining changes in brain activity by fMRI, and monitoring purchasing changes
<ul style="list-style-type: none"> Causation of 6-TG level by the drug is clear Transforms the tested sample Central: enables adjustment of dose 	<ul style="list-style-type: none"> Specific image causation problematic; statistical data prove causation of behavior fMRI may transform brain circuits Central if useful for adjusting exposure 	<ul style="list-style-type: none"> Specific message causation problematic; statistical data prove causation of behavior fMRI may transform brain circuits; statistical measure may prove causation of behavior Central if useful for adjusting exposure 	<ul style="list-style-type: none"> Specific visualization causation problematic; statistical data prove causation of behavior fMRI may transform brain circuits; statistical measure may prove causation of behavior Central if useful for adjusting exposure
3. Wherein the measured level indicates either a need to increase or decrease the subsequent dose	3. Wherein the measurements can indicate a need to increase the subject’s exposure to the images	3. Wherein the measurements can indicate a need to increase the subject’s exposure to the messages	3. Wherein the measurements can indicate a need to increase the subject’s visualization of the scenarios
<ul style="list-style-type: none"> “Mental step” 	<ul style="list-style-type: none"> “Mental step” 	<ul style="list-style-type: none"> “Mental step” 	<ul style="list-style-type: none"> “Mental step”
Conclusion: Meets the <i>Bilski</i> transformation test	Conclusion: Meets the <i>Bilski</i> transformation test and likely the machine test	Conclusion: Meets the <i>Bilski</i> transformation test	Conclusion: Step 1 causes a transformation but, as a “mental step,” is not sufficient

oxygen level–dependent signal revealed by event-related fMRI, although he claims progress in addressing causality.³⁰

Thus, neuroscientists may face a lengthy path to discovering basic mechanisms of decision making within the brain. Researchers will have to determine not only how the unconscious brain works, but also the mechanism by which conscious thought can overcome underlying tendencies. However, basic facts have been established: the brain is a physical machine that physically changes in response to stimuli. Even a notable opponent of business method patents has acknowledged that neural activity “arguably” involves theoretically measurable chemical and physical changes.³¹

Comparing Transformation by an Advertising Invention to the Medical Treatment Method of *Prometheus*

As the *Bilski* decision often is perceived to be primarily a response to the spread of business method patents, let us use the context of a business method claim to further explore the patent eligibility of “mental processes.” Consider the following hypothetical claims directed to methods of changing a person’s likelihood of purchasing an item by exposing the person to a series of stimuli in a combination assumed for purposes of this discussion to be novel and nonobvious, and to lead to observable changes in purchasing behavior.

Hypothetical 1 is directed neither to underlying brain functions nor to conscious thought per se. Its step 1 is a purely mechanical step of displaying physical images to people in a novel sequence not found in nature. Furthermore, step 1 always results in transforming physical human tissue, neural circuits, in a way no less physical than the result of administering a drug providing metabolites, though less specifically understood. Hypothetical 2 can be analyzed in the same way as hypothetical 1 because a step such as the formation of the physical stimuli (voice-delivered messages) can be done by a human and still satisfy the *Bilski* transformation test. Many variations are possible for conveying the visual or audible stimuli, such as displaying or broadcasting them along a road or pedestrian way. Or other senses such as smell, taste, or touch could be utilized. Furthermore, hypotheticals 1 and 2 do not claim application of human intelligence alone because they require physical actions in a step central to the method’s purpose, notwithstanding that the advertising aims to organize human activity. By creating a physical transformation with a step that utilizes human intelligence alone, hypothetical 3 shows that *Bilski*’s transformation test per se does not filter out methods whose steps all recite human intelligence alone.

One transformation step is sufficient, and thus the hypotheticals do not need an additional transformation in step 2 for the claim to pass the *Bilski* transformation test. Step 2 does provide another transformation under *Bilski*, however, as the transforming step is central to the purpose of the method (the statistical measurement of increased purchasing activity proving that the display step is central to the advertising purpose), and under *Prometheus* no more specific proof of causation should be required.

In considering the physical transformations caused by these hypothetical advertising methods, advocates of denying

patent-eligibility to methods that organize human activity, such as marketing strategies or advertising methods, no doubt will be disappointed in the failure of the transformation test to weed out such methods of doing business.³²

Considering the Patentability of “Mental Processes” and the Brain as a Machine

In the context of patent-eligible subject matter, “mental processes” have received specific attention from the Supreme Court and the Federal Circuit. Too often, the definition of a mental process is assumed, when the term can be ambiguous. The distinction between “underlying brain function” and “conscious mental steps” that was drawn above from the discussion of how neuroscientists believe decisions are made should be considered in fitting “mental processes” into the test of patent-eligible subject matter. Thus far, one finds little evidence the courts have considered how the brain works in developing their treatment of “mental processes.”

In *Gottshalk v. Benson*, the Supreme Court stated: “Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work.”³³ The Court did not expound on the scope of “mental processes,” basing its denial of protection to a numerical conversion method on the conclusion that “the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.”³⁴

In his dissent in *Diehr*, Justice Stevens traced the history of mental processes from an early rule that processes involving mental operations were unpatentable, to denial of claims where patentability was predicated upon a mental step, to 1968 decisions of the Court of Customs and Patent Appeals repudiating the mental steps doctrine where the process also may be performed without mental operations.³⁵ The majority in *Diehr* did not discuss mental processes or the mental steps doctrine. However, the Court made it clear that the mere presence of a step that is not individually patentable subject matter does not prevent a claim taken as a whole from qualifying.³⁶

Can mental processes be treated as fundamental principles? Yes, when considering underlying, unconscious functions of neural circuits as discussed above because such functions are more logically classified as natural phenomena than conscious thought. No one should be able to obtain a patent on steps that merely recite underlying brain function, such as the process by which external stimuli are initially perceived and categorized in the brain’s neural circuits. Conscious thought processes, on the other hand, present a more difficult question, falling more logically into the broad category of what is “made by” humankind.³⁷ Conscious mental steps represent practical application of underlying brain capabilities to create judgments or acts of will.

In the *Bilski* decision, the definition of “fundamental principles” quoted above does not explicitly refer to “mental processes” but would cover them if they are restricted to natural phenomena. Various in the decision, the court refers to “a fundamental principle (such as an abstract idea) or a mental process”³⁸ and “mental processes, like fundamental principles, are excluded by § 101,”³⁹ usages suggesting that

a mental process differs from a fundamental principle or an abstract idea, but referring also in the holding of the case to “a fundamental principle, the mental process of arbitrating a dispute,”⁴⁰ a usage implying that a mental process is a “fundamental principle.”

So the *Bilski* decision leaves us wondering whether or not mental processes are fundamental processes, but relies on a finding that the claim is limited to what I have earlier defined as “conscious mental steps”:

Applicants here seek to claim a non-transformative process that encompasses a purely mental process of performing requisite mathematical calculations without the aid of a computer or any other device, mentally identifying those transactions that the calculations have revealed would hedge each other’s risks, and performing the post-solution step of consummating those transactions.

...

[S]ee also *Comiskey*, 499 F.3d at 1378–79 (holding that “mental processes,” “processes of human thinking,” and “systems that depend for their operation on human intelligence alone” are not patent-eligible subject matter under *Benson*).⁴¹

If the court means here to assert that purely mental processes are by nature nontransformative, that proposition is disproved by the fact that mental processes transform the physical brains of the thinker.

The only clear course left for those who would prevent patents on methods for organizing human activity is to enforce an exception separate from the machine-or-transformation test denying patent-eligibility to all method claims that include only mental processes, underlying or conscious. A possible basis for such an exception might be sought in the Supreme Court’s desire to protect “basic tools of scientific and technological work.”⁴² Exempting such tools is a laudable goal, but the Supreme Court’s statement of the rule has not been developed. Recognized by the Federal Circuit in both *Bilski* and *Prometheus*, the basic tools doctrine is neither defined nor circumscribed in those decisions. Today a general-purpose computer is indispensable for scientific work, and treated as insufficient per se to satisfy the machine prong of the *Bilski* test, but no one would dispute that such a machine was patentable when first invented.⁴³ Are all conscious mental steps “basic tools of scientific and technological work”? Many thoughts have no relation to science or technology.⁴⁴

What is lacking in guidance from the *Benson* Court is a discussion or concrete example of what falls within the basic tools category. Certainly underlying brain functions as distinguished from conscious mental steps are basic tools. But to what extent should some class of novel conscious mental steps be so treated? Indeed, in *Parker v. Flook*,⁴⁵ the Supreme Court recognized:

The line between a patentable “process” and an unpatentable “principle” is not always clear. Both are “conception[s] of the mind, seen only by [their] effects when being executed or performed.”⁴⁶

A series of conscious mental steps may well create effects when being performed, such as in hypothetical 3 above. Such a combination leading to a specific practical result is not required for basic scientific and technological work. *Bilski*’s claimed *sequence* of steps relating to hedging risks could

hardly be labeled a “basic tool of science and technology.” Nor should the combination be equated with a natural phenomenon—it is human made. The traditional criteria applied to patentable subject matter restrictions are not a good fit for such combinations of mental processes.

The transformation test focuses on the target of the steps of a claimed method, whereas the machine test focuses on whether the method is tied to a particular machine. In the case of steps involving human thought, the fact that the brain is a physical machine leads to the conclusion that such steps meet the machine prong of the *Bilski* test, creating a need again to debate a special exception banning claims the steps of which involve only thought processes, conscious or unconscious. Again the *Bilski* test fails to be comprehensive.

A ban on claims including only mental process steps makes sense in cases where infringement cannot be detected.⁴⁷ But some mental steps can be detected for infringement purposes. For example, in the case of a claim to mixing components, a person could mentally complete a step of timing how long components are heated. An infringer’s mental act of carrying out the timing step cannot be directly detected, but under *Diehr* in a post-*Bilski* world we accept the sufficiency of circumstantial evidence for proving infringement when the other steps lead to a physical transformation.

As a Matter of Policy, Should Society Want Patents on Methods That Alter Neural Processing Circuits?

There seems to be general agreement that claims to medical treatment are patent-eligible, even in the case of a mind-altering drug, which often would affect the organization of human activity. Turning to claims related to nonmedical goals, the hypothetical claims discussed above probably elicit strong reactions from many against their patent eligibility, and would do so more strongly if the preamble read: a method of changing the average likelihood among a group of people to accept a political doctrine (or to stop reacting with racial prejudice, or to renounce ideological violence). Berns suggests that progress toward understanding how neural circuits predispose people to adopt political ideologies may lead to more effective government.⁴⁸ When legislators understand how their constituents’ brains work, will we have a better, fairer society, or one that is better able to serve the interests of a few? When dictators understand how their subjects’ brains work, will they enjoy more subservient subjects? Will fMRI scans lead to help for the mentally ill, or to labeling of people by employers or insurance companies? Like much scientific progress, neuroscience has potential for both good and evil.

Much of the debate over the patent-eligibility of methods has focused on what sort of innovations were typically patented or meant to be patentable in the past, rather than on fulfilling the purpose of the patent laws—to stimulate the development of desirable innovations. A more forward-looking approach would consider whether the benefits of new types of innovation outweigh the detriments. Society will not want to provide a patent incentive for harmful innovations, but some new methods of organizing human activity will bring useful good. One also must remember that patents make technology more likely to be developed, but, for the limited term of the patent, less available to the

public.⁴⁹ And regardless of whether a patent incentive is or is not granted, society must deal with ethical and moral issues raised by particular innovations. This applies to techniques for transforming neural brain circuits that might be used for evil, just as it applies to an AIDS test kit that might be used either to help millions to obtain treatment or to deny housing or insurance protection to infected persons. A broad prohibition of patent-eligibility for all methods and treatments that transform the human brain would be neither practical nor desirable.

Conclusion

Much work remains to establish a viable rule of patent-eligible subject matter and then resolve its application to functions of the human mind and methods that organize human activity. Existing Supreme Court precedent, not made in light of recent scientific progress, will not prove adequate as a basis for resolving questions of “mental processes.” The *Bilski* machine-or-transformation test is inadequate to deal with such issues, even in the case of advertising, a quintessential business method.

Therefore attempts by the lower courts to follow existing precedent also will be inadequate. The machine-or-transformation test tends to perpetuate an inaccurate dualism between “the mind” and other physical objects. Starting with an understanding of current scientific knowledge of the human brain would be a better baseline from which to build a patent-eligibility test.

Congress should address the policy issues raised by new scientific understanding and new potential ways to influence human behavior. Regardless of the imperfections of our legislative system, Congress should set new policy, not the courts. The better view of patent-eligibility leaves the door open to different kinds of innovation, rather than seeking to limit patenting to traditionally patent-eligible technologies. Perhaps in revisiting the scope of patentable subject matter, Congress will see the wisdom of the forward-looking approach ably stated by Judge Newman in her dissent in *Bilski*:

The public and the economy have experienced extraordinary advances in information-based and computer-managed processes, supported by an enlarging patent base.

...

Patents provide an incentive to invest in and work in new directions. In *United States v. Line Materials Co.*, 333 U.S. 287, 332 (1948), Justice Burton, joined by Chief Justice Vinson and Justice Frankfurter, remarked that “the frontiers of science have expanded until civilization now depends largely upon discoveries on those frontiers to meet the infinite needs of the future. The United States, thus far, has taken a leading part in making those discoveries and in putting them to use.” This remains true today. It is antithetical to this incentive to restrict eligibility for patenting to what has been done in the past, and to foreclose what might be done in the future.⁵⁰ ■

Endnotes

1. *In re Bilski*, 545 F.3d 943, 2008 U.S. App. LEXIS 22479 (Fed. Cir. 2008) (en banc), cert. granted, *Bilski v. Doll*, No. 08-964, June 1, 2009.
2. *Prometheus Lab., Inc. v. Mayo Collaborative Serv.*, Appeal No. 2008-1403 (Fed. Cir. Sept. 16, 2009).
3. 545 F.3d 943.
4. Brief for Respondent at 19–25, *Bilski v. Kappos* (Appeal No. 08-964,

U.S. 2009).

5. *In re Bilski*, 545 F.3d at 962.
6. *Diamond v. Diehr*, 450 U.S. 175, 193 (1981).
7. Appeal No. 2008-1403, *supra* note 2.
8. See generally *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368 (Fed. Cir. 2005) (relating to a method for treating or preventing sunburns by topical application); *Rasmusson v. SmithKline Beecham Corp.*, 413 F.3d 1318 (Fed. Cir. 2005) (relating to a method for treating prostate cancer by administering a chemical compound that causes conversion of a hormone); *Univ. of Rochester v. G.D. Searle & Co.*, 358 F.3d 916 (Fed. Cir. 2004) (relating to a method for treating inflammation by administering a compound that inhibits a gene).
9. *Ex parte Bilski*, No. 2002-2257, 2006 WL 4080055, at 31–32 (B.P.A.I. 2006) (informative) (“Claims that can only be performed by a human, such as dance and sports moves, meditation techniques, etc., present difficult questions under § 101. Surgical methods are performed by humans, but since they involve the application of scientific medical knowledge to transform human and animal tissue they are readily classifiable as a type of manufacturing process.”), citing A.P.J. Barrett’s concurrence/dissent in *Ex parte Lundgren*, Appeal No. 2003-2088, at 72 (B.P.A.I. 2005) (precedential).
10. U.S. Patent 6,778,850, Claim 1 to a “method for treating a patient, . . . said anatomical region including a target region [such as the brain] to be treated by a radiosurgical treatment beam”
11. U.S. Patent 5,206,248, Claim 1 to a “method for reducing emotional lability in human patients, comprising orally administering, to a patient in need thereof, a therapeutically effective quantity of non-addictive analog of morphine which penetrates a mammalian blood-brain barrier”; U.S. Patent 7,226,908, Claim 5 to a “method of enhancing survival of a motor neuron in a mammal, the method consisting essentially of administering to the mammal an amount of a VEGF-A protein”
12. GREGORY BERNS, *ICONOCLAST: A NEUROSCIENTIST REVEALS HOW TO THINK DIFFERENTLY* 6–9 (Harvard Business Press 2008). See Andrei Yu, *Brain as Quantum-like Machine for Transferring Time into Mind*, KHRENNIKOV CENTER FOR MATHEMATICAL MODELING IN PHYSICS AND COGNITIVE SCIENCES, UNIVERSITY OF VAXJO, S-35195, Sweden, ARXIV:Q-BIO/0702004V1 [q-bio.NC] (Feb. 5, 2008), http://arxiv.org/PS_cache/q-bio/pdf/0702/0702004v1.pdf.
13. GEORGE LAKOFF, *THE POLITICAL MIND: A COGNITIVE SCIENTIST’S GUIDE TO YOUR BRAIN AND ITS POLITICS* 103–04 (2009).
14. *Id.* at 10. Compare the *Bilski* Court’s conclusion that such subject matter as legal obligations or relationships and business risks are abstract concepts.
15. See note 28, *infra*. As noted below, some studies use fMRI to indirectly monitor changes in activity in regions of the brain in response to stimuli, but the conclusions validly drawn from such data are limited.
16. Jonah Lehr, *A New State of Mind*, SEED (Aug. 8, 2008), http://seed-magazine.com/content/article/a_new_state_of_mind/.
17. *Id.* Montague further explained that ideas, for example, political causes, are treated the same as physical rewards by the dopamine system. *Id.*
18. BERNS, *supra* note 12, at 6–9, 39–47, 99.
19. *Id.* Is there an “uncertainty principle” at work in human perception? If probability is at the heart of human perception, one cannot help but notice the similarity in terminology to quantum mechanics. Only time will tell whether we discover the brain’s categorization processes to be as predictable as splitting atomic nuclei or combining chemicals.
20. *Id.* at 39 (“Recent advances in neuroscience, however, have shown just how big a role experience plays in perception.”).
21. LAKOFF, *supra* note 13, at 9–11, 34–35, 39, 43, 128, 197.
22. BERNS, *supra* note 12, at 47–58.
23. *Id.* at 8, 37–39, 57–58.
24. LAKOFF, *supra* note 13, at 129. Thus, a discussion of the “war on terror” would include a discussion of the manipulative power of the metaphor. *Id.*
25. Kay Torrance, *The Myth of Rational Thinking*, EMORY HEALTH, Spring 2009, at 14–15 (“By discovering how our brains are wired to behave in group settings, we can begin figuring out solutions to problems of global impact.”); LAKOFF, *supra* note 13, at 129–32; Brian Knutson et al., *Neural Predictors of Purchases*, 53 NEURON 147, 152–53 (Jan. 4, 2007); Brian Knutson & Peter Bossaerts, *Neural Antecedents of Financial Decisions*, 27:31 J. NEUROSCIENCE 8174 (Aug. 1, 2007).
26. Torrance, *supra* note 25, at 15.

27. Knutson et al., *supra* note 25, at 153.
28. Functional magnetic resonance imaging (fMRI) is a type of MRI scan that measures the haemodynamic response related to neural activity in the brain or spinal cord. See <http://www.reference.com/browse/fMRI?jss=1>. Images from an fMRI device do not show the brain itself; they depict a measurement of magnetic field effects in brain regions. The spatial resolution of an fMRI machine is a few millimeters, within which millions of individual neurons are firing. An fMRI image does not distinguish individual neural circuits. LAKOFF, *supra* note 13, at 195–96.
29. Knutson et al., *supra* note 25, at 147–53; Knutson & Bossaerts, *supra* note 25, at 8174.
30. Knutson & Bossaerts, *supra* note 25, at 8176.
31. *Ex parte* Lundgren, Appeal No. 2003-2088, at 72 (B.P.A.I. 2005) (Barrett, A.P.J., dissenting) (“Arguably any human activity (muscle contraction), neural activity (thoughts, emotions), or endocrine activity (secretion of adrenal glands) involves chemical and physical changes that can be measured and (in theory) controlled or influenced.”) (emphasis added).
32. See also Gregory Aharonian, *CAFC Implicitly Endorses Patents on Music in Prometheus*, INTERNET PATENT NEWS SERV. (Sept. 29, 2009) (alleging the “literature is filled with [publications] on the multiple useful physical transformative effects of music on the human brain.”).
33. 409 U.S. 63, 67 (1972).
34. *Id.* at 67, 71–72.
35. *Diamond v. Diehr*, 450 U.S. 175, 195–200 (1981) (Stevens, J., dissenting).
36. *Id.* at 193.
37. See the Supreme Court’s famous broad statement of congressional intent for patentable subject matter in *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980) (“The Committee Reports accompanying the 1952 Act inform us that Congress intended statutory subject matter to ‘include anything under the sun that is made by man.’”).
38. *In re Bilski*, 545 F.3d 943, 952 (Fed. Cir. 2008).
39. *Id.* at 960.
40. *Id.* at 961.
41. *Id.* at 952.
42. *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).
43. For example, U.S. Patent 3,120,606 (1964).
44. Some, including the USPTO, argue that patent-eligible subject matter should be restricted to technological subject matter (to the extent the scope of the latter term can be understood). Brief for Respondent at 8, *Bilski v. Kappos* (No. 2002-2257). This is quite a contrast to the view expressed by the majority in *Ex parte Lundgren*, Appeal No. 2003-2088 (B.P.A.I. 2005) (precedential). On whether “technology” can be usefully defined, see Jeff Young, *Examining Business Method Patents—Is the “Technological Arts” Requirement at Odds with State Street and Diehr?* 23:3 *ABA IPL Newsletter* (Spring 2005).
45. 437 U.S. 584 (1978).
46. *Id.* at 589 (alterations in original) (quoting *Tilghman v. Proctor*, 102 U.S. 707, 728 (1880)).
47. Whether this rule should be based on § 101 or § 112 is an interesting question beyond the scope of this article. See *Ex parte Lundgren*, Appeal No. 2003-2088, at 72 (B.P.A.I. 2005) (Barrett, A.P.J., dissenting) (“Perhaps a part of the concern with some human-performed methods is that the steps may not be guaranteed to produce the results or be repeatable, whereas machine-implemented process steps will reliably produce the expected result; however, this seems to be more of an enablement issue.”).
48. Torrance, *supra* note 25.
49. Perhaps if credit default swaps had been patented when they were invented, a royalty burden would have kept them from being so widely adopted. Who knows where the economy would be today as a result.
50. *In re Bilski*, 545 F.3d 943, 992, 997–98, 2008 U.S. App. LEXIS 22479, at *30, 41 (Fed. Cir. 2008) (Newman, J., dissenting).

ABA Amicus Brief in *Bilski*

On October 2, the ABA filed an amicus curiae brief with the U.S. Supreme Court in *Bilski v. Kappos*. In this case, the Court is expected to provide additional guidance and direction on the line between subject matter that is eligible to receive a patent and that which is too abstract and expansive for eligibility.

The ABA brief agrees that the U.S. Court of Appeals for the Federal Circuit reached the correct result in upholding the USPTO’s rejection of this claim and that the claim sought to patent abstract ideas or mental processes in violation of existing Supreme Court precedent. The brief states that “Patent law should not interfere with the exercise of human intellect by granting a monopoly on processes in which thinking is central.”

The ABA brief urges the Court to reject the lower court’s rigid test for determining patent eligibility. That test would permit a patent for a method or process only if it is tied to a particular machine or if it transforms an article into a different state or thing.

The brief opposes an application of patent law “in a manner that articulates fixed and specific requirements that adversely affect yet-to-be-conceived but deserving inventions in emerging or unknown technologies.” It advocates instead that the Supreme Court continue to determine patentability incrementally.

To read the ABA brief, go to <http://www.abanet.org/amicus>.