CREATIVITY, INNOVATION, AND OBVIOUSNESS

by
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Psychologists who study creativity have never incorporated nonobviousness into their definition of creativity. Nonetheless, much of the psychological research is relevant to legal issues, particularly in light of the Supreme Court's decision in KSR v. Teleflex, *in which the Court problematized previous notions of obviousness—but without presenting a new standard to replace it. However, there are many critical issues left unresolved in the Supreme Court's opinion. After a brief introductory summary of the decision, the author discusses three unresolved issues and for each, discusses how creativity research could contribute to their resolution: (1) the role of prior art in invention; (2) the distinction between "ordinary" and exceptional innovation; and (3) the relative importance of proper posing of a problem and the combination that results in the solution. The author then briefly reviews research on the history of invention, proposes several recommendations for future changes to IP law, and concludes by noting a few of his concerns with the decision.*

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> *"We build and create by bringing to the tangible and palpable reality around us new works based on instinct, simple logic, ordinary inferences, extraordinary ideas, and sometimes even genius. These advances, once part of our shared knowledge, define a new threshold from which innovation starts once more. And as progress beginning from higher levels of achievement is expected in the normal course, the results of ordinary innovation are not the subject of exclusive rights under the patent laws. Were it otherwise patents might stifle, rather than promote, the progress of useful arts."* (KSR International Co. v. Teleflex Inc., 2007, p. 1746)

I. INTRODUCTION

Soon after psychologists began to study creativity in the 1950s, they began to propose definitions of creativity that would be objective and thus submit to rigorous scientific investigation.[**] The current consensus definition, which had taken form by the 1960s, is that to be creative, a product must meet two criteria: novelty and appropriateness. Novelty is not enough, because a novel idea may be ridiculous or nonsensical; many dreams are novel but rarely have any impact on the world after breakfast. In addition to novelty, to be creative an idea must be *appropriate*, recognized as socially valuable in some way to some community. Appropriateness is a broader criterion than the "usefulness" of patent law; it is meant to cover not only technical innovation, but also creativity in the arts and letters.

Patent law adds to these two criteria a third: the idea must not be obvious. Psychologists who study creativity have never incorporated nonobviousness into their definition; nonetheless, much of the psychological research is relevant to legal issues, particularly in light of the Supreme Court's decision in *KSR v. Teleflex*. In *KSR v. Teleflex*, the Court problematized previous notions of obviousness, but without presenting a new standard to replace it. I believe that the Court's

[**] This Article is part of a multi-disciplinary conference on *KSR v. Teleflex* held at Lewis & Clark Law School on October 5–6, 2007. In respect for the multi-disciplinary nature of this conference, the Articles written by non-lawyers are presented herein in a modified APA citation format, rather than the usual Bluebook citation format. We have added some pinpoint citations to aid the legal reader.

decision is largely consistent with the research on creativity and innovation, and in this Article I describe how that research relates to the decision. However, there are many critical issues left unresolved in the Supreme Court's opinion. After a brief introductory summary of the decision, I discuss three unresolved issues and for each discuss how creativity research could contribute to their resolution: (1) the role of prior art in invention; (2) the distinction between "ordinary" and exceptional innovation; and (3) the relative importance of proper posing of a problem and the combination that results in the solution. I then briefly review research on the history of invention, propose several recommendations for future changes to Intellectual Property (IP) law, and conclude by noting a few of my concerns with the decision.

II. *KSR V. TELEFLEX*

The Supreme Court's decision in *KSR v. Teleflex* has resulted in much commentary, both in advance of the decision (with numerous amicus briefs filed in support of both petitioner and respondent) and following the decision (with coverage in major media outlets including *The New York Times* (Greenhouse, 2007), and *The Wall Street Journal* ("Patently Obvious," 2007). After the decision was issued in April 2007, the IP community was quick to identify winners and losers (Sterne & Bass, 2007). Winners, and those who filed amicus briefs for the petitioner, were entities who benefited from making it easier to challenge existing patents: the generic drug industry, for example, but also a wide range of large, successful high technology companies including Microsoft and Cisco. Other winners include organizations that my book *Group Genius* (Sawyer, 2007) identifies as examples of innovative organizations: the open source software community, and standards-setting bodies—winners, in both cases, because they are less likely to fall afoul of IP law by inadvertently infringing on a patent. Losers, many of whom filed amicus briefs for the respondent, included those who depend on IP protection for income: independent inventors, universities with their technology transfer operations, and small startup businesses, who often depend on proprietary technology to interest venture capital investors.

The decision raised the bar significantly for the issuance of a patent. What I find most intriguing is that the Court excluded "ordinary innovation" from intellectual property protection ("the results of ordinary innovation are not the subject of exclusive rights under the patent laws" (KSR International Co. v. Teleflex Inc., 2007, p. 1746)). The Court argued that it had become too easy to receive a patent; in particular, the Court noted that it was possible to patent even ideas that would have been obvious to anyone. The most egregious violators are the "patent trolls": companies that are little more than shell organizations staffed by lawyers, who patent obvious ideas—sometimes known as "combination patents"—and then lie in wait for a company to attempt to use a similar idea. Critics of the current intellectual property regime have

argued that if the bar for granting IP protection is too low, overall innovation in the economy could be stifled because although creators deserve some reward for their inventions, all inventions depend on prior art, and the national economy has a broad interest in ensuring that future inventions are free to draw on prior art.

In general, I believe that the Court's decision is consistent with the current state of research on creativity and innovation. I side with those who believe that prior to the decision, it was too easy to obtain a patent for fairly obvious and trivial variations on existing technology. I agree with the Court that the Teaching-Suggestion-Motivation (TSM) standard that was in effect was overly restrictive in holding that a patent claim is only proved obvious if the petitioner can show a teaching, suggestion, or motivation to combine prior art references *already exists* in the prior art.

III. THE ROLE OF PRIOR ART

One of the most solid findings to emerge from psychological research is that new ideas always build on existing ideas. More specifically, psychological research has made great progress in explaining exactly how new ideas build on existing ideas. This research draws on a long tradition of cognitive studies of the mental representations of concepts. At a basic, cognitive level, creative insights are often mental combinations between concepts in the mind. An individual with average skill in the art has acquired a large set of mental structures, and the moment of insight occurs when two or more concepts already in the mind are combined. Most of the legal discussion about obviousness has focused on combination as the source of innovation.

The Patent Act, 35 U. S. C. § 103, forbids issuance of a patent when "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." In *Graham v. John Deere Co.*, the Supreme Court specified a multi-step framework for applying § 103: first, determine the scope and content of previous work in the area; second, determine the differences between previous work and the new patent; and third, determine the level of ordinary skill in the area (Graham v. John Deere Co., 1966).

The Engelgau patent, held by Teleflex, is a combination of two prior patents: Asano (an adjustable pedal with a fixed pivot point) and Smith (the sensor detecting the pedal's position should be placed on a fixed part of the pedal assembly rather than on the pedal's footpad). The Engelgau patent is for a position-adjustable pedal assembly, with the electronic sensor attached to the support member of the pedal assembly. The benefit of this combination is that the driver can adjust the pedal while the sensor does not move.

KSR claimed that this combination of two previous patents was an obvious combination to a person of ordinary skill in the area, which was

decided to be a person with "an undergraduate degree in mechanical engineering (or an equivalent amount of industry experience) [and] familiarity with pedal control systems for vehicles" (KSR International Co. v. Teleflex Inc., 2007, p. 1738).

In its decision, the Supreme Court began by noting that as far back as 1950, patents were not to be granted for "a combination which only unites old elements with no change in their respective functions" (Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp., 1950, p. 152). A combination, using known methods, is determined to be "obvious" when it yields predictable results. The decision stated that "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions" (KSR International Co. v. Teleflex Inc., 2007, p. 1740).

The Court, however, continues to note that not all combinations of elements known in the prior art are obvious simply by virtue of being combinations, pointing out that almost all inventions are combinations of previous building blocks. The unresolved question raised by the decision is: which combinations are not obvious? I will turn to that question in the Part V, but first, I want to raise a more fundamental issue: combination, although a common source of innovation, is not the only form of creativity analyzed by psychologists. Combination is only one of four distinct mental processes that are at the core of creativity; the other three are conceptual transfer, conceptual elaboration, and concept creation (Sawyer, 2007, p. 119). And each of these processes raises somewhat different issues regarding nonobviousness.

A. Conceptual Combination

Many successful products are created from conceptual combination, and this form of innovation has been the focus of legal discussion. Combo snacks are a combination of cheddar cheese and pretzel. Reese's candies are a combination of peanut butter and chocolate.

Everyone has a basic mental ability to combine concepts and use these combinations to develop creative new concepts. Researchers have studied this ability by giving subjects pairs of words, for example those in the table below, and asking them to envision and describe the combined concept. For example, if a subject is presented with the words PANCAKE and BOAT, the subject might suggest that a pancake boat is a very flat boat, with a low profile that allows it to go under low-lying bridges, or that it is a new kind of restaurant that serves breakfast while touring the harbor.

	A	**B**
1	PANCAKE	BOAT
2	SNAKE	BOOK
3	CITY	DINNER

4	RUBBER	ARMY
5	ROCKET	SPONGE
6	BASEMENT	FRUIT
7	SOFA	FLASHLIGHT
8	COMPUTER	DOG
9	PONY	BOX
10	STONE	PAPER

Table 1. Creative combination (Sawyer, 2007, p. 113)

All people also have the ability to understand a conceptual combination they have never heard before, and understanding a new combination requires creative mental processes. To take the words in row number 4, a *rubber army* might have the property: "makes a good toy for a boy," but most people do not think of "good toy" when they hear the words army or rubber. These are *emergent attributes,* attributes that are not true of either base concept. People are incredibly creative in coming up with emergent attributes for noun combinations.

Edward Wisniewski and Dedre Gentner (1991) used pairs like this with an interesting twist: they came up with some words that were relatively similar, and other words that were very different. They did this by identifying important dimensions that apply to all nouns, such as "artifact" versus "natural," and "count noun" (nouns that can be preceded with numbers, like "five chairs") versus "mass noun" (nouns that cannot be numbered, like "sand" or "paper"). Then they gave subjects pairs of concepts that varied on these dimensions, and pairs that did not. For example, a "pony chair" combines a natural concept and an artifact concept, both count nouns; "snake paper" combines two concepts that are different in two ways: one is natural and one is an artifact, and one is a count noun and the other a mass noun (see Table 2). They discovered a fascinating result: it turns out that the further apart two concepts are, the more likely it is that a truly creative idea will result.

GROUP 1: COUNT NOUNS		GROUP 2: MASS NOUNS		GROUP 3: COUNT NOUNS	
Natural	*Artifact*	*Natural*	*Artifact*	*Natural*	*Artifact*
Frog	Box	Clay	Candy	Elephant	Book
Moose	Chair	Copper	Chocolate	Fish	Car
Robin	Pan	Sand	Glass	Pony	Clock
Skunk	Rake	Stone	Paper	Snake	Ladder
Tiger	Vase	Sugar	Plastic	Squirrel	Pencil

Table 2. Concepts combined in Wisniewski and Gentner experiments (Sawyer, 2007, p. 114)

To understand why, it helps to know a bit about how the mind represents concepts. Each concept is stored in the mind as a set of *properties* and the *values* of each property (Wisniewski & Gentner, 1991). For example, the concept "spoon" has properties and values "shape: long and thin", "function: holds liquid", "size: (large or small)" and "material: (wooden or metal)." For many concepts, the properties interact with each other; most of us think that wooden spoons are large spoons and that metal spoons are smaller.

In the simplest type of conceptual combination, the properties for both concepts are joined together (Wisniewski, 1997). Properties that are true of one concept but incompatible with the other are discarded; a pet shark cannot be "warm and cuddly" as most pets are. For two properties that are incompatible, you have to choose one; a pet "lives in a domestic environment" but a shark "lives in the ocean" and a pet shark can only live in one place. When combining, you will pick the one that is most compatible with all of the other properties of the new concept. If you said a "pony chair" is a chair that is furry and cute—but not alive—this is what you are doing.

In a second form of combination, *property mapping*, you take just one value from one concept and merge it with the second concept. If you said a "pony chair" was a brown and white chair, this is what you are doing: taking the "color: brown and white" value of pony, and setting the color property of chair to the same value.

In a third, more complex form of combination, you look for a relation that can bring the two concepts together. When imagining a "book box," you might think of the relationship of "containing"; "box" is the container and "book" is what is contained. If you said a "pony chair" is a chair that a pony sits in, or a chair that you sit in while taking care of a pony, this is what you are doing.

But the most creative combinations result from a fourth process known as *structure mapping*, in which you take the complex structure of one concept and use it to restructure the second concept. There are two different kinds of structure mapping, internal structure mapping and external structure mapping. If your pony chair is a chair shaped like a pony, that is internal structure mapping—you took the internal structure of a pony and applied it to the chair. If you said a "pony chair" was a small chair, that is an external structure mapping. What you are thinking of is not a chair that is smaller than a pony, but a chair that is smaller than other chairs, in the same way that a pony is smaller than other horses.

The more similar two concepts are, the easier it is to use the simpler strategies of combining properties and values. That is the kind of innovation that results in Reese's candies—a combination of two snack foods. When concepts are very different, you have to use the more

complex strategies of property mapping or structure mapping, and these strategies result in the most novel and innovative combinations.

This research suggests a potential objective way to distinguish between ordinary innovation and real innovation: a real innovation combines concepts that are relatively distant from each other.

B. Conceptual Transfer

Edison's original light bulb sockets were just wooden holes with two strips of wire at the side; the light bulbs all had to be mounted straight up or else they would fall out. Edison's lab team had been trying to think of a better way to secure bulbs in the sockets, because some of their first installations were in ocean-cruising vessels that leaned from side to side as they went over the waves. We screw in light bulbs today because one of Edison's lab assistants saw Edison cleaning his hands with turpentine; when Edison unscrewed the metal top of the metal can, the assistant had the idea of a screw-in lamp base. This is a transfer of a concept from one domain to another: a metal screw top applied to a light bulb base (Friedel & Israel, 1986).

John Fitch made the first commercial steamboat, which he demonstrated at the Constitutional Convention in Philadelphia on August 22, 1787. It would turn out to be a brilliant idea, but it had an ungainly design that today seems crazy: instead of a paddle wheel or a propeller, the engine drove six oars, with the oars suspended from a special beam that ran the length of the ship, over the heads of the passengers. By the summer of 1790, Fitch was running the nation's first steam passenger service, on the Delaware River—doing the thirty-eight mile run from Philadelphia to Trenton in an hour and a half, at eight miles an hour. It was propelled by twelve oars, six on either side, and the passengers could see the oars swinging around as they looked out at the countryside. Fitch took the pre-existing concept of an oar and combined it with the pre-existing steam engine. It would not be until 1809 that Robert Fulton patented his design for a steamboat propelled by a rear paddle wheel (Evans, 2004).

Such examples are quite common in the history of invention, because new ideas often come from conceptual transfer, also known as analogical thinking. The psychologists Mary L. Gick and Keith J. Holyoak are famous for their studies of analogical thinking (Gick & Holyoak, 1980). Gick and Holyoak applied their studies of analogical thinking to creative insight, by giving ten subjects two analogous problems in a row to see if they would be able to transfer the solution of the first to the second. The first story contained both a problem and its solution:

> A fortress was located in the center of the country. Many roads radiated out from the fortress. A general wanted to capture the fortress with his army. The general wanted to prevent mines on the roads from destroying his army and neighboring villages. As a result the entire army could not attack the fortress along one road.

> However, the entire army was needed to capture the fortress. So an attack by one small group would not succeed. The general therefore divided his army into several small groups. He positioned the small groups at the heads of different roads. The small groups simultaneously converged on the fortress. In this way the army captured the fortress.

Then subjects were given a second problem and told to use the solution of the first problem to help them solve it:

> Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient, but unless the tumor is destroyed the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays reach the tumor all at once at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue?

Seven of the ten subjects got the answer right away; for the other three, the researchers told them again to think back to the fortress story, and after that hint, those three got it too. Another group of subjects was presented with only the x-ray problem, without first hearing the fortress story. None of those who did not hear the fortress story was able to solve the x-ray problem. Another third group of subjects heard the fortress story, but the group was not told to use it to help solve the x-ray problem. This time, only three solved the problem, and only one of those three said they had noticed the analogy with the fortress story. Having the right analogy in your memory is not enough to be creative; the key to creativity involves *noticing* the right analogy (Gick & Holyoak, 1980).

An analogy is not quite the same thing as the "combination" so often referred to in legal discussions of patents. When an idea originates from conceptual transfer, legal judgments about whether the analogy is novel or nonobvious will not take the same form as those with respect to conceptual combination.

C. Conceptual Elaboration

A third fundamental cognitive process that brings sparks together over time is *conceptual elaboration*—taking an existing concept and modifying it to create something new (Ward, 1994). And as with conceptual combination, psychological research offers some suggestions about which conceptual elaborations are more or less obvious.

Arm & Hammer Baking Soda was first sold in 1846, and the company, Church & Dwight, thrived for over a hundred years. But by 1970, Church & Dwight had a problem. Everyone was either buying box mix or not baking at all, and people did not need baking soda anymore.

The old box of baking soda was so useless that people had started putting the box in their refrigerators: word of mouth had it that the powder absorbed odors. The company did some research and discovered that the powder actually worked fairly well at absorbing odors, and it decided to market the odor-absorbing qualities of baking soda. In 1972, it unveiled a new TV ad campaign: use Arm & Hammer in the fridge to "keep food tasting fresh." Within a year, more than half of American refrigerators contained an open box at the back of the shelf. Church & Dwight have now extended the product to new brands of deodorant, toothpaste, cat litter deodorizer, and laundry detergent (Church & Dwight Co., Inc., 1999).

The continued success of Arm & Hammer baking soda is due to conceptual elaboration. The easiest way to elaborate a concept is to modify one of its property values, while keeping the other properties the same. Popular songs are often small variations of existing songs; architects design new buildings that are only slightly different from existing buildings; chefs create recipes that are subtle variations on old favorites. Many of these elaborations would qualify as obvious and not be patentable. But in 1972, Church & Dwight's elaboration was not obvious, because they changed a key property of their product, the "function" property, and kept everything else the same. That insight was less obvious than creating yet another chicken and pasta dish, because the "function" property of baking soda was one of its core properties, and core properties are resistant to change. The psychologist Thomas Ward showed this by asking people to imagine, draw, and describe animals that might exist on other planets (Ward, 1994, p. 1). People assume certain core properties of animals: they all have eyes, ears, legs, and their bodies are symmetrical. And like a wooden spoon being large, some properties are linked together: animals with feathers also tend to have wings; animals with scales tend to have fins. On another planet, all of these things might, of course, be different. But Ward's subjects did not usually imagine them so. The property values they modified were predictable: more than two eyes, eyes in different locations, variations on legs such as legs with wheels at the end.

When conceptual elaboration is very small—changing the number of legs or eyes—it does not take that much creativity. What Church & Dwight did sounds simple, but baking soda's "function" property—set to "baking"—was not obvious. Changing a core property results in a less obvious new idea than changing a more peripheral property.

D. Concept Creation

The three mental processes above all involve building on existing concepts. But would not it be even more creative, even less obvious, to invent a completely new concept? Psychologists have shown that everyone can create new concepts, using a fourth cognitive process. Psychologist Larry Barsalou has created experiments where subjects are put in

situations where they spontaneously create *ad-hoc concepts* (Barsalou, 1983). For example, even people who live in disaster-prone areas rarely have evacuation lists prepared and ready to go. But, interestingly, many of them—as in New Orleans' Katrina disaster—are able to quickly create a list of items for the category "Things to take with you when evacuating": children, blankets, food, important papers, expensive electronics, and pets. Other ad-hoc concepts include *things not to eat on a diet*, *good birthday presents*, *things to take on a camping trip*, and *heavy objects to prop open a door with*. Barsalou's experiments show that everyone can create new concepts quickly.

Barsalou found that right after you create a category, you are almost as good at thinking with it as you are with categories you have known about your whole life, like *bird* and *furniture*. For example, he found that ad-hoc categories have "graded structure" just like common categories, meaning that not only can you quickly tell whether a new item is a member of the category, you can also tell how good an example of the category it is (Barsalou, 1985). For the ad-hoc category "Things to take with you when evacuating," "children" and "food" are better examples than "expensive electronics." A tent is a more important thing to take on a camping trip than a folding chair, even though both are useful.

All of us are able to create these ad-hoc categories quickly. Psychological research, however, provides no guidance as to which new concepts should be considered nonobvious.

IV. ORDINARY AND EXCEPTIONAL INNOVATION

A key question raised, but not answered, by the decision is: what criteria can be used to prove, after the fact, that an idea was not obvious ahead of time? The Court wrote: "Granting patent protection to advances that would occur in the ordinary course without real innovation retards progress and may, in the case of patents combining previously known elements, deprive prior inventions of their value or utility" (KSR International Co. v. Teleflex Inc., 2007, p. 1741).

I want to emphasize the use of the phrase "real innovation." The Court proposes to make a distinction between patentable innovation—referred to as "real innovation" on page 1741—on the one hand, and "ordinary innovation" (KSR International Co. v. Teleflex Inc., 2007, p. 1746) or "ordinary skill and common sense" or "ordinary creativity" (KSR International Co. v. Teleflex Inc., 2007, p. 1742), on the other. The Court's decision critically rests on whether it is possible to systematically make a distinction between "real innovation" and "ordinary" creativity. But the decision leaves this distinction unspecified. Creativity research offers very little that could help to define this distinction systematically.

The above descriptions of four everyday cognitive processes that are capable of generating innovation provides some pointers for thinking about how to judge the degree of nonobviousness of a new idea. Of course, these are everyday mental processes, which would suggest that, to

the Court, they would constitute "ordinary" innovation. But is the Court's decision actually referring to a psychological distinction between two different mental processes? Probably not in those terms, but by referring to a person of "ordinary skill" who is capable of "ordinary creativity," one unavoidably steps into a discussion about distinctions between mental processes.

One well-established distinction in creativity research is between little-c and big-C creativity. Big-C creativity refers to the substantial innovations that are recorded in history, innovations that make a difference in the world. Little-c creativity refers to everyday creativity that we are all capable of: improvising a new route around a traffic jam, for example. Scientific studies of creativity focus on big-C creativity, and its definition is based on novelty and appropriateness. In part, that is because little-c creativity is almost impossible to define; anything we do throughout the day that is not completely scripted involves some amount of creativity.

This is not the distinction the Court is proposing. In its decision, "ordinary innovation" is clearly beyond the little-c level that all of us are capable of; the law specifies that the relevant social group is a person with a typical level of expertise in the art. At the same time, the Court's category of "real innovation" is certainly a broader category than the big-C creativity associated with innovations that transform society. That would be too high a standard for patentability, and in any case, it is rarely possible to identify big-C creativity without observing its later historical impact. The Engelgau patent is more creative than everyday little-c creativity because it is something that no one not versed in prior art could have thought of, and yet, even Engelgau himself is not likely to claim that it transforms society dramatically.

In the previous section's discussion of the mental processes underlying creativity, I identified several potentially objective ways to judge obviousness. For example, less obvious ideas tend to emerge when a concept is elaborated by changing one of its core properties; changing a peripheral property is more likely to result in an obvious idea. To take a second example, less obvious ideas tend to emerge from combinations between more distant concepts; combinations between near concepts tend to be more obvious. This is why it has so often been observed that breakthrough innovations emerge from cross-fertilizations of different domains or disciplines. The development of Computer Motion's AESOP, the world's first commercial surgical robot, is one such example. AESOP holds the internal or "endoscopic" camera during laparoscopic surgery. Before it was invented, a surgical assistant had to hold the endoscopic camera and minor hand tremors always caused problems. AESOP can understand the surgeon's verbal commands, and it has been used in over 100,000 surgeries. The idea for this invention required expertise in two prior arts: robotics and surgery (Suomala et al., 2006).

The legal discussion of prior art has rarely touched on this multi-disciplinary form of innovation. The discussion implies that the inventor

is skilled in only one prior art. Imagine an invention that involves a combination of two existing inventions from two distinct areas of expertise, such as AESOP. Imagine, further, that upon reflection, surgeons and robotics experts both agree that this invention would have been obvious to anyone with both areas of expertise. However, for whatever historical reason, the person patenting the idea happened to be the first person to become knowledgeable in both areas. Would this constitute a nonobvious idea? I believe this remains unclear because the legal discussion has narrowly focused on expertise in one area. Almost by definition, a court would have to agree that any such multi-disciplinary idea would meet the standard of nonobviousness—even after *KSR v. Teleflex*.

Psychological research has shown that significant innovations—nonobvious new ideas—emerge from mental processes that are fairly similar to those that result in ordinary innovation. All new ideas are conceptual combinations, conceptual elaborations, etc. Some of them turn out to be more significant breakthroughs than others, but in many cases, the person having the idea is not fully aware of the import of the idea that they have had. Even the creator himself could believe the idea was a simple small-c idea, but it could later, in a different context, turn out to be a breakthrough, transformative idea. So although the Court's decision rests on a distinction between ordinary innovation and real innovation, such a distinction may be impossible to make, consistently, in practice. This leads me to my third and final topic.

V. PROBLEM FINDING AND PROBLEM SOLVING

Psychologists studying creativity typically make a distinction between problem solving and problem finding creativity. The legal discussion has focused almost exclusively on problem solving creativity, but historically, the most radical breakthroughs result from problem finding creativity. There is very little in the Court's decisions that provides IP protection to problem finding creativity.

Problem solving is the type of creativity that occurs when a problem is known to everyone working in an area, yet no one is able to determine the solution (Sawyer, 2006). The creative insight that solves the problem is called a problem solving insight. The Court's decision, and other legal discussions of obviousness, clearly imply a problem solving model of creativity: applying a problem solving framework to the origin of AESOP, for example, would require a court to posit a known problem—surgeons have difficulty communicating with the assistant who is holding the endoscopic camera, and even a very steady hand moves enough to cause problems—and then someone went looking for a solution, and then found out about robotic technology. But that is not how AESOP originated.

Problem finding is a type of creativity that occurs when no one working in the area has yet realized that there is a problem to be solved; a

problem finding creator is one who discovers the problem and first poses the question in such a way that it lends itself to solution (Sawyer, 2006). The idea for AESOP was born in a conversation between the founder of Computer Motion, Yulun Wang, and the surgeon Ron Lattimer. Like other robotics companies, Wang had intended to focus on the military and the automobile industry, but both of those sectors were in an economic slump in the early 1990s. One of the few growth industries was health care, so Wang decided to talk to doctors.

During their conversation, Lattimer told him about laparoscopic surgery, noting that if a robot would hold the scope and the camera the problem of the inevitable small hand movements would be solved. Wang later said: "[T]hat was a significant moment . . . [, the] very first time the concept of AESOP came into being" (Suomala et al., 2006, p. 2206). As with so many other inventions, the solution and the problem in this case had to be jointly created, together.

Sometimes the problem comes long after the solution; this was the case with the origin of the Post-It note, developed and sold by 3M. Research scientist Spence Silver was trying to improve the adhesive that was used in tape, and in 1968 he developed an adhesive that bonded very weakly and thus failed to achieve that goal. But Silver noticed something unusual about the adhesive—it formed itself into tiny balls that were just about the size of paper fiber. For five years, Silver told everyone who would listen about this new adhesive and tried to think of a way to use it in a product. One day, Art Fry, who worked in new product development, attended a seminar where Silver described his adhesive. Fry sang in his church choir, and he had repeatedly been frustrated when paper bookmarks fell out of his hymnal. One Sunday morning, soon after the seminar, he realized that Silver's adhesive could be used to make a bookmark that would not fall out, and the now-famous product was born. This was a classic example of problem finding creativity; the secret was to come up with the right problem (3M Company, 2002).

This case raises no legal issues because both individuals worked at the same company. But imagine a situation where Silver had patented his new adhesive, but without a specific use or problem in mind for that adhesive. Then, Fry, working at a different company, learns of this adhesive and then identifies a problem that the adhesive is ideal for solving. I would argue that both individuals have contributed to this innovation equally. One might even argue that Fry's idea for a useful application is even more innovative than Silver's new adhesive. But under current IP law, would both Silver's and Fry's creative contributions be patentable? We would not want a situation where IP law protects the solution, but not the posing of the problem, because in many historical cases the posing of the problem is the more critical creative contribution.

Of course, a patentable idea has to be "useful." If Silver had applied for a patent, he would have described a use in vague terms: "an adhesive for applications where it is important that the adhesive not leak through the paper surface." And this use would probably qualify the adhesive for

patent protection. Then Fry's proposal to apply the adhesive to a small piece of bookmark-sized paper would also possibly constitute a nonobvious combination, of the adhesive with a bookmark. In hindsight perhaps this seems obvious, even though Silver looked for applications for five years and Fry was the first to think of this one.

The distinction between problem solving and problem finding might have played a larger role in the Court's deliberations, but it only appeared briefly, and was not stated very effectively. In his oral argument for the respondent, Mr. Goldstein on three occasions attempted to introduce this distinction: "Invention is finding the problem, deciding what pieces of the prior art to use, and deciding how to put them together. Everybody is always capable of, it will always be the case, I think, that a practitioner of the art can put them together" (p. 38). Page 40: "the right question is not is—was someone merely capable of putting the two together. The right question is is there any reason to believe that it would have been apparent at the time of the invention to create this invention." Page 45: "here's the process of invention: We have to figure out there's a problem. We have to figure out what prior art you're going to use. You have to figure out how you're going to combine it, and then you actually combine it. The act of invention, the thing that is the discovery that we want to encourage, is there in the middle. It's picking out the prior art and deciding how to put it together."

The justices ignored this repeated line of argument. Although Mr. Goldstein did not develop this argument effectively, I believe he was trying to make the argument that patentable innovation involves both problem finding and problem solving processes. Mr. Goldstein seems to be intending to make the argument that combining prior art is only half of the innovation; the other half is identifying the problem.

I suspect that where Mr. Goldstein was going was to argue that the creativity of the Engelgau patent was not in the combination of existing inventions, but was in the recognition by Engelgau that there was a problem to be solved. After all, several years had passed since the two existing inventions had been patented, and yet no one had yet thought to combine them—as the respondent argued in defense of the nonobviousness of the patent.

In their oral questions, two of the justices stated that they had no idea what "motivation" might mean (Justice Breyer, page 9: "I just don't understand what is meant by the term 'motivation'"; Justice Scalia, page 14: "like Justice Breyer, I don't understand what the motivation—motivation element is"). Teaching and suggestion seem to require something explicit in prior art—that, in the written record, it is widely known that the existing inventions could be combined in exactly that manner to solve exactly that problem (the Federal Circuit Court of Appeals has long recognized that TSM might also be implicit, and this also leaves unresolved the exact nature of the test). But motivation is hard to define either explicitly or implicitly. I propose that motivation refers to the existence or posing of a problem. If the problem has not yet

been posed, then there cannot be motivation for the solution. In *KSR v. Teleflex*, the relevant fact would have been whether or not this was a widely recognized problem; it seems to have been widely recognized that using a cable with an adjustable pedal was not an ideal solution.

Pringles Prints resulted from a combination of events somewhat similar to the Post-It note. Proctor & Gamble (P&G) had the idea that Pringles' chips with text printed on them might be a successful product. But internal engineers had not developed a printable edible dye that would be appropriate. P&G tapped into their network of corporate and research partners, and identified a small company in Italy that had developed a vegetable-based dye that would be perfect for their application. The Italian company did not make potato chips and had not conceived of this particular use for their technology. Was P&G's idea of creating potato chips with text on them a "combination"? Existing precedent would require that language to be used, but I think it misrepresents the situation to describe it as a combination between potato chips and vegetable dye (Huston & Sakkab, 2006).

The Court held that an invention would be obvious if, at the time of its invention, there was a known problem for which there was an obvious solution. Several of the Supreme Court Justices professed confusion regarding the motivation component of TSM (Oral Arguments, 2006, pp. 9 & 14). I believe that motivation essentially refers to the existence of a known problem.

The Court's multi-step framework in *Graham v. John Deere* does not include any consideration of the identification or framing of the problem to be solved (Graham v. John Deere Co, 1966). And again, in *KSR v. Teleflex*, all of the decision, and all of the oral argument, was focused on whether or not the particular combination of existing inventions was or was not obvious, *given* a known problem. A key point is made on page 1742 of the *KSR v. Teleflex* decision: "One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims" (KSR International Co. v. Teleflex Inc., 2007, p. 1742). This statement refers to two components: a known problem—indicating that every knowledgeable person working in the area is aware of the problem and realizes the value of a solution—and an obvious solution. The Court placed great weight on whether or not the need or problem was widely known in the field; if the problem is widely known, that makes the patent more likely to be obvious.

The Court leaves open the possibility that posing a problem for the first time is not protectable when the solution to that problem is immediately obvious. After all, they were considering a case where both the petitioner and the respondent had faced the same problem and had developed the same solution. But in many cases, the stating or posing of the problem is a more significant creative contribution than the solution.

This seems to touch on problem finding creativity: if the need or problem was not widely known, then the patent cannot be obvious. But

the Court is essentially stating that any invention that *both* poses a new problem, *and* proposes a solution to that problem, is patentable. If the problem is well known, then the solution has a very high threshold to cross to be nonobvious. If the problem is not known and the solution is "out there," then there is nothing patentable: the poser of the problem has to compensate the patent holder of the solution.

A. Shifting the Context

The decision in *KSR* implies that an application of an idea originally developed to solve one problem, to a second problem might nonetheless qualify as obvious. Obviousness is not restricted to the application of an idea to the same or similar problems: "A person of ordinary skill is also a person of ordinary creativity, not an automaton" (KSR International Co. v. Teleflex Inc., 2007, p. 1742).

Even though Asano was designed to solve the constant ratio problem, the design in Asano provided an example of an adjustable pedal with a fixed pivot point, and prior art contained many patents indicating that a fixed pivot point was a good mounting location for a sensor. The Court ruled that taking an idea originally developed to solve one problem and using it to solve another problem was not necessarily nonobvious and patentable—thus overruling the Court of Appeals (KSR International Co. v. Teleflex Inc., 2007, p. 1739). But the Court did not provide clear instructions on how to determine whether such an application is nonobvious.

The history of invention is filled with ideas that were initially intended for a purpose that never panned out, but that were later drafted into use in another project. At Thomas Edison's lab, when one team was testing a new way to make the underwater Atlantic telegraph cable work better, they discovered some formerly unknown conductive properties of carbon. Later, Edison's telephone design team learned of this discovery, and realized the carbon could be used in a new low-cost microphone design; this new design turned out to be a critical technological step in making the telephone commercially feasible (Hargadon, 1998). Is this new use of the carbon nonobvious and therefore protectable intellectual property? Everyone knew that Bell's telephone microphone was not adequate; if another lab had known about the conductive properties of carbon, would they have considered this new application of it to be obvious? It is not clear how a court could consistently make such a distinction after the fact.

Further, the Court ruled that in many cases, if a combination of elements is "obvious to try," that it might qualify as obvious under § 103, overruling the Court of Appeals, which held, in error, that a patent claim cannot be proved obvious merely by showing that the combination was obvious to try (KSR International Co. v. Teleflex Inc., 2007, p. 1739). The Court reasoned that when there is a known problem with a demonstrated market need, and the number of known, predictable solutions is limited,

that any person of ordinary skill has reason to apply all of the solutions to see which one works. This is, as the Court said, "likely the product not of innovation but of ordinary skill and common sense" (KSR International Co. v. Teleflex Inc., 2007, p. 1742). Edison's lab was particularly skilled at quickly trying a large number of potential solutions. Famously, his light bulb team considered thousands of different potential filaments before settling on a carbonized sewing thread as the filament. If, as seems likely, a PHOSITA would have recognized the importance of choosing a proper filament material, and could have tried the same thousands of possibilities, then does that make Edison's solution obvious, as the Court seems to suggest?

The Court does not provide clear direction in how to judge such cases. What constitutes a "limited number" of known solutions? Taking the light bulb filament example: is 1,000 potential solutions too many to make it obvious? But what if it only takes one hour to try each of the 1,000 potential solutions? Then, a PHOSITA could complete the task in under half a year. What if there are sixty potential solutions that each take only five minutes to try? Then, a total of five hours would suffice to try them all and identify the successful solution. Common sense suggests that there is a difference between a five-hour process and a half-year process, but it's hard to clearly specify where to draw the line. And the Court's language in *KSR* seems to imply that any such trial-and-error process is not "real" innovation, but is rather "ordinary skill and common sense," even if it takes a year. The Court has placed us in a position where hard work and trial and error can never result in protectable intellectual property. But the history of innovation shows that there is not a strict distinction between processes of hard work and trial and error, on the one hand, and leaps in knowledge that result from a flash of insight on the other hand.

The Court seems to assume a view of insight as emerging unexpectedly and occurring rarely: "The proper question to have asked was whether a pedal designer of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to upgrading Asano with a sensor"—*not* whether a pedal designer "writing on a blank slate" would have chosen the two prior patents to be combined (KSR International Co. v. Teleflex Inc., 2007, p. 1744). Innovation never occurs on a blank slate, but always in a situation where everyone working in the area is deeply familiar with prior art.

B. Is Utility Objective?

It is widely acknowledged that the obviousness criterion is problematic because it is difficult to remove the subjective element: in hindsight, many good and successful ideas seem obvious. But it is generally believed that novelty and usefulness can be objectively defined. However, the above discussion of the innovation process, and of the

importance of problem finding and problem posing, shows that usefulness is a slippery concept.

I have discussed several examples where the use of an idea was not envisioned by the person who originally had the idea. The ultimate use of an idea often emerges from a later, problem-finding insight; for example, the new adhesive discovered by Silver was later discovered to be useful, but Silver did not know what that eventual use would be when he discovered the adhesive. Or, an idea can take on a new use when applied to a different context. The new carbon that Edison's team developed while working on a transatlantic cable later finds its utility in an improved telephone design.

Legal precedent seems to suggest that such cases are not problematic, that the originator of the idea—of the solution even without its problem—is the owner, and the person or team that later finds a use for the idea has not developed any protectable intellectual property. I believe that such a regime runs a dangerous risk of blocking the natural flow of innovation.

VI. HOW INNOVATION HAPPENS

If it is too easy to patent simple and obvious ideas, the natural flow of innovation could potentially be blocked. In my research, I have observed that innovation emerges from many small ideas, over long periods of time. Rarely is any one of the ideas, in itself, enough to build a successful business; in today's complex economy, profitable innovations depend on a long string of component ideas.

Implicit in the Court's decision are some common myths about how creativity works. First, a "creative person" has a moment of insight and creates an invention based on that inspiration. Second, executives and managers decide to select that invention for development. Third, teams of experts develop the invention into a workable product, and release it to the market. This set of beliefs is, to some extent, embedded in the patent system, with its protection for ideas: ideas that are new, useful, and nonobvious. The Court's decision continues this emphasis on the linear process of insight, in that it focuses on the idea that sparks the ensuing development process. But it turns out that the innovation process rarely begins with such an idea.

Instead, innovations today emerge over long periods of time, with contributions from many different individuals. And most important of all, the meaning of each individual idea is not clear when it is first proposed; an idea's usefulness only becomes clear later, after a new context has emerged, a context that is largely created by later ideas and their combinations. And what is perhaps a bit harder to understand is that whether or not an idea is obvious also can rarely be determined at the psychological moment when one individual had the idea. Nonobviousness almost always emerges later, and is retroactively applied to ideas.

The history of innovation shows many such cases of creativity retroactively applied. To take another example from Edison's lab: in 1899, the sales of electric automobiles were increasing, and Edison became convinced that the gasoline engine would disappear and that future automobiles would all be electric. We know today that this was a mistake, but at the time the gasoline engine had not been perfected and the future was not at all obvious. Edison directed his lab to begin working on an improved alkaline storage battery. But it soon became clear that immense problems faced the battery-powered car: the rough roads of the day damaged the battery's plates, and the cars were so heavy that the batteries drained quickly. By 1909, when Edison was ready to mass produce his car batteries, the gasoline engine had been perfected and had put electric cars out of business. But Edison's battery turned out to be useful in heavy-duty factory applications, something that Edison had never intended (Hughes, 1977, p. 13).

The key to understanding innovation is to realize that *the networks that bring people together are more important than the people themselves.* Of course, creative people play an important role as the active elements of collaborative webs. But in today's economy, most of the action is in the web, where everyone's creative power increases so that the whole is greater than the sum of the parts.

In my book *Group Genius* (Sawyer, 2007), I identified five key features of collaborative webs:

1. Each innovation builds incrementally on a long history of prior innovations. The creative products that are successful in the market rarely spring to life full-grown. The consumer rarely sees the long historical path of small sparks that accumulate to result in the emergence of the final synergy. We learn that Eli Whitney invented the cotton gin, but his creation built on a centuries-old string of cotton gins that had been used from India to Italy before being brought to the American South. We learn that James Watt invented the steam engine, but his creation was but one version in a long chain of steam engines; the Newcomen engine had been in use throughout the world long before Watt's birth (Basalla, 1988).

2. A successful innovation is a combination of many small sparks. Key technical innovations of complex modern devices like the television and the telephone emerged at different times and from different people. It is the synergy of all of these ideas together that results in a successful innovation.

3. In collaborative webs, there is frequent interaction among teams. Silicon Valley is an innovative region in part because of frequent communication among companies and teams. Members of each team see what other teams are doing, and key employees frequently transfer allegiances, taking their expertise from one team to another. At Hewlett-Packard, it was company policy to move engineers between projects every few years, rather than have each project manager hire and fire individually (Fleming, 2002).

4. In collaborative webs, multiple discovery is common. In the words of MIT Media Lab cofounder Nicholas Negroponte: "Innovation is inefficient" (Negroponte, 2003, p. 2). From a big-picture perspective, it is a waste of resources to have many different teams working on the television, or the airplane, in parallel. But without multiple efforts and frequent failure, innovation slows to a crawl.

5. No one company can own the web. The key characteristic of the most creative webs is a shift away from an ownership mentality to a collaborative approach. Companies that try to build the entire web themselves will end up losing everything.

For much of the twentieth century, innovation was dominated by large corporations with big research laboratories, but that era is over. Successful companies still invest heavily in R&D, but they increasingly collaborate with others in collaborative webs, particularly with small companies and venture-capital startups.

VII. IMPLICATIONS FOR PATENT LAW

Innovations emerge from collaborative webs, networks that bring together the many small sparks that are required to generate a successful innovation. The eventual meaning of these individual ideas is often not realized at the time of their creation. This historical reality problematizes the concept of nonobviousness; I have described cases where it is not obvious to anyone, not even the inventor, what the idea's true usefulness would later become.

Of course, the person who had the idea deserves to retain some intellectual property in that idea. But don't the others, who later realized what the idea could be used for, deserve to be rewarded as well? The current IP regime gives the idea originator all of the rewards, and nothing goes to the problem poser, the conceptual elaborator, the retroactive interpreter. And history is filled with stories of patent holders, who had the original idea, blocking innovation, because they were not capable of or not interested in continuing the unfolding process that would have realized the potential of their original idea. This hurts the patent holder as much as it hurts everyone else.

The Wright brothers' original patent was for a system for controlling flight, and the key innovation was their use of wing warping to control lateral movement (Wescott & Degen, 1999). Their wood-and-canvas wings were quite flexible, compared to today's metal wings, and by pulling on metal cables, the operator could make the wings twist forward or backwards. Twisting the left wing forward and the right wing backward would cause the airplane to turn left.

Glen Curtiss, an early aviator who worked closely with financial backing from Alexander Graham Bell, developed a different solution to lateral movement. He proposed the *aileron*—a smaller surface at the rear of the wing which would move up and down, while most of the wing remained fixed (Shulman, 2002, p. 171). This is a superior technology—

with the development of metal wings, it would have been technically very difficult to warp or even rotate the entire wing—and it is the system that every airplane uses today. The Wright brothers sued Curtiss, claiming that the aileron was covered by their wing-warping patent (Shulman, 2002). They claimed a broad scope for their patent: any lateral control mechanism that involved any portion of the wing moving up or down, was covered by their patent, not just wing warping. The Court found in the Wrights' favor, sending Curtiss and the rest of Bell's team back to the drawing board (Shulman, 2002, p. 176). Was it nonobvious, at the time of the Wright brothers' success in 1903, that moving a portion of each wing up and down was necessary for successful flight? Was it nonobvious that ailerons could accomplish lateral control better than wing warping? (In fact, Curtiss was granted a patent for the aileron, but the courts ruled that it was an extension of the prior art of the Wright brothers' patent.)

After their 1903 flight, the Wright brothers stuck with their original design, and later technological improvements were contributed by others. The Wright brothers' airplane never had wheels on it, for example; they launched it from a railroad track (Shulman, 2002, pp. 148, 150). And Glen Curtiss was the first to develop a plane that could take off and land on water (Shulman, 2002, pp. 148–150). If the Wright brothers had been allowed to own the entire airplane industry, none of these innovations would have been allowed. The Wright brothers' possessiveness held back the U.S. airplane industry for ten years, while companies in Germany, England, and France raced ahead because the Wright brothers were not able to enforce their patents in the same sweeping manner.

The challenge that we face is to reward individuals and still nurture the collaborative webs that allow the next innovation to emerge. Countries need legal systems in place that balance the rights of individual creators, but without blocking the collaborative webs that give them inspiration. In recent years, U.S. copyright and patent law has shifted toward greater protection of individual ownership of specific ideas. This recent shift is ironic because at the same time, innovation has become more and more dependent on collaborative webs, and on networks of many ideas.

To release the innovation potential of society, we need to modify several aspects of our legal system to more closely match the natural behavior of collaborative webs.

A. Reward Small Sparks

Current policy favors linear, centralized innovation, and blocks the natural rhythm of the collaborative web. First, large corporations often use their R&D labs to create "patent thickets"—many related patents that aren't quite usable (because the complementary innovations have not appeared) but that give the company a strong defensive position: the ability to sue anyone else who innovates, even if that idea fills in one of

the gaps in the thicket. But in collaborative webs, each person or company has only a subset of the ideas needed for innovation.

The open source community thrives because programmers share their sparks for free, for intangible benefits like recognition, and also in exchange for receiving the sparks from others. Creators of small sparks could get a patent, but that takes effort and money, and current patent protections are not designed to reward small sparks of innovation. With very small innovations, a patent holder rarely gets any income from licensing—it is often easy for a large R&D lab to get around one small patent by inventing a slightly different solution. We should consider new government policies that would provide additional incentives for sharing small sparks; these policies could expand the number and size of collaborative webs dramatically.

B. Legalize Modding

In many areas—like mountain biking, videogame modding, or music sampling—many people create modifications for their own use and never share them. There are thousands of people like the extreme bike jumper who came up with a way to keep his pedals from spinning (Luthje, Herstatt, & von Hippel, 2002). One reason they do not share is that those modifications are often illegal. The U.S. Digital Millennium Copyright Act—designed to prevent users from making illegal copies of software, music, and movies—has the side effect of making it impossible to modify the products you purchase (The U.S. Digital Millennium Copyright Act, 1998). If a dedicated videogamer hacks into the game's code and changes the way the game plays, he is breaking the law. LEGO could have sued the engineers who hacked into their Mindstorms robotics control system and then wrote a new operating system (Koerner, 2006). But they realized that constant modification by many people in a collaborative web is what drives innovation, and they welcomed this user community.

C. Mandatory Licensing

Today, patent owners can license their technology to others, and copyright holders can license re-use of their media content. But they are not required to do this, and the licensing fees are not regulated. If a movie producer or an actor wants to charge an arm and a leg, you have to forget about using that film clip. And even when the owners are willing to license re-use, it can take a year or more to contact everyone with an ownership right, find out how much money they want, and get all of the release forms signed. As Stanford law professor Lawrence Lessig puts it, "the cost of complying with the law is impossibly high" (Lessig, 2004, p. 106). Patents owners should be required to license their technology, and pricing for the license should be removed from the patent owner, to prevent excessively high pricing that would interfere with the flow of ideas. Government law could specify a fixed rate (Lessig suggests one

percent of revenues), or perhaps an auction-like system would allow the true market for the idea to set the value of the license.

D. Pool Patents

One historically successful way to foster a collaborative web has been to pool patents. In the U.S. airplane industry, once the competitors got out of the courtroom and pooled their patents, innovation took off. With pooled patents, every company shares in the collective benefits of participating in the web. New laws could encourage the formation of such patent pools by requiring open access and non-discriminatory membership arrangements.

E. Encourage Industry-Wide Standards

Complex mechanical devices like typewriters, accordions, and adding machines never had a cross-industry standard. The Underwood typewriter had a completely different mechanism from the Remington, and innovations in one mechanism did not transfer to the others. As a result, innovation was extremely slow. One of the main reasons that technical innovation has proceeded so rapidly in the last forty years is the spread of industry-wide standards. With universal and shared standards in place, modular innovation takes off: anyone can attach a new innovation to the rest of the system, enabling the potential for complementary innovation. Proprietary ownership of a standard almost always reduces innovation. Ethernet won out over Token Ring because it was a more open standard; VHS won out over Betamax because Sony had a possessiveness mindset, and tried to retain control of the collaborative web (Burg & Kenney, 2003).

VIII.CONCLUSION

On balance, I believe that creativity research is on the side of the petitioner and that the Court's ruling was correct. But I have three concerns with the Court's decision. First, the decision suggests that "ordinary skill" and "ordinary creativity" cannot result in a patentable idea. Yet the psychology of creativity shows no clear cognitive distinction between so-called "ordinary" and "real" creativity, and the history of invention shows many cases where ordinary skill resulted in breakthrough innovation. The PTO and the courts will have great difficulty distinguishing between ordinary and real creativity.

Second, I remain concerned about the potential for hindsight in decisions about obviousness. The Court has rejected the TSM standard, and has restated that obviousness must be defined in terms of what a PHOSITA would consider obvious. An amicus brief filed by twenty-four law professors pointed out that much of a PHOSITA's knowledge is implicit craft knowledge that would not be written down and thus would

not show in any record of TSM. But after reading this amicus brief, my reaction was: are these twenty-four professors proposing that the way to determine obviousness is to conduct a poll of PHOSITAs? The problem, of course, is that the judgment of all PHOSITAs in an area could simultaneously be influenced by hindsight (for example, by a single article in a widely read trade journal). The benefit of the TSM standard is that it is less likely to be subject to hindsight, and I believe we need a new standard that can do the same. I am not sure that polling PHOSITAs would be sound legal practice, either.

The Court does not seem inclined to use the collective voices of PHOSITAs as the legally determining factor, however, and that leads me to my third and final concern: the Court's ruling that summary judgment—a decision without a court trial—could proceed in decisions about obviousness even in the presence of a technical dispute among experts: "The ultimate judgment of obviousness is a legal determination" (KSR International Co. v. Teleflex Inc., 2007, p. 1745). Even if one or more experts were willing to testify that the combination was nonobvious, does not mean the Court could nonetheless make a summary judgment that it was obvious. I understand the Court's motivation—it is worried that any patent holder will be able to find some expert somewhere willing to testify that there is a technical debate—but it makes me nervous that a court could make a ruling on nonobviousness that would overrule expert opinion. A court could take into account the existence of disputes among PHOSITAs in deciding whether or not summary judgment was appropriate, but even in the presence of a dispute, the court can still grant a summary judgment if the idea seems obvious, in the legal sense of the term, to them.

On the whole, I believe the Court's decision in *KSR v. Teleflex* has moved our IP regime closer to the research-based recommendations that I have made in this paper. An IP regime that too readily grants patent protection to simple combinations of existing ideas will block the natural flow of innovation, for two primary reasons. First, the use of an idea often is not obvious until later, when another entity proposes a problem which that idea can solve. Second, ideas are rarely useful in isolation, but instead only become useful when combined, usually in complex multi-part systems, with other ideas, and the obvious value of the idea does not become clear until later, when the complete system comes into view. I am glad to see patent law receiving this level of attention, and I expect the implications of *KSR* to unfold in interesting ways in the near future.

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