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Nanotechnology and Advanced Materials Patenting:
A Look Back to Adams and His Battery

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Abstract

KSR v. Teleflex came down in April of 2007 redefining the obviousness analysis with respect to the application of the teaching-suggestion-motivation test. The preferred question is now to ask whether the combination provides a predictable result in a predictable way. The origin of this inquiry is sourced in U.S. Supreme Court precedent. After *KSR* patent professionals should remember that *U.S. v. Adams* provides an exemplary case in which the patented technology was simple, yet found to be non-obvious. The Adams battery employed technology that required the patentee to ignore industry teachings in order to create the innovation. In

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advocating for patentability in the field of nanotechnology and advanced material sciences after *KSR*, patentees should understand *Adams* and when appropriate mimic its arguments.

I. Introduction

Following the U.S. Supreme Court's landmark ruling in *KSR International v. Teleflex*, on April 30, 2007, the patent law community has been abuzz[2]. For example, the U.S. PTO has issued guidelines for interpreting *KSR*, its application in patent prosecution, and is training its examiners on the same.[3] New appellate and district court rulings have already come out citing *KSR*.[4] Commentators continue to debate the appropriate role of the teaching-suggestion-motivation test (or "T-S-M test").[5] While the Court sought to create flexibility in the manner in which the T-S-M test is applied, the opinion at the same time reminds us that other pathways remain valid approaches for establishing non-obviousness.[6] In this article, we look at one important Supreme Court case cited in *KSR* – *U.S. v. Adams* – and the application of its simple but effective message today.[7]

The Court's treatment of the T-S-M test is especially relevant to patents in nanotechnology and related fields. Whereas previously the T-S-M test served as a gatekeeper, protecting patentability, after *KSR* the T-S-M test is but one of several ways in which an invention may be rendered obvious. The Court altered the rigid application of the T-S-M test stating that the test should only serve as one of many ways in which an invention may be rendered obvious, instead of the only way. It is not the case, after *KSR*, that an invention is patentable merely because there is no explicit teaching, suggestion or motivation to combine the disclosures of the prior art references found therein. In patent rich technological fields, where innovation typically occurs in small increments, the revamped application of the T-S-M test will have a significant impact.

Much of understanding the new standard involves understanding some of the older standards presented by the Court. The *KSR* opinion, for example, relies solely on aged Supreme Court precedent. The Court reiterated its own language from the *Adams* decision that came down in 1966. Highlighted in *Adams* and reinstated in *KSR*, is the "predictable results" test, as discussed hereinbelow, which demoted the T-S-M test and is now the leading standard by which obviousness should be determined. The teaching away doctrine – discussed in *Adams* as well – is given

2. 127 S.Ct. 1727 (2007).

3. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co v. Teleflex, Inc., 72 Fed. Reg. 57,526-57,535 (October 10, 2007).

4. *See e.g.*, McNeil-PPC v. Perrigo Co., 2007 U.S. Dist. LEXIS 50255 (S.D. NY Jul. 3, 2007)(invalidating a pharmaceutical patent after applying the predictable results test laid out in KSR); *Ex parte* Kubin, Case No. 2007-0819 (BPAI 2007)(finding the patent invention obvious to try in light of *KSR*); and Takeda Chemical v. Alphapharm, 2007 U.S. App. LEXIS 15349 (Fed. Cir. 2007)(finding the patented compound non-obvious after considering *KSR*, the predictable results test and the obvious-to-try standard).

5. *See e.g.*, Benjamin Borson., *KSR v. Teleflex, Inc.: The Supreme Court Revirus Obviousness*, 89 J. Pat. & Trademark Off. Soc'y 523 (2007); Dowd et al., *KSR International Co. v. Teleflex Inc.: Another Small Issue for Nanotechnology?*, Nanotechnology Law & Business (Fall 2007).

6. Other pathways include size-dependent unexpected results that can occur due to quantum effects and absence of an enabling method for producing nanoscale materials of certain properties, as discussed in Koppikar, Rutt & Maebius, *Current Trends in Nanotech Patents*, 1 Nanotechnology Law & Business, 1 at 24-30 (2004).

7. 383 U.S. 39 (1966).

greater significance as a mechanism by which patentability may be established.

The language of *Adams* is also reflected in the U.S. PTO *KSR* examination guidelines as *Adams* demonstrates a pathway to showing non-obviousness.[8] The guidelines rely on *Adams* for its language on the predictable results standard.[9]

> Note, that combining known prior art elements is not sufficient to render the claimed invention obvious if the results would not have been predictable to one of ordinary skill in the art. 'When the prior art teaches away from combining certain known elements, discovery of successful means of combining them is more likely to be non-obvious.'

It is important to understand the *KSR* opinion and its usage of cases like *Adams* as we move forward in building patent portfolios and avoiding potentially infringing activity.

2. The KSR Decision

The U.S. Supreme Court altered the Court of Appeals for the Federal Circuit's teaching-suggestion-motivation test in *KSR v. Teleflex*. Since, *Graham* – a companion case to *Adams*, the CAFC has required that the "movant establish some suggestion, teaching or motivation that would have led a person of ordinary skill in the art to combine the relevant prior art teachings in the manner claimed."[10] In a unanimous opinion written by Justice Kennedy, the Court changed the application of the T-S-M test because of its "narrow" scope – essentially obviating a patent only where the prior art taught specific encouragement to combine the prior art in the claimed manner. A more general question of whether the patentee would have found some predictable benefit in combining the prior art references is preferred by the Court.

A. Background on KSR

KSR v. Teleflex originated in the Eastern District of Michigan where Judge Zatkoff found the Teleflex patent (U.S. Pat. No. 6,237,565) invalid by reason of obviousness.[11] The *'565 Patent* regards an adjustable pedal assembly with electronic throttle control. Claim 4 of the *'565 patent* – the only claim at issue – requires that the electronic [throttle] control be mounted to the pedal support. Like the invention in *Adams*, the technology involved a relatively simple improvement to the prior art. The prior art included references teaching pedal assemblies with a pivot wire or cable-linked to throttle controls and references teaching an electronic control mounted to the support bracket using a potentiometer.

The CAFC vacated the District Court decision, highlighting the important role the T-S-M test plays in resisting the temptation to engage in impermissible hindsight while reviewing inventions for obviousness.[12]

8 Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co v. Teleflex*, Inc., 72 Fed. Reg. 57,526-57,535 at n.48 (October 10, 2007).

9 *Id.*

10 *See* KSR v. Teleflex, 119 Fed. Appx. 282 at 285, 2886 (Fed. Cir. 2005).

11 Teleflex Inc. v. KSR Int'l Co., 298 F. Supp. 2d 581 (E.D. Mich. 2003).

12 KSR v. Teleflex, 119 Fed. Appx. 282, *supra* at 7a citing *In re* Dembiczak, 175 F.3d 994 at 999 (Fed. Cir. 1999)("This is because '[c]ombining prior art references without evidence of such suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability—the essence of hindsight").

B. Away from the T-S-M Test and Towards the Predictable Results Test

In redefining the CAFC's T-S-M test, the Supreme Court stated that the better question to ask is whether the resulting combination provides a predicable benefit? ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). The U.S. Supreme Court found two major faults in the CAFC T-S-M test: (1) its focus on the problem the patentee was attempting to solve; and (2) "its assumption that a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem."[13] While the newly articulated test does not endorse obviating patents based on independent knowledge of each of the claimed elements in the prior art, it does broaden the available basis for undermining patentability turning the focus away from the motivations of the patentee/authors of the prior art and towards the "objective reach of the claim" and its predictable advantages.[14]

The U.S. Supreme Court obviated Claim 4 of the Teleflex patent based on the predictable benefits of making "pre-existing pedals work with new engines" and "tak[ing] an adjustable electronic pedal... and seek[ing] an improvement that would avoid the wire-chafing problem."[15] In the absence of objective evidence of non-obviousness, the *'565 Patent* was found invalid.[16]

C. Hindsight Addressed

With respect to hindsight, the Court stated the T-S-M test was unnecessary where "common sense" would have encouraged the inventor to combine teachings within the prior art.[17] "Rigid preventative rules that deny fact-finders recourse to common sense... are neither necessary under our current case law or consistent with it." Though the T-S-M test was helpful in the obviousness analysis, concerns about hindsight did not justify its rigid application according to the Court.

D. Teaching Away

One such pathway for arguing non-obviousness, upon which the *KSR* opinion favorably commented, is the "teaching away" approach. In *KSR*, the Supreme Court looked favorably on *Adam's* treatment of teaching away stating, "when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be non-obvious." The Court further tied in the relationship between the teach-away standard and demonstrating unpredictable results. "The fact that the elements [in *Adams*] worked together in an unexpected and fruitful manner supported the conclusion that Adam's design was not obvious to those skilled in the art."[18]

E. Obvious to Try

The Court rejected the CAFC's previous treatment of innovations that might have

13 KSR v. Teleflex, 127 S.Ct. 1727 at 1742.

14 *Id.* at 1741-42.

15 *Id.* at 1744-46.

16 *Id.* at 1746.

17 *Id.* at 1743.

18 *Id.* at 1740.

been obvious to try at the time of the invention. This is persuasive evidence of obviousness and might show that the invention is obvious under § 103.

> When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.

In any technological field where innovation is incremental and based on known engineering principles, many developments are arguably obvious to try. In the absence of some demonstration of teaching away or reliance on secondary considerations patentability becomes more difficult to establish/maintain after *KSR*.

III. The Adams Case

The *Adams* case presents unique significance to the non-obviousness analysis in the present day. The subject patent in *Adams* involved a relatively simple innovation that yielded unpredictable results. It is somewhat of a model case that favors patentability even in the face of a predictable results standard.

A. An "Untutored Simple Man" with "Creative Genius"[19]

The *Adams* case, now more than 40 years old, assessed the obviousness of a "wet battery." The battery was unusual because it contained water and different electrode materials than normal. In *Adams*, the Supreme Court found the invention to be non-obvious, even though each of the elements of the claims were known in the art. In *KSR*, the Supreme Court stated:

> When Adams designed his battery, the prior art warned that risks were involved in using the types of electrodes he employed. The fact that the elements worked together in an unexpected and fruitful manner supported the conclusion that Adam's design was not obvious to those skilled in the art.[20, 21]

Adams obtained U.S. Patent No. 2,322,210 to protect his invention. It was filed 11 days after Pearl Harbor and issued on June 22, 1943 (several weeks before the Allies landed in Sicily and 11 days after Himmler ordered liquidation of all Jewish

19 J. F. Witherspoon, Nonobviousness-The Ultimate Condition of Patentability, app. A-15. (J. F. Witherspoon ed., BNA Books 1978)(papers compiled in commemoration of the silver anniversary of 35 USC 103 providing transcript of oral argument at Supreme Court. Counsel said in closing argument) (1978)("Recognition by outstanding experts in the field of electrochemistry that this untutored simple man has made an important advance in the science of electrochemistry. ... I think this surely a work of creative genius, not merely skill of the art. Thank you.").

20 Adams v. U.S., 330 F.2d 622 at n.6 (Ct. Cl. 1964)("Adams first became interested in batteries in the summer of 1939. While employed at the New York World's Fair, he studied various battery theories at home, and conducted experiments using various types of electrodes and electrolytes in batteries. Finally, Adam discovered that when cuprous chloride was used in combination with magnesium and water, the result was an operable battery.").

21 *Id.* at 622 n.7. ("Adams continued experimenting, and in 1940, after accidentally dropping cigarette ashes into the cuprous chloride which he was making into a cathode, he discovered that the addition of carbon improved the battery by increasing the current and providing a substantially level (constant) potential. Subsequent experiments taught Adams that a small addition of magnesium chloride to the electrolyte would increase the speed of activation of the battery and that the addition of a small amount of magnesium sulphate helped to clean the electrodes.").

ghettos in Poland). The patent is an historic ode to simplicity: it has one page of drawings, just over one page of specification, and a half page of claims, totaling eleven.

In 1942, Adams disclosed the invention to the U.S. Army and the Navy Department. Both finally concluded that the battery offered great promise. Some initial review, however, the Government indicated it felt the battery did not work. The U.S. government subsequently used the Adams battery without authorization and litigation followed. The government claimed the patent was invalid over prior art for both lack of novelty and for obviousness.

B. The §103 Analysis in Adams

The validity of the patent was upheld in both the U.S. Court of Claims in 1964 and the Supreme Court in 1966.[22] U.S. Patent No. 2,322,210 to Adams involved a non-rechargeable electrical battery that included two electrodes – one made of magnesium and the other of a cuprous chloride material. The electrolyte was water-based and in some embodiments included salt water. While the basic idea of a battery was not novel at the time of invention, the type of electrode paired with a water-based electrolyte was novel. The Court considered six primary references presented by the Government.

All of the claimed elements were found in at least one of the references presented. However, the Adams patent was found valid as it yielded unexpected results.

> Despite the fact that each of the elements of the Adams battery was well known in the prior art, to combine them as did Adams required that a person reasonably skilled in the prior art must ignore that (1) batteries which continued to operate on an open circuit and which heated in normal use were not practical; and (2) water-activated batteries were successful only when combined with electrolytes detrimental to the use of magnesium.

Such teachings were found not to encourage, but actually deter their combination. While innovation in the face of disadvantages does not always lead to patentability "known disadvantages in old devices which would naturally discourage the search for new inventions may be taken into account in determining obviousness."[23]

Adams provides a roadmap for advocating for patentability in the face of an obviousness challenge. Presenting teachings that deter the combination of known elements, that the patentee must ignore, is an effective way of overcoming an obviousness assertion.

22 *See*, Adams v. U.S., 330 F.2d 622 (Ct. Cl. 1964); *See also*, U.S. v. Adams, 383 U.S. 39 (1966); During oral argument at the Supreme Court, the attorney for Adams, John Reilly, demonstrated the battery, using warm water so that it would work within the 30 minutes he was provided. *See*, J. F. WITHERSPOON, NONOBVIOUSNESS-THE ULTIMATE CONDITION OF PATENTABILITY, app. A-15. (J. F. Witherspoon ed., BNA Books 1978)(papers compiled in commemoration of the silver anniversary of 35 USC 103 providing transcript of oral argument at Supreme Court, Counsel said in closing argument)(1978). Counsel said, "Now I'll put in the water. Now I'm using warm water here hopefully so that this battery may activate before my 30 minutes are up." *Id.* at app. A-8.

23 *U.S. v. Adams*, *supra* note 22, at 52.

IV. *KSR's* Implications on Obtaining a Patent – U.S. PTO *KSR* Guidelines

The predictable results test and the *Adams* decision played a substantial role in the recently issued U.S. PTO examination guidelines for *KSR*.[24] The Guidelines list rationales to support rejections under §103 as well as examples of an applicant's rebuttal arguments.

A. Rationales to Support Rejections under §103

The PTO echoes language in *KSR* stating that there must be some articulated reasoning with rationale supporting the legal conclusion of obviousness. [25] Accordingly, Examiners should not issue a rejection without making explicit their grounds for rendering the invention obvious. Moreover, the examiner's grounds should be logically sound.

The PTO presents a non-exclusive list of seven rationales that may support a rejection under §103.

(A) Combining prior art elements according to known methods to yield predictable results;
(B) Simple substitution of one known element for another to obtain predictable results;
(C) Use of known technique to improve similar devices (methods, or products) in the same way;
(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
(E) 'Obvious to try' – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference to combine prior art reference teachings to arrive at the claimed invention.

Strikingly enough, the T-S-M test left the forefront of the obviousness analysis to being the last mentioned in the list of potential grounds for rendering an invention obvious.

Obvious to try is added as a legitimate grounds for rejecting an application where there are a finite number of predictable solutions. Chemical innovations involving the substitution of one element for the other that yield a predictable result now have a greater impediment to patentability. While the obvious-to-try standard previously provided insufficient grounds for undermining patentability, now it is added to the U.S. PTO's examination arsenal as viable grounds for rejecting claims under Section 103.

24 Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co v. Teleflex*, Inc., 72 Fed. Reg. 57,526-57,535 (October 10, 2007).

25 *Id.* at 57,529.

B. An Applicants Rebuttal Evidence

Unfortunately the PTO Guidelines on *KSR* more emphasized legal rationales for rejecting claims on the basis of obviousness but little attention was given to theories for non-obviousness. The *KSR* Guidelines confirmed that there are several manners in which the applicant can present rebuttal evidence of patentability. Secondary considerations (such as industry recognition, long-felt need and commercial success) remain persuasive as long as they are sufficiently linked to the claimed invention. The PTO presents three examples of rebuttal evidence that may be offered.

> Applicants may submit evidence or arguments to demonstrate that: (1) one of ordinary skill in the art could not have combined the claimed elements by known methods (e.g., due to technology difficulties); (2) the elements in combination do not merely perform the function that each element performs separately; or (3) the results of the claimed combination are unexpected.

Such exemplary evidence highlights the importance of the predictable results standard.

V. Lessons from Adams in Nanotechnology and Other Related Fields

Nanotechnology finds many applications in similar types of devices such as light emitting diodes, solar cells, fuel cells, sensors, transistors, supercapacitors, etc. In this new *KSR* regime, we advise nanotechnology applicants and patentees to focus when they can on an "*Adams* like" approach.

First, look for demonstrated advantages if not unexpected results. While the law does not require that an invention be physically reduced to practice, such inventions can more persuasively be argued as nonobvious in many instances. One question to ask is – does the invention provide a good story to tell?

One should also study the prior art and understand why the art teaches against what you are inventing and what long felt need is present. Indeed, the lawyer who argued for Adams in front of the Supreme Court (John A. Reilly) later said the following about how to learn from the case:

> You look into the art that defendant is putting in and you drive his art back in time. You run your own searches. If he puts in art and says that your level was old in 1965, and your cam was old in 1960, you run searches on the lever and the cam specifically and prove that the lever was old in 1900 and the cam was old in 1880. Thereby you'll show that when he's trying to show anticipation, you are showing patentability. You show that the means are so old that it couldn't possibly have been obvious or somebody would have put them together long before.
>
> And you must prove up the level of skill in the art, by patent searches and by literature searches, to prove basically that your inventor has triumphed where great minds and great names have labored without his result. Any you must prove up the acceptance of the invention and you can do that by

> looking for the use of the invention by either infringers or by others as part of devices to produce further inventions or other important results.[26]

These are good words and relevant to today's patent practice.

During prosecution at the U.S. PTO, many examiners and applicants (unnecessarily) restrict themselves to debating over art cited by the examiner. That art, however, is only the starting point. Applicants need to have a broader approach and cite art that helps their case when appropriate, even if the art is not cited by the examiner. Applicants should further cite to *KSR* and its approval of *Adams*. Declaration evidence on how your prior art teaches away and meets a long felt need may be particularly persuasive after *KSR*. These principles, of course, also apply to counseling, negotiation, and litigation.

Thus, the *KSR* opinion reinforces for us the notion that innovative nanotechnology will continue to be patentable when attention is focused on the proper analysis. At the same time, the *KSR* opinion creates flexibility for the manner in which the T-S-M test will be applied.

VI. Concluding Points

Adams did not broadly claim his invention. Rather, the claims were narrowly focused and therefore better withstood the invalidity challenge. Indeed, Adams could not prove that all of the products at issue in litigation infringed as he had to rely (unsuccessfully) on the doctrine of equivalents for some of the argument. Patentees must be realistic about the scope of what they have invented and can exclude (or regulate) others from doing.

Adams was but one case and obviousness is a complicated legal subject covering a blizzard of cases, past and present. In a post-*KSR* world, it may be a mistake to argue obviousness without considering the *Adams* approach. Many nanotechnology inventions find applications in energy devices such as batteries, making *Adams* particularly relevant to the fields of nanotechnology and advanced material sciences.