NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

IN RE: HUPING HU, MAOXIN WU,
Appellants

2019-2104, 2019-2105, 2019-2106, 2019-2107

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. 11/670,996, 11/944,631, 13/449,739, 13/492,830.

Decided: March 17, 2021

HUPING HU, MAOXIN WU, Stony Brook, NY, pro se.

MICHAEL S. FORMAN, Office of the Solicitor, United States Patent and Trademark Office, Alexandria, VA, for appellee Andrew Hirshfeld. Also represented by THOMAS W. KRAUSE, FARHEENA YASMEEN RASHEED.

Before NEWMAN, LOURIE, and STOLL, *Circuit Judges*.

NEWMAN, *Circuit Judge*.

Huping Hu and Maoxin Wu (collectively, "Hu" or "applicants") appeal four decisions of the U.S. Patent Trial and

Appeal Board ("PTAB" or "Board"),[1] affirming the final rejections of claims based on subject matter described as "quantum entanglement." Hu defines quantum entanglement as the entanglement of "quantum spins of photons, electrons and nuclei." U.S. Patent Application No. 11/944,631 ("the '631 application"), ¶ 3.

Hu states that "quantum spins of photons, electrons and nuclei have now been successfully entangled in various ways for purposes of quantum computation and communication." *Id.* In the four patent applications on appeal, quantum entanglement is said to occur when fundamental particles such as photons or electrons interact and become linked; whereby when the particles are moved apart and separated by distance, the molecules' mechanical states (such as their spin, momentum, and polarization) remain coupled, and if the state of one entangled particle is changed, its distant linked particle is instantaneously affected.

The U.S. Patent and Trademark Office ("PTO") summarizes the concept of quantum entanglement as the ability "to change the characteristics of one substance via the manipulation of a completely physically separate substance." PTO Br. at 4. Hu states that the inventors "have harnessed and developed quantum entanglement and nonlocal effects into useful technologies to serve the mankind

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[1] *Ex Parte Hu*, No. 2018-007211, 2019 WL 2285560 (P.T.A.B. May 16, 2019) ("the '631 Application); *Ex Parte Hu*, No. 2018-003120, 2019 WL 2255472 (P.T.A.B. May 16, 2019) ("the '996 Application); *Ex Parte Hu and Wu*, No. 2018-003401, 2019 WL 2255476 (P.T.A.B. May 16, 2019) ("the '830 Application); *Ex Parte Hu*, No. 2018-003398, 2019 WL 2255475 (P.T.A.B. May 16, 2019) ("the '739 Application). The four Board opinions are substantially identical in analysis.

in many areas, such as communication, engineering, health, medicine and recreation." Hu Br. at 5.

The four patent applications at issue are directed to various methods or apparatus for producing or using quantum entanglement. The patent applications are as follows:

U.S. Patent Application No. 11/944,631, filed Nov. 25, 2007 ("the '631 application")

The '631 application is titled "Method and Apparatus for Producing Non-Local Physical, Chemical and Biological Effects." The application states that it concerns the "method of producing . . . effects on physical, chemical and/or biological systems through quantum entanglement mediated processes, to apparatus for such productions, and to method of using the non-local effects for beneficial purposes." '631 application at ¶ 2. The '631 application states that: "One benefit of the present invention is that the physical and/or chemical properties such as pH values, temperatures and gravities of two or more quantum-entangled systems separated by arbitrary distances can be, in one broad embodiment, manipulated or modified for a desired purpose." *Id.* at ¶ 23.

The '631 application describes the method whereby, as a first step, a "certain volume of a liquid, gel, gas, solid or a composition thereof such as water" is quantum entangled by being "simply left alone at a desired temperature for a certain period of time before use." *Id.* at ¶ 46. This material is then divided into the target substance in a container at location A, and an originating substance in another container at location B. *Id.* at ¶¶ 47–49. The originating substance is then manipulated, and the effects are manifested in the target substance through quantum entanglement. *Id.* at ¶ 49. Claim 1 is deemed representative:

> 1. A method of producing a non-local effect in a target substance through manipulating an

> originating substance and detecting said nonlocal effect which comprises the steps of:
>
> selecting a substance which comprises said target substance and said originating substance;
>
> generating a plurality of quantum entanglements within a plurality of quantum entities in said substance by irradiating said substance with magnetic pulse, laser light or microwave, or letting said substance sit for at least thirty days;
>
> separating said substance into said target substance and said originating substance;
>
> positioning said target substance at a first location in a first stable environment and said originating substance at a second location in a second stable environment;
>
> cooling, heating or adding a third substance to said originating substance; and
>
> detecting with a high-precision instrument a change in weight, temperature and/or pH value of said target substance;
>
> whereby said non-local effect is produced through a non-local process mediated by said quantum entanglements and said non-local effect is said change in weight, temperature and/or pH value of said target substance.

J.A. 79. The '631 specification provides an example whereby the container with the originating substance is chilled by placement in liquid nitrogen, and the pH of the target substance in a container in another room is altered, due to quantum entanglement. '631 Application at ¶ 49.

The examiner rejected all of the '631 claims on appeal, *viz.* claims 1, 7, 9, 10, 16, 18, 19, 25, 27, and 70–81, on grounds of 35 U.S.C. § 101 as inoperative, and 35 U.S.C. § 112 as not enabled. The examiner stated to the Board:

> Appellant's disclosure and claimed invention that the weight, temperature and/or chemical

> properties (pH value) of an isolated target substance (e.g. water) can be changed by manipulating a separate "originating substance" (e.g. water) that is physically separated and isolated from the "target substance" is not credible and consequently fails the "useful invention" (utility) requirement of 35 U.S.C. 101 . . . Appellant's experiments and experimental data at paragraphs 83–99 of the written description fails to adequately disclose and describe the claimed subject matter in such a way as to enable one of ordinary skill in the art to practice the invention as claimed without undue experimentation. Moreover, the invention as claimed and described is incapable of functioning as claimed as set forth above; accordingly, the application fails to meet the enablement requirement.

'631 Application, Examiner's Answer at 2, 5. The Board affirmed, and Hu appeals, stating that the Board erred in law and fact.

U.S. Patent Application No. 13/449,739, filed April 18, 2012 ("the '739 application")

The '739 application is titled "Method and Apparatus for Producing Quantum Entanglement and Non-Local Effects of Substances," and is particularly directed to anesthetic and other medication effects. The specification describes the benefits of the claimed method:

> One benefit of the present invention is that a substance such as a medication can be repeatedly used to obtain a beneficial effect on a biological system without the said biological system physically consuming the said substance. A second benefit of the present invention is that the beneficial effect of a substance such as a medication can be, in one broad embodiment, delivered to a biological system such as a patient from a remote location of arbitrary distance. A third benefit of the present invention is

> that two parts of a quantum-entangled medium with one part being physically at one location and a second part being physically at another location of arbitrary distance can be, in one broad embodiment, used to transmit an encoded message.

'739 application at ¶ 24. The '739 application presents the example of administration of a general anesthetic by "applying magnetic pulses to a biological system such as the human brain when a substance such as a general anesthetic was placed in between caused the brain to feel the effect of said anesthetic for several hours after the treatment as if the test subject had actually inhaled the same." *Id.* at ¶ 9. Figure 1A is presented as illustrative of administration of an anesthetic:

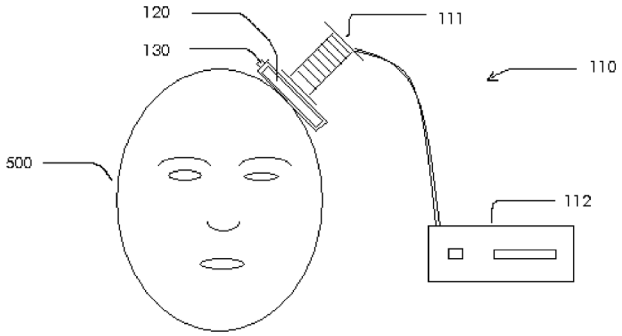

Fig 1A

The anesthetic is placed in a container outside the patient's head, and the container is attached to a magnetic coil connected to an audio system such as a radio. '739 application at ¶¶ 42–43. The Board described the method as "directing music toward that brain through a container of that anesthetic." '739 Application, Board Op. at *3. Claim 1 is deemed representative:

> 1. An apparatus for producing a plurality of quantum entanglements between a first plurality

> of quantum entities in a chemical substance and a second plurality of quantum entities in a human or animal, a non-local chemical effect of said human or animal on said chemical substance through said plurality of quantum entanglements and/or a non-local biological effect of said chemical substance on said human or animal through said plurality of quantum entanglements which comprises:
>
> a quantum-entanglement generating source which emits a plurality of quantum-entangling photons or magnetic pulses when said source operates;
>
> a first container for holding said chemical substance disposed next to said source; and
>
> said chemical substance in said container;
>
> such that when said first container is filled with said chemical substance is disposed next to said human or animal, and said source operates, said photons or magnetic pulses interact with said first plurality of quantum entities in said chemical substance and said second plurality of quantum entities in said human or animal generating said plurality of quantum entanglements, said non-local chemical effect through said plurality of quantum entanglements which comprises an effect of said human or animal on a chemical property or process of said chemical substance and/or said biological non-local effect through said plurality of quantum entanglements which comprises an effect of said chemical substance on a biological property or process of said human or animal.

J.A. 1990.

The Board affirmed the rejection of all of the claims of the '739 application, *i.e.*, claims 1–3, 6–8, 12, and 13 under 35 U.S.C. § 112 on grounds of written description, indefiniteness, and lack of enablement. Reviewing the application, the Board stated:

> [D]ue to the absence of any known scientific principles explaining how Appellant's invention could possibly operate in this manner, the absence of any cogent explanation in Appellant's Specification regarding the general principals or mechanisms causing this to occur, and the absence of any verifiable test data reasonably attributable to the purported result, the Examiner reasonably characterized Appellant's Specification as failing to satisfy the enablement requirement. . . . We find no explanation as to why ordinary and conventional audio produces any meaningful quantum entanglements and, even if it did, why they would have any meaningful effects on the pharmacological interaction between an anesthetic agent and the brain. . . . We are also not apprised of any data logically evincing such a pharmacological interaction has actually occurred.

'739 Application, Board Op. at *3 (footnote omitted).

The Board also affirmed the rejection under § 101, stating:

> The Examiner concludes claim 1 is directed to a natural phenomenon of generating quantum entanglements which, along with their interactions with a subject, are natural results of magnetic pulses or photons, and therefore falls within a judicial exception to subject matter eligible for patenting. . . . The Examiner considers the source and container limitations and determines they lack the particularity necessary for a machine, transformation, or useful application to bring the claim within the ambit of subject matter that is a patent-eligible practical application. . . . The Examiner's analysis, summarized above, is consistent with PTO guidance and stands essentially uncontroverted. Accordingly, we adopt the Examiner's

> position and sustain the § 101 rejection on the basis set forth by the Examiner.

Id. at *7, *9 (footnote omitted).

U.S. Patent Application No. 13/492,830, filed June 9, 2012) ("the '830 application")

The '830 application is titled "Method and Apparatus for Producing and Detecting Non-Local Effects of Substances," and, like the other applications, recites the "method for communicating between two remote locations through two parts of a quantum-entangled medium with one part being applied to a responsive target such as a particular biological, chemical or other system at one location and a second part being subsequently entangled with a particular substance representing a particular message through quantum-entangling members such as photons at a remote location of arbitrary distance." '830 application at ¶ 25. The '830 application describes non-local effects of medications, and presents the example where the physiological effects of the drug Primatene, a medication that includes a heart stimulant, are experienced by a remotely located person who did not consume the drug, based on microwave activated quantum entanglement. The specification provides the example where a solution of Primatene, containing the heart stimulant ephedrine, is exposed to microwave radiation in one room, and effects are felt by a person in a room about 50 feet away "in the form of rapidly increased heart rate for at least four (4) minutes in the range of 1-6 points (beats) or l.5%-10% above the fluctuating ranges of the baselines." *Id.* at ¶¶ 102–103, 120. Claim 5 is deemed representative:

> 5. A method of producing and detecting a second plurality of quantum entanglements between a third plurality of quantum entities in a first target and a fourth plurality of quantum entities in a second target, a first non-local effect of said second target on said first target through said second

plurality of quantum entanglements and/or a second nonlocal effect of said first target on said second target through said second plurality of quantum entanglements which comprises the steps of:

selecting said first target which comprises a first chemical substance, human or animal at a first location;

selecting said second target which comprises a second chemical substance, human or animal at a second location;

providing a first water-based medium at said first location and a second water-based medium at said second location, a first plurality of quantum entities in said first medium being in a first plurality of quantum entanglements with a second plurality of quantum entities in said second medium;

providing a detecting means for detecting said second plurality of quantum entanglements, said first non-local effect and/or said second non-local effect when said detecting means operates;

causing said first target to interact with said first water-based medium through a first contact or radiation from a first photon or magnetic pulse generating source;

causing said second target to interact with said second water-based medium through a second contact or radiation from a second photon or magnetic pulse generating source; and

detecting said second plurality of quantum entanglements, said first non-local effect and/or said second non-local effect;

whereby said second plurality of quantum entanglements between said third plurality of quantum entities in said first target and said fourth plurality of quantum entities in said second target is generated through said interaction between said third plurality of quantum entities in said first

> target and said first plurality of quantum entities in said first water-based medium and said interaction between said fourth plurality of quantum entities in said second target and said second plurality of quantum entities in said second water-based medium, and detected through said detecting means; and said first non-local effect of said second target on said first target, comprising a first effect of said second target on a first physical, chemical or biological property or process of said first target, and/or said second non-local effect of said first target on said second target, comprising a second effect of said first target on a second physical, chemical or biological property or process of said second target, are generated through said second plurality of quantum entanglements between said third plurality of quantum entities in said first target and said fourth plurality of quantum entities in said second target and detected through said detecting means.

J.A. 4391–93.

The PTAB held claims 5, 7–9, 11, and 12, all of the claims on appeal of the '830 application, unpatentable under. § 101 as inoperative and under § 112 as not in compliance with the written description requirement and not enabled. The Board stated:

> We agree with the Examiner's analysis, which raised reasonable doubts as to operability of Appellants' invention and the Specification's compliance with the enablement requirement. . . . The Specification provides a few examples of suitable sources and one example of a detecting method. However, claim 5 encompasses subject matter wherein anything capable of generating photons or magnetic pulses for causing quantum entanglements, whether known or unknown, described in

> Appellants' Specification or not, can be the source. . . . Even if we were to set aside the question of operability and assume that Appellants have demonstrated possession of a limited number of sources and at least one detecting technique, the scope of the right to exclude that would be granted by claim 5 would far exceed Appellants' contribution to the art—preempting the future before it has arrived . . . .

'830 Application, Board Op. at *4, *8. The Board adopted the Examiner's reasoning, and rejected the claims.

U.S. Patent Application No. 11/670,996, filed February 4, 2007 ("the '996 application")

The '996 application is titled "Method and Apparatus for Producing Quantum Entanglement and Non-Local Effects of Substances" and describes remote effects and producing quantum entanglements with laser light, reciting the following experiment:

> [L]aser light from the laser first passed through the large glassware filled with 200 ml tap water and then through the small glassware filled with a substance . . . located about 300 cm away. . . . After 30 min exposure to the laser light, a test subject consumed the treated tap water without being told the details of the experiments and report the biological and/or chemical effects felt for the next several hours.

'996 application at ¶ 79. Claim 1 is deemed representative:

> 1. A method of producing a plurality of quantum entanglements between a first plurality of quantum entities in a first target and a second plurality of quantum entities in a second target, a first non-local effect of said second target on said first target through said plurality of quantum entanglements and/or a second non-local effect of said first

target on said second target through said plurality of quantum entanglements which comprises the steps of:

selecting said first target ,which comprises a first chemical substance, water-based medium, human or animal;

selecting said second target which comprises a second chemical substance, water-based medium, human or animal;

providing a photon or magnetic pulse generating source, which emits a plurality of photons or magnetic pulses as quantum entanglement generating members when said source operates;

disposing said first target between said source and said second target or said second target between said source and said first target; and

driving said source to emit said photons or magnetic pulses which interact with said first plurality of quantum entities in said first target and said second plurality of quantum entities in said second target;

whereby said plurality of quantum entanglements between said first plurality of quantum entities in said first target and said second plurality of quantum entities in said second target is generated through said interactions of said photons or magnetic pulses as said quantum entanglement generating members with said first plurality of quantum entities in said first target and said second plurality of quantum entities in said second target; and said first non-local effect of said second target on said first target, comprising a first non-local effect of said second target on a first physical, chemical or biological property or process of said first target, and/or said second non-local effect of said first target on said second target, comprising a second non-local effect of said first target on a second physical, chemical or biological property or

> process of said second target, are generated through said plurality of quantum entanglements.

J.A. 5166–67. The Board held claims 1, 3–7, 11, 14, 18, 19, 23, 24, 32–34, 36, 37, 44 and 46 of the '996 application (all of the claims on appeal) unpatentable under § 101 as inoperative and § 112 as not enabled. The Board held that the described remote effects attributed to quantum entanglement were not substantiated by adequate evidence to meet the requirements of patentability. The Board also expressed skepticism as to the scientific premise of quantum entanglement.

DISCUSSION

The Board considered each application separately, and issued separate opinions. The applications were not all in the same art unit, and were processed by two examiners. We consolidated the four appeals for briefing and argument.

Hu argues that the examiners and the Board erred in examination procedure, for the burden of establishing unpatentability is on the PTO, and requires evidence based on prior art, knowledge, and analytic reasoning. Hu states that this burden is not met by skepticism and ignorance. Hu points to the absence of prior art, the absence of contrary knowledge, and the absence of contrary evidence.

Hu is correct that the burden is on the PTO to establish that the standards of patentability are not met. *See* 35 U.S.C. § 102 ("A person shall be entitled to a patent unless . . . ."). In implementation of the patent statute, on examination the PTO bears the initial burden of presenting a prima facie case of unpatentability. If that burden is not met, patentability is established. If it is met, the burden shifts to the applicant, to come forward with evidence and argument to rebut the prima facie case. *In re Piasecki*, 745 F.2d 1468, 1472 (Fed. Cir. 1984). In the back-and-forth of argument and explanation that characterizes patent

examination, the ultimate burden of showing unpatentability is on the PTO, as the statute requires. *In re Duvi*, 185 F.3d 885 (Fed. Cir. 1999) ("[T]he ultimate burden of establishing unpatentability is with the PTO."); *see also In re Oetiker*, 977 F.2d 1443, 1449 (Fed. Cir. 1992) (Plager, J., concurring) ("An applicant for a patent is entitled to the patent unless the application fails to meet the requirements established by law. . . . The burden is on the Commissioner to establish that the applicant is not entitled under the law to a patent. . . . [W]hen obviousness is at issue, the examiner has the burden of persuasion and therefore the initial burden of production. Satisfying the burden of production, and thus initially the burden of persuasion, constitutes the so-called prima facie showing. Once that burden is met, the applicant has the burden of production to demonstrate that the examiner's preliminary determination is not correct. The examiner, and if later involved, the Board, retain the ultimate burden of persuasion on the issue. . . . Thus on appeal to this court as in the PTO, the applicant does not bear the ultimate burden of persuasion on the issue.").

In three of the four applications no references were cited; in the '739 application the examiner rejected claims 1, 6, and 12 under § 102(b) as anticipated by a reference of Kiontke. In all four applications the examiners and the Board stated their reasons for doubting the efficacy of the claimed subject matter. An examiner summarized that the experimental report of changing the temperature or pH of one substance by manipulating a physically separate and distant second substance "violates the first law of thermodynamics," is "contrary to traditional understanding of chemistry," and "violates the classical laws of physics." '631 Application, Examiner's Answer at 3–4, 9. The examiner stated that the scientific principle of conservation of mass was violated by the asserted change of weight inside a closed container:

> Here appellant asserts that the weight of the isolated target substance in a closed container changes over time even though no more water is added or subtracted. With the force of gravity from earth a constant for a particular location, appellant's assertion that the weight of the target substance changes while at the same location without the addition or subtraction of water (or other matter) violates the established scientific principle of conservation of mass. Accordingly, appellant's assertions and claims regarding a change in weight of the target substance are not credible and the claimed invention lacks utility.

'631 Application, Examiner's Answer at 3. The examiner further stated that the enablement requirement was not met:

> Appellant's experiments and experimental data at paragraphs 83–99 of the written description fails to adequately disclose and describe the claimed subject matter in such a way as to enable one of ordinary skill in the art to practice the invention as claimed without undue experimentation. Moreover, the invention as claimed and described is incapable of functioning as claimed as set forth above; accordingly, the application fails to meet the enablement requirement.

Id. at 5. Hu responded that the examiner had no evidence or other support for these arguments, which are mere speculation and without foundation, and thus contrary to the rules of patentability, as well as not conforming to the requirements of patent examination and the placement of the burden of proof.

The Board sustained the rejection, stating that "the Examiner reasonably characterized Appellant's invention as being of an incredible nature." '631 Application, Board Op. at *4. Precedent supports such an examination rejection,

in an appropriate case. *See In re Cortright*, 165 F.3d 1353, 1357 (Fed. Cir. 1999) ("The PTO may establish a reason to doubt an invention's asserted utility when the written description 'suggest[s] an inherently unbelievable undertaking or involve[s] implausible scientific principles.'" (quoting *In re Brana*, 51 F.3d 1560, 1566 (Fed. Cir. 1995)) (alterations in original)).

The Board stated its skepticism of the claimed invention's operability, citing the absence of support in scientific principle and credible data:

> We have no doubt that if Appellant's invention is able to use quantum entanglement to alter the weight, temperature and/or pH value of a *first* substance by modifying only some other *second* substance that had previously been exposed to "magnetic pulses, laser light, or microwave," with the first substance it would be both groundbreaking and revolutionary . . . However, due to the absence of any known scientific principles explaining how Appellant's invention could possibly operate in this manner, the absence of any cogent explanation in Appellant's Specification regarding the general principals [sic] or mechanisms causing this to occur, and the absence of any verifiable test data reasonably attributable to the purported result, the Examiner reasonably characterized Appellant's invention as being of an incredible nature.

'631 Application, Board Op. at *4 (emphasis in original) (footnote omitted). We agree that the Board reasonably placed weight on the absence of scientific explanation of the announced effects of magnetic pulse, laser light, or microwave radiation, and "why spin or any other quantum property of entangled particles would bring about these types of changes in a remote, 'non-local' portion of a sample or substance." *Id.* The Board concluded:

> The Examiner provided a detailed analysis, citing various evidentiary sources, including, but not limited to, those submitted by Appellant, in considering the question of enablement, and the question of whether the claimed invention contravenes established scientific principles, as that question relates to the utility requirement. . . . We agree with the Examiner's analysis, which raised reasonable doubts as to operability of Appellant's invention and the Specification's compliance with the enablement requirement.

Id. at *3.

Hu argues on appeal that no authority supports the Board's theory that the claimed inventions are contrary to scientific principles and that the Board cited no authority for its conclusion. Hu provided twenty-five scientific publications by physicists concerning quantum entanglement, and five publications authored by Huping Hu and Maoxin Wu concerning observations such as those set forth in their patent applications. Hu states that the examiners and the Board "resort[ed] to speculation, unfounded assumptions or hindsight reconstruction." Hu Br. at 54 (quoting *In re Warner*, 379 F. 2d 1011, 1017 (C.C.P.A. 1967)). Hu states that physicists knowledgeable in the science of quantum mechanics would understand the principles of quantum entanglement, although the PTO examiners and the Board did not.

An examiner informed the Board that "the concept of quantum entanglement *per se* is not being disputed." '996 Application, Examiner's Answer at 7. An examiner observed that "[q]uantum entanglement has been observed momentarily in highly controlled experiments involving photons, electrons and more recently macroscopically in diamonds . . . conducted under extreme conditions that last for fractions of a second." '631 Application, Examiner's Answer at 11, 16. The examiners' rejections were based on

skepticism concerning Hu's application of quantum entanglement to produce the effects Hu described and claimed.

The Board found that the scientific articles cited by Hu did not provide a scientific basis for Hu's reports of physical or chemical or biological behavior attributed to quantum entanglement. We agree that this finding comports with the cited scientific articles.

The Board did not err in requiring Hu to establish the operability of his asserted discoveries, in view of the conflict with ordinary experience as well as with established scientific principles. *See Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1359 (Fed. Cir. 1999) (holding claims inoperable because they violate the principle of conservation of mass); *Newman v. Quigg*, 877 F.2d 1575 (Fed. Cir. 1989) (describing device as an operating perpetual motion machine violates the first or second law of thermodynamics); *In re Swartz*, 50 F. Appx 422, 424–25 (Fed. Cir. 2002) (claims to process said to implement "cold fusion" rejected as directed to an "unattainable result"). In *Swartz* the Board found that "results in the area of 'cold fusion' were irreproducible as of the filing date of this application, and that those skilled in this art would 'reasonably doubt' the asserted utility and operability of cold fusion." *Id.* at 424.

The PTO, as the nation's guardian of technologic invention, must be receptive to unusual concepts, for the core of invention is unobviousness. However, concepts that strain scientific principles are properly held to a heightened standard, typically measured by reproducibility of results. Here the Board was presented with an apparent departure from conventional scientific understanding, and the Board appropriately sustained the examiners' requirements for experimental verification. The Board applied a reasonable and objective standard, and acted reasonably in sustaining the examiners' requirements. Should further investigation

bring peer recognition and verifiable results, the PTO and the scientific community would surely be interested.[2]

We affirm the Board's holding, as to all four patent applications, that there is not scientific support for the claimed methods or apparatus, and that the experimental data and explanations are inadequate to support the novel results and scientific principles asserted by Hu. "When a claim requires a means for accomplishing an unattainable result, the claimed invention must be considered inoperative as claimed and the claim must be held invalid under either § 101 or § 112 of 35 U.S.C." *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 956 (Fed. Cir. 1983); *see also In re Milligan*, 101 F.3d 715 (Fed. Cir. 1996) ("[A]s we conclude as a matter of law that those of reasonable skill in the art would not find Milligan's contentions of utility credible, we must affirm [on the ground] of the lack of utility . . . .").

CONCLUSION

The Board's decisions in the four applications on appeal are affirmed, rejecting all of the claims on appeal.

AFFIRMED

COSTS

No costs.

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[2] There are more things in heaven and earth, Horatio,
Than are dreamt of in your philosophy.
W. Shakespeare, HAMLET, Act 1, Scene 5, ll. 166–67.