

**United States Court of Appeals
for the Federal Circuit**

ATI TECHNOLOGIES ULC,
Appellant

v.

**ANDREI IANCU, UNDER SECRETARY OF
COMMERCE FOR INTELLECTUAL PROPERTY
AND DIRECTOR OF THE UNITED STATES
PATENT AND TRADEMARK OFFICE,**
Intervenor

2016-2222, 2016-2406, 2016-2608

Appeals from the United States Patent and Trademark
Office, Patent Trial and Appeal Board in Nos. IPR2015-
00325, IPR2015-00326, IPR2015-00330.

Decided: April 11, 2019

AARON ROBERT FAHRENKROG, Robins Kaplan LLP,
Minneapolis, MN, argued for appellant. Also represented
by BRYAN MECHELL; DANIELLE ROSENTHAL, New York, NY.

THOMAS W. KRAUSE, Office of the Solicitor, United
States Patent and Trademark Office, Alexandria, VA, ar-
gued for intervenor. Also represented by FARHEENA
YASMEEN RASHEED, ROBERT J. MCMANUS.

Before NEWMAN, O'MALLEY, and WALLACH, *Circuit Judges*.

NEWMAN, *Circuit Judge*.

ATI Technologies ULC (“ATI”) appeals three final decisions of the Patent Trial and Appeal Board (“PTAB” or “Board”) on petitions for Inter Partes Review filed by LG Electronics, Inc. (“LGE”).¹ The Board held all but one of the challenged claims unpatentable as anticipated or obvious, invalidating claims 1, 2, and 5–7 of U.S. Patent No. 7,742,053 (“the ’053 patent”); claims 1–3, 5, 6, 8–11, 13, 15,² 17, and 18 of U.S. Patent No. 6,897,871 (“the ’871 patent”); and claims 1 and 2 of U.S. Patent No. 7,327,369 (“the ’369 patent”). Claim 20 of the ’871 patent was held patentable. The three patents are called the “Unified Shader Patents.”

Petitioner LGE cited references against each of the Unified Shader Patents, and ATI’s response was that the invention in each of the three patents preceded the primary reference dates for that patent. In conformity with 37 C.F.R. § 1.131 (“Rule 131”), ATI presented evidence of conception, reduction to practice, and diligence for each patent. The PTAB held separate trials, and received testimony and argument from both sides. The antedating

¹ *LG Electronics, Inc. v. ATI Techs.*, No. IPR2015-00325 (PTAB April 14, 2016) (“the ’053 Op.”); *LG Electronics, Inc. v. ATI Techs.*, No. IPR2015-00326 (PTAB June 28, 2016) (“the ’871 Op.”); *LG Electronics, Inc. v. ATI Techs.*, No. IPR2015-00330 (PTAB July 1, 2016) (“the ’369 Op.”). The cases were consolidated for this appeal. LG Electronics withdrew from the appeal and withdrew its cross-appeal, and the PTO Director intervened in support of the three PTAB decisions.

² Claim 15 of the ’871 patent is not challenged on appeal.

issue was treated in detail in the '053 opinion, and applied to the '871 and '369 patents in separate opinions.

For all three Unified Shader Patents, the PTAB held that conception was established before the primary reference dates, and that constructive reduction to practice occurred on the filing date of each patent. However, the PTAB held that ATI had not established actual reduction to practice and had not established diligence to constructive reduction to practice, for all three patents. The PTAB then invalidated the Unified Shader Patents based on the cited references.

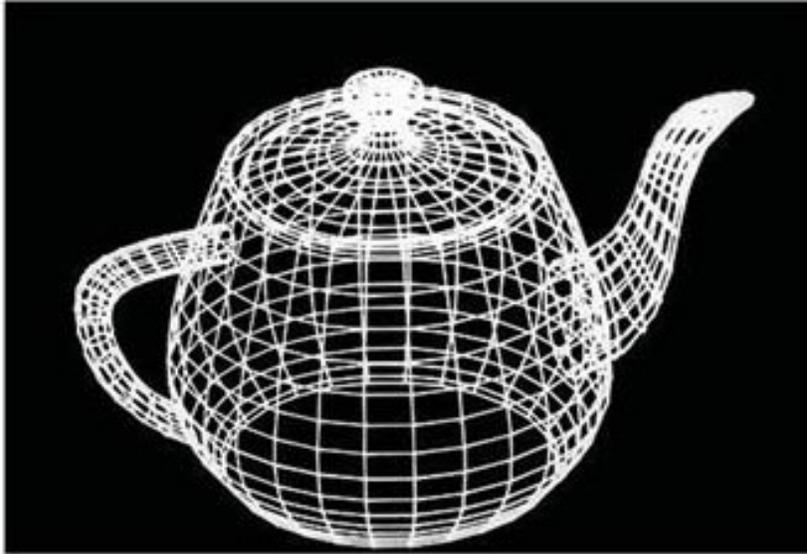
We conclude that the PTAB erred in its application of the law of diligence, and that on the correct law, diligence was shown, thereby antedating the relevant references. The PTO's decisions of unpatentability are reversed.

The technology

A "shader" as used in this field is a computer-implemented system that specifies how a computer-graphics three-dimensional image is generated and presented on a two-dimensional screen. The prior art describes that computer-graphics images are drawn on a screen by filling in a grid of dots called "pixels." Shapes are represented by a collection of simple polygons such as triangles or squares, called "primitives," formed by the interconnection of pixels. The corner of each primitive is called a "vertex," with each vertex defined by the spatial coordinates: x, y, and z.

Color and texture are applied to the individual pixels that comprise the shape, based on the location of the pixels within the primitive and the primitive's orientation relative to the generated shape. To orient the wireframe three-dimensional model, matrix transformations applied to vertices V_x , V_y , and V_z of the primitives generate new vertices V_x' , V_y' , and V_z' , which are then translated into pixels. The graphics processor interconnects the primitives and applies color and texture to the generated shapes. ATI

presented the following illustration of the graphics of display of a three-dimensional object as a two-dimensional image:



Dr. Wolfe Decl. at ¶¶ 44–45 (J.A. 5200–01); *see* '871 patent, col. 1, ll. 11–60.

Prior art processors required separate shaders to specify how and with what attributes a final image is drawn, in transforming primitives by adjusting the x, y, and z coordinates of their vertices. Prior art graphics processors required both a vertex shader and a pixel shader, because vertex operations and pixel operations have different processing requirements and were required to be performed separately and sequentially by separate shader systems. The Unified Shader Patents describe novel systems that perform both vertex operations and pixel operations, thereby providing enhanced efficiency, reliability, and speed.

Following is an outline of the Unified Shader Patents, and representative claims on appeal:

The '053 patent, inventors Laurent Lefebvre, Andrew E. Gruber, and Stephen L. Morein, filed Sept. 29, 2003

The '053 patent is the first-filed of the Unified Shader Patents. It describes a multi-thread (unified) graphics processing system that processes both vertex and pixel operations. The system employs a memory device for storing command threads and an arbiter for providing a command thread to a command processing engine, based on a priority plan whereby the command processing engine performs either vertex or pixel operations based on the command thread from the arbiter. The specification provides details of the system and its operation. Claim 5 was deemed representative for the '053 patent:

5. A graphics processing system comprising:

at least one memory device comprising a first portion operative to store a plurality of pixel command threads and a second portion operative to store a plurality of vertex command threads;

an arbiter, coupled to the at least one memory device, operable to select a command thread from either of the plurality of pixel command threads and the plurality of vertex command threads; and

a plurality of command processing engines, coupled to the arbiter, each operable to receive and process the command thread.

The PTAB cited three primary references against the '053 patent: U.S. Patent No. 7,363,472 ("Stuttard") having an effective filing date of October 9, 2001; U.S. Patent No. 7,015,913 ("Lindholm") having an effective filing date of June 27, 2003; and U.S. Patent No. 7,233,335 ("Moreton") having an effective filing date of April 21, 2003.

ATI presented evidence of conception before the earliest reference filing date of October 9, 2001 (Stuttard), and

evidence of continuing activity until the '053 patent's effective filing date of September 29, 2003. The PTAB held that "ATI has demonstrated by a preponderance of the evidence that the named inventors of the '053 patent conceived the claimed system no later than August 24, 2001, prior to the U.S. filing dates of Stuttard, Moreton, and Lindholm." '053 Op. at 16–17. The dates of conception and constructive reduction to practice are not disputed on appeal.

However, the PTAB held that diligence and actual reduction to practice had not been shown, and on this basis the PTAB held claims 1, 2, and 5–7 of the '053 patent unpatentable on the following grounds: (1) claims 5–7 as anticipated by the Moreton reference; (2) claims 1 and 2 as obvious over Moreton combined with Whittaker (U.S. Patent No. 5,968,167); (3) claims 1, 2, and 5–7 as obvious over Lindholm in view of Admitted Prior Art; and (4) claims 1, 2, and 5–7 as obvious over Stuttard in view of Admitted Prior Art.

LGE has withdrawn from the appeal, and the PTO Director has intervened and argues in support of the PTAB's holdings that diligence and actual reduction to practice were not established, and thus that the references were not antedated.

The '871 and '369 patents, inventors Steven Morein, Laurent Lefebvre, Andy Gruber, and Andi Skende, filed November 20, 2003

The '871 and the '369 patents have a common specification and priority filing date of November 20, 2003. Both patents are directed to a graphics processor employing a unified shader capable of performing both vertex operations and pixel operations, and describe and claim specific embodiments. Figure 4A is a schematic of the overall process, and is included in '871 and the '369 Patents:

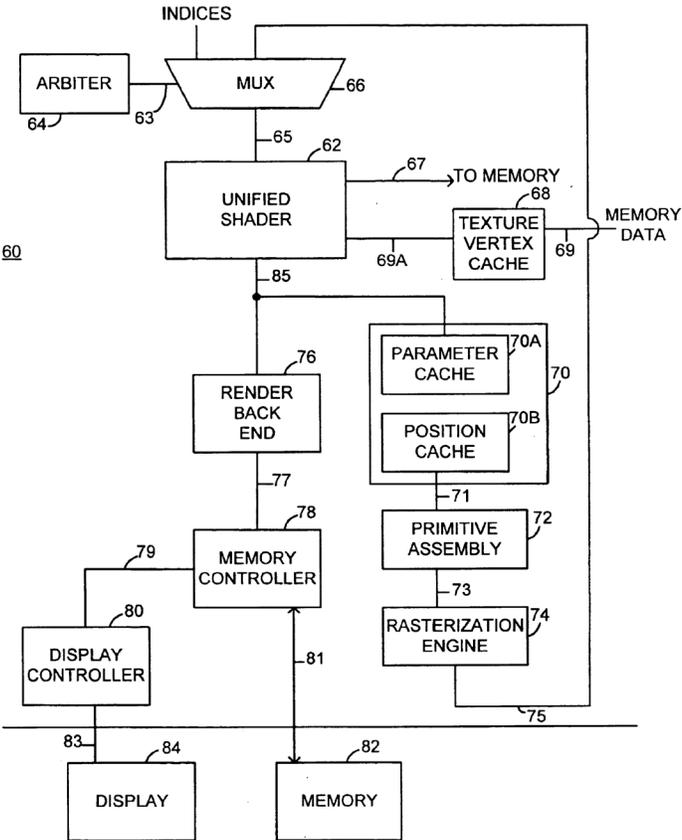


FIG. 4A

As described in the patents, the graphics processor 60 includes a multiplexer 66 with a first and a second input, whereby vertex data are provided at a first input, and interpolated pixel parameter data and attribute data from a rasterization engine 74 are provided at a second input. The arbiter 64 generates a control signal that is transmitted to the multiplexer 66, determining the inputs transmitted to the unified shader 62.

Lindholm is the only primary reference cited against the '871 and '369 claims on appeal.

The '871 patent

The '871 patent adds to the '053 patent the structural elements of a unified shader architecture, including an arbiter and selector for determining which vertex or pixel inputs the unified shader will process. The shader is “more computationally efficient because it allows the shader to be flexibly allocated to pixels or vertices based on workload.” '871 patent, col. 2, ll. 64–67. Claim 1 was deemed representative:

1. A graphics processor, comprising:
 - an arbiter circuit for selecting one of a plurality of inputs in response to a control signal; and
 - a shader, coupled to the arbiter circuit, operative to process the selected one of the plurality of inputs, the shader including means for performing vertex operations and pixel operations, and performing one of the vertex operations or pixel operations based on the selected one of the plurality of inputs, wherein the shader provides a appearance attribute.

The PTAB again held that ATI had established conception before the applicable reference date, but had not established actual reduction to practice and had not established diligence to constructive reduction to practice, stating that “Patent Owner relies [on] the same evidence and substantially the same arguments in the present review and in IPR2015–00325 in support of its efforts to antedate Lindholm.” '871 Op. at 3.

Thus the PTAB held claims 1, 2, 5, 8, 10–11, 13 and 15 of the '871 patent unpatentable as anticipated by Lindholm, claims 3 and 6 unpatentable as obvious over the combination of Lindholm and Open GL, and claims 9, 17, and

18 unpatentable as obvious over the combination of Lindholm and Kizhepat. The PTAB alternatively held claim 15 unpatentable as obvious over a reference to Rich.

The PTAB held claim 20 patentable, and LGE's cross-appeal on claim 20 has been withdrawn.

The '369 patent

The '369 patent adds a vertex storage block to the unified shader system. The '369 patent further generates a color associated with a specific pixel. Claims 1 and 2 are the only claims in the '369 patent:

1. A graphics processor, comprising:

an arbiter circuit for selecting one of a plurality of inputs in response to a control signal;

a shader, coupled to the arbiter circuit, operative to process the selected one of the plurality of inputs, the shader including means for performing vertex operations and pixel operations, and performing one of the vertex operations or pixel operations based on the selected one of the plurality of inputs, wherein the shader provides a appearance attribute;

a vertex storage block for maintaining vertex information;

wherein the vertex storage block further includes a parameter cache operative to maintain appearance attribute data for a corresponding vertex and a position cache operative to maintain position data for a corresponding vertex; and

wherein the appearance attribute is color, and the color is associated with a corresponding pixel when the selected one of the plurality inputs is pixel data.

2. The graphics processor of claim 1 wherein the appearance attribute is position, and the position attribute is associated with a corresponding vertex when the selected one of the plurality of inputs is vertex data.

The PTAB again held that conception and constructive reduction to practice had been established, but that actual reduction to practice and diligence had not been shown. On this ground, the PTAB held the '369 claims unpatentable over Lindholm and OpenGL.

DISCUSSION

Standard of review

The PTAB's findings of fact are reviewed for support by substantial evidence, and plenary review is accorded the PTAB's conclusions of law. "[S]ubstantial evidence' review involves examination of the record as a whole, taking into account evidence that both justifies and detracts from an agency's decision." *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000). "[T]he Board's opinion must explicate its factual conclusions, enabling us to verify readily whether those conclusions are indeed supported by 'substantial evidence' contained within the record." *Id.* at 1314. "That record, when before us, is closed, in that the Board's decision must be justified within the four corners of that record." *Id.*

Antedating a Reference — 37 C.F.R. §1.131

Rule 131 is called the "swearing back" or "swearing behind" provision. *See generally* Manual of Patent Examining Procedure ("MPEP") § 715 (9th ed. Jan. 2018). It applies to references that may be prior art, but that do not claim the same invention.³ The standards for whether the

³ Prior to March 16, 2013, patents or applications on the same invention were placed into "interference" for

subject matter in a reference has been antedated are stated in Rule 131:

(a) When any claim of an application or a patent under reexamination is rejected, the applicant or patent owner may submit an appropriate oath or declaration to establish invention of the subject matter of the rejected claim prior to the effective date of the reference or activity on which the rejection is based.

(b) The showing of facts for an oath or declaration under paragraph (a) of this section shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective date of the reference coupled with due diligence from prior to said date to a subsequent reduction to practice or to the filing of the application.

Accordingly, pursuant to Rule 131(b), the applicant bears the burden of proof to establish either: (1) prior reduction to practice; or (2) prior conception “coupled with due diligence.” *In re Steed*, 802 F.3d 1311, 1316 (Fed. Cir. 2015). “Demonstration of such priority requires documentary support, from which factual findings and inferences are drawn, in application of the rules and law of conception, reduction to practice, and diligence.” *Id.* Indeed, Rule 131(b) expressly provides that: “[o]riginal exhibits of drawings or records, or photocopies thereof, must accompany and form part of the affidavit or declaration or their absence must be satisfactorily explained.”

It is undisputed that ATI conceived of the patent claims before the primary reference filing dates. As explained

determination of the first inventor. Since March 16, 2013, only the application with the earlier filing date is granted. MPEP § 2301.04.

below, we find that ATI demonstrated diligence through constructive reduction to practice as to the three Unified Shader Patents. Given this conclusion, we need not review the PTAB's rulings concerning actual reduction to practice. These rulings are vacated.

The Standard for Diligence

The diligence requirement implements the principle that, to antedate a reference, the applicant must not only have conceived the invention before the reference date, but must have reasonably continued activity to reduce the invention to practice. The court summarized the law with respect to “due diligence” for purposes of Rule 131:

A patent owner need not prove the inventor *continuously* exercised reasonable diligence throughout the critical period; it must show there was *reasonably continuous* diligence. See, e.g., *Tyco Healthcare Grp. v. Ethicon Endo-Surgery, Inc.*, 774 F.3d 968, 975 (Fed. Cir. 2014); *Monsanto*, 261 F.3d at 1370. Under this standard, an inventor is not required to work on reducing his invention to practice every day during the critical period. See *Monsanto*, 261 F.3d at 1369. And periods of inactivity within the critical period do not automatically vanish a patent owner's claim of reasonable diligence.

Perfect Surgical Techniques, Inc. v. Olympus Am., Inc., 841 F.3d 1004, 1009 (Fed. Cir. 2016) (emphases original).

“An inventor's testimony regarding his reasonable diligence must be corroborated by evidence.” *Id.* at 1007; see *Price v. Symsek*, 988 F.2d 1187, 1194 (Fed. Cir. 1993). The burden of proving diligence is on the party asserting the benefit of diligent activity, in this case the benefit of the Rule 131 “swearing back” provision. See *In re Steed*, 802 F.3d 1311, 1316 (Fed. Cir. 2015) (“Steed bears the burden to establish ‘facts ... in character and weight, as to establish

reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective date of the reference coupled with due diligence from prior to said date to a subsequent reduction to practice or to the filing of the application.’ 37 C.F.R. § 1.131(b)”; *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016) (“[A] patentee bears the burden of establishing that its claimed invention is entitled to an earlier priority date than an asserted prior art reference.”); *see also Perfect Surgical*, 841 F.3d at 1007 (Fed. Cir. 2016) (“Pre-AIA section 102(g) allows a patent owner to antedate a reference by proving earlier conception and reasonable diligence in reducing to practice.”); *Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1578 (Fed. Cir. 1996) (“Where a party is first to conceive but second to reduce to practice, that party must demonstrate reasonable diligence toward reduction to practice from a date just prior to the other party’s conception to its reduction to practice.”). “A ‘variety of activities’ may corroborate an inventor’s testimony of reasonable diligence and such corroborating evidence is considered ‘as a whole’ under a rule of reason.” *Perfect Surgical*, 841 F.3d at 1007–08 (quoting *Brown v. Barbacid*, 436 F.3d 1376, 1380 (Fed. Cir. 2006)).

ATI stated that the PTAB applied an incorrect definition of diligence, and LGE so conceded in its brief before it withdrew from this appeal. The Director instead describes as “boilerplate” the PTAB’s erroneous definition. However, it was not boilerplate, for the PTAB appeared to find a dispositive difference between “continuous reasonable diligence” and “reasonably continuous diligence,” despite the documentary evidence of activity by ATI on “every business day.” We conclude that the PTAB applied the wrong legal standard for diligence. As explained below, under the proper legal standard, the record is clear that ATI exercised the requisite “reasonably continuous diligence.” *See Perfect Surgical*, 841 F.3d at 1009.

Diligence — Declarations and Documents

Inventor Laurent Lefebvre described conception and activities developing the technology in the three Unified Shader Patents. His 60-page Declaration describes his and the other inventors' and other ATI employees' activities on this project (designated the R400 project), and was accompanied by "almost 1300" pages of documentary records showing the work done and by whom and when, including metadata, document logs, and folder histories. J.A. 2628–88; J.A. 2689–3943; J.A. 3994–4312.

Mr. Lefebvre explained that as the Unified Shader project evolved, ATI increased the number of employees until "ATI assigned over one hundred project managers/designers to implement and test the R400 . . . [and] at least one person on the R400 project team worked on the R400 design every non-holiday business day." '053 patent Lefebvre Decl. ¶¶ 38–43 (J.A. 2650–54). He explained the development of the technology, and identified the records as the project evolved. He explained that the employees were required to save their work in a revision-control system called Perforce that maintains metadata, and he referenced the relevant documentary records and provided summaries of the various aspects to which employees were assigned, and records in document logs and folder histories.

"Metadata" are data about changes in files, source codes, edits, logs of access of files, time and date stamps, user, changes made, etc. Calvin Watson Decl. ¶¶ 7–10 (J.A. 7906–07). The metadata include information concerning revisions, including who made the revision and the date each revision was made. '053 patent Lefebvre Decl. ¶ 39 (J.A. 2650). Mr. Lefebvre provided a calendar summarizing the metadata documentation, showing what activities were performed on what dates. *Id.* ¶¶ 41–43 (J.A. 2654); Section V (J.A. 2660–85) (calendar summarizing Perforce folder history entries).

Mr. Lefebvre explained that ATI employees used the R400 Sequencer Specification to write emulation code and RTL [register-transfer level] code for the R400's functional blocks, and testing the R400's functional blocks. The documentation included documents recording metadata on the R400 Sequencer Emulator Folder History, Ex. 2048 (18 pages) (J.A. 3994–4012); Sequencer Parts Development Folder History, Ex. 2049 (33 pages) (J.A. 4013–46); R400 Document Library Folder History, Ex. 2050 (110 pages) (J.A. 4047–4157); R400 Architecture Folder History, Ex. 2051 (26 pages) (J.A. 4158–84); and R400 Testing Folder History, Ex. 2052 (127 pages) (J.A. 4185–4312). Mr. Lefebvre stated that:

This metadata is not exhaustive of all sequencer/shader-pipe files that were edited during this timeframe. But this metadata shows work that was necessary for implementing the R400 design. Specifically, this metadata shows the design, development, and testing of the R400 sequencer and graphics blocks.

'053 patent Lefebvre Decl. ¶ 42 (J.A. 2654).

Summarizing the information in the documents, Mr. Lefebvre classified the ongoing activities as they applied to the three Unified Shader patents, for the following periods: (1) from prior to the Stuttard reference's filing date of October 9, 2001 to the '053 patent's filing on September 29, 2003; (2) from prior to the Moreton reference's filing date of April 21, 2003 to the '053 patent's filing date of September 29, 2003; (3) from prior to the Lindholm reference's filing date of June 27, 2003 to the '053 patent's filing date of September 29, 2003; (4) from prior to the Lindholm reference's filing date of June 27, 2003 to the '871 patent's filing date of November 20, 2003; and (5) from prior to the Lindholm reference's filing date of June 27, 2003 to the '369 patent's filing date of November 20, 2003. '053 patent Lefebvre Decl. ¶¶ 41–43 and Part V (Ex. 2006) (J.A. 2654;

J.A. 2660–85); '871 patent Lefebvre Decl. ¶¶ 41–43 and Part V (Ex. 2006) (J.A. 8001; J.A. 8007–34).

Mr. Lefebvre testified that “[f]or me and many of the other project managers/designers, the R400 was the only project that most of us were assigned to—it was our full-time responsibility. . . . [and] any time that we did work for ATI between late 2001 and the end of 2003, that work would have been on the R400.” '871 patent Lefebvre Decl. ¶ 43 (J.A. 8001). Mr. Lefebvre further testified his “analysis [of this metadata] shows that at least one person on the R400 project team worked on the R400 design every non-holiday business day from early 2002 (when we conceived of the invention) until November 20, 2003 (the effective filing date of the '871 patent).” *Id.* ¶ 41. Mr. Lefebvre states that he updated the R400 Sequencer Specification every two to three weeks as the team worked to add or remove data. '053 patent Lefebvre Decl. ¶ 36 (J.A. 2649).

ATI’s expert witness, Dr. Wolfe, reviewed the records and summarized their content, submitting a Declaration and appearing as a witness before the PTAB. Dr. Wolfe’s testimony concentrated on actual reduction to practice, and included additional exhibits as well as some of the same exhibits (e.g., Ex. 2010), as well as mapping the RTL Code to the claims. Ex. 2106 (J.A. 4702–4882).

During the trial and at the final hearing the PTAB raised no question about any of the evidence as to any of the claimed inventions; nor had LGE done so. No inquiry was made to any witness as to any fact or date or statement or document. However, in its Final Written Decision the PTAB held that diligence had not been established as to any of the three Unified Shader Patents, the PTAB ruling that “ATI fails to provide evidence that is specific both as to facts and dates for each of the three critical periods.” '053 Op. at 43.

The PTAB Decision

The PTAB decision mentions two aspects as showing failure of proof of diligence: (1) that “Mr. Lefebvre redesigned the R400, after the conception date, to include an optional feature that is not recited in the claims at issue,” ’053 Op. at 44; and (2) that “ATI fails to provide a reasonable way for us to determine whether unexplained lapses have not occurred.” *Id.* at 53.

The “optional feature” aspect was focused on a “second chip design,” the PTAB stating that Mr. Lefebvre had not provided a “meaningful explanation as to which activities listed in the metadata are directed to the second chip design,” ’053 Op. at 45. The PTAB criticized that “ATI’s calendar, metadata, document logs, and folder histories (nearly 1,300 pages) are not self-explanatory and do not explain meaningfully as to which tasks are reasonably necessary for reducing the claimed elements to practice, and which tasks are directed toward developing and testing other chip designs and optional features.” *Id.* at 41–42. The PTAB dismissed the entirety of the evidence, stating that “work done for the entire R400 project includes developing and testing other chip designs and optional features to improve graphic processing systems generally, and not merely for the claimed elements.” *Id.* at 42.

The trial record shows no inquiry of any witness, asking about lapses in activity related to the Unified Shader. In its Final Written Decision the PTAB refers to Lefebvre’s information that ATI worked to increase the capability of the product to meet the criteria of a potential customer for the Unified Shader, identified as Microsoft. The PTAB appears to have held that this work defeated diligence, although the PTAB did not state or suggest that this work was not within the Unified Shader patents. Nor does the PTAB propose that any of the work documented in the 1300 pages of exhibits is outside of the claims. Rather, the PTAB

complains that ATI did not identify “unexplained lapses” in the shader activity. *Id.* at 53.

Diligence is not negated if the inventor works on improvements and evaluates alternatives while developing an invention. *In re Jolley*, 308 F.3d 1317, 1328 (Fed. Cir. 2002) (“[W]e decline to adopt a rule that evidence of diligence *must* be excluded if there is any possibility that it could be construed in support of an invention beyond the reach of the count.” (emphasis original)). Here, neither LGE (before its withdrawal) nor the PTAB points to even such possibility — to the contrary, Lefebvre testified that over 100 ATI employees worked on this project.

Mr. Lefebvre’s Declaration traced the development of this technology, and explained the significance of the various stages. He testified that the first “triangle test” demonstrated that they had successfully designed software that performed the unified shader operations, but that additional effort was required to perfect the operations. He testified that “after you are done with the single triangle you need to continue working . . . [because] it’s not a sign that you can productize a chip. In order to have something you can productize, you have to run these thousand other tests.” Ex. 1035 at 143:20–144:22 (J.A. 2060–61) (Deposition Transcript of Mr. Lefebvre).

The PTAB identified no delays, no gaps in activity. Rather, the PTAB complained that Lefebvre had not identified any “unexplained lapses.” It is correct that Mr. Lefebvre identified daily activity, not lapses. The Director as Intervenor quotes the PTAB statements that ATI was working on “unclaimed features,” but the Director, like the PTAB, does not explain or identify any such features. *See Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 1323 (Fed. Cir. 2015) (the Board must “fully and particularly set out the bases upon which it reached [its] decision”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1382 (Fed. Cir. 2016) (“[T]he PTAB must make the necessary findings and have an

adequate ‘evidentiary basis for its findings.’”) (quoting *In re Lee*, 277 F.3d 1338, 1344 (Fed. Cir. 2002)).

On appeal, we are directed to no view of the evidence that could support a conclusion that ATI set aside the development of the Unified Shader. The PTAB cited no basis for finding that this technology was not being diligently pursued. The Director seeks to excuse the PTAB’s absence of support for its holding, by stating that ATI bears the burden of proof of diligence. However, the Director does not explain where the burden of proof was not met, upon the extensive evidence of daily activity. LGE provided no evidence to the contrary; the LGE argument was that ATI could have filed its patent applications at an earlier stage of development, and that continuing activity to develop a satisfactory product does not count as diligence. Precedent is not in accord; the purpose of the diligence requirement is to show that the invention was not abandoned or set aside. *See Perfect Surgical*, 841 F.3d at 1009 (explaining that the “point of the diligence analysis . . . is to assure that, in light of the evidence as a whole, ‘the invention was not abandoned or unreasonably delayed’”). Here, the Director does not point to the remotest suggestion of abandonment or setting aside of the Unified Shader technology.

The Director as Intervenor cites no support for the PTAB’s decisions, but merely quotes the PTAB’s statement that the testimony of Lefebvre is “vague and not sufficiently corroborated by independent evidence,” ’053 Op. at 42. The Director does not mention the 1300 pages of corroborative documents. Although the Director states in his Intervenor’s brief that there is an “unexplained delay” before the ’053 application was filed, Dir. Br. 52, the Director does not elaborate.

Instead, the Director presses the argument that ATI should have filed its patent applications sooner. The Director states that: “At bottom, the problem was ATI’s failure to ‘explain why the team of engineers and designers

could not have designed, built, and tested a chip embodying the claimed elements, without those optional features,” Dir. Br. 56, quoting PTAB ’053 Op. at 52–53. The Director states that to show diligence “the work relied on must ordinarily be directly related to reduction to practice of the invention.” Dir. Br. 56 (quoting *Naber v. Cricchi*, 567 F.2d 382, 385 (CCPA 1977)). The ensuing sentence states that

work in preparation for filing related patent applications may suffice (e. g., *Rey-Bellet v. Englehardt*, 493 F.2d 1380, 181 USPQ 453 (Cust. & Pat. App. 1974)), as may work required to develop a first invention in order to develop or reduce to practice a second invention (e. g., *Keizer v. Bradley*, 270 F.2d 396, 47 CCPA 709, 123 USPQ 215 (1959); *Thompson v. Dunn*, 166 F.2d 443, 35 CCPA 957, 77 USPQ 49 (1948)).

Id. The principles underlying the law of diligence have long been recognized:

No general standard, by which diligence can be estimated, has been established by the law, nor, in the nature of things, is such a standard possible. It must be reasonable, under all the circumstances of the particular case in question. The character of the invention; the health, the means, the liberty of the inventor; his occupation upon kindred or subordinate inventions, — are proper subjects for consideration. Such reasonable diligence does not involve uninterrupted effort, nor the concentration of his entire energies upon this single enterprise.

1 Robinson on Patents § 387, at 548–49 (1890).

The Board criticized ATI for “fail[ing] to provide a reasonable way for us to determine whether unexplained lapses have not occurred.” ’053 Op. at 53. Neither LGE nor the Board raised a question of “unexplained lapses” at trial, or requested additional information concerning

corroboration. Although the Board also faulted ATI's presentation as "not explain[ing] meaningfully the nature of the work" that was being done, '053 Op. at 51, the Board did not inquire of any witness as to the nature of the work. In contrast, for example, a Board member asked counsel what a "tape out" is, as that usage appeared in the documents. Oral Hr'g. Tr. 76–78. The record does not show objection by LGE to the adequacy of the documentation.

The PTAB did not separately explain its ruling of absence of diligence for the '871 and '369 patents, where the periods were three and six months, respectively. The PTAB simply referred to its '053 patent decision, and stated that "Patent Owner relies [on] the same evidence and substantially the same arguments in the present review and in IPR2015–00325 in support of its efforts to antedate Lindholm. . . . [I]n IPR2015-00325, the panel determined that Patent Owner had not antedated Lindholm. . . . In view of the determination that Patent Owner has not antedated Lindholm . . . we conclude that" the challenged claims are unpatentable. '871 Op. at 3; *see* '369 Op. at 8–9 ("Patent Owner relies on the same evidence and substantially the same arguments in the instant proceeding and in IPR2015-00325, in support of its efforts to antedate Lindholm. . . . To the extent necessary, we incorporate here the discussion of the antedating of Lindholm from the Final Written Decision of IPR2015-00325 by reference.").

During the '871 and '369 patent trials, Mr. Lefebvre again testified and analyzed the metadata that show diligence from conception to the effective filing date, antedating the Lindholm reference. '871 patent Lefebvre Decl. ¶ 41 (J.A. 8001); '369 patent Lefebvre Decl. ¶ 41 (J.A. 8443).

Mr. Lefebvre provided an annotated calendar for the critical periods. J.A. 8007–34. The calendar summarized the various documents that show "the design, development, and testing of the R400 sequencer and graphics blocks . . .

[which] was necessary to make progress on the sequencer block and the shader pipe block.” ’871 patent Lefebvre Decl. ¶ 42 (J.A. 8001). The documentation included documents recording metadata on the R400 Sequencer Emulator Folder History, Ex. 2048; Sequencer Parts Development Folder History, Ex. 2049; R400 Document Library Folder History, Ex. 2050; R400 Architecture Folder History, Ex. 2051; and R400 GFX Testing Folder History, Ex. 2052. J.A. 8007.

The PTAB did not provide full analysis for the ’871 and ’369 patents, and referred to the reasoning in the ’053 opinion. The Board’s rulings as to diligence are in error, in all three patents, for the same reasons. These rulings are reversed.

CONCLUSION

The Board erred in holding that diligence had not been shown for the three Unified Shader Patents. On the undisputed rulings that conception and constructive reduction to practice were shown for the three patents, and on our holding that diligence was shown for the three patents, the Board’s decisions of unpatentability of the ’053 patent, the ’871 patent, and the ’369 patent are reversed.

REVERSED