

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NICHOLSON MANUFACTURING LTD.,

Petitioner,

v.

BID GROUP TECHNOLOGIES LTD.,

Patent Owner.

Case No. PGR2025-00081

Patent No. 12,163,947

**DECLARATION OF DR. RUBIN SHMULSKY IN SUPPORT
OF BID GROUP TECHNOLOGIES LTD.'S RESPONSE TO
PETITION FOR POST GRANT REVIEW**

TABLE OF CONTENTS

I.	QUALIFICATIONS	5
II.	MATERIALS CONSIDERED	7
III.	LEGAL STANDARDS	10
A.	Claim Construction	10
B.	Prior Art	11
C.	Obviousness	12
D.	Indefiniteness	15
IV.	SCOPE OF GROUNDS.....	15
V.	LEVEL OF ORDINARY SKILL IN THE ART	15
VI.	TECHNOLOGY BACKGROUND	18
A.	Debarking Machines	18
B.	The Process of Logging	21
C.	Log Sourcing.....	27
D.	Wood Species.....	27
1.	Hardwoods versus softwoods.	27
2.	Species Identification in Debarking.....	28
E.	Use of Neural Networks in the Lumber Industry.....	28
VII.	THE ‘947 PATENT	29
VIII.	BRIEF DESCRIPTION OF THE APPLIED PRIOR ART REFERENCES	30
A.	WO 2013/188948 (“Gagnon”).....	30
1.	Gagnon requires human operators to pre-sort logs and program the debarker according to wood species.	31
2.	Gagnon’s downstream sensors provide retrospective controls.....	32
3.	Gagnon’s upstream sensors used for aperture opening were known in the art.....	34
B.	CNN Based Tree Species Identification from Bark Image (“Ido”)	35

4.	Ido lacks reliability and rigor.	36
5.	Ido focuses on hardwoods. The '947 Patent focuses on softwoods.	37
6.	Ido's database is unrealistic.	38
7.	Ido's identification solution is focused on valuation and taxonomy, which is irrelevant to debarking.	38
C.	U.S. Patent Publication No. 2019/0003829 ("Kambla")	40
D.	Programmable Logic Controllers ("Petruzella")	43
IX.	OPINIONS ON VALIDITY	44
A.	A POSITA would not have been motivated to combine Gagnon with Kambla, Ido, or Petruzella.	44
1.	A POSITA would not have been motivated to combine Gagnon and Kambla. ...	44
2.	Petruzella is redundant.	45
3.	A POSITA would not expect success in combining Ido with Gagnon.	46
B.	Grounds 1 to 3: Gagnon in light of Ido, Kambla and/or Petruzella does not disclose each element of the claims.	48
1.	Gagnon does not use a computer-implemented method of detecting claimed log characteristics.	48
1.	Gagnon's computer-implemented detection of diameter and length is non-analogous.	49
2.	Gagnon does not disclose "identifying characteristics of the debarked log" and "computing operating parameters of a debarker based on the identified characteristics."	50
C.	Objective Indicia Confirm Non-Obviousness of the Claimed Debarking Methods.	52
D.	Ground 5: Claims 7 and 8 Are Definite	53

X. CONCLUSION..... 54

I, Rubin Shmulsky, being over the age of 18 and competent to make the statements herein, hereby declare the following:

1. I am a citizen of the United States of America and reside in Starkville, Missouri.
2. I have been retained by Bid Group Technologies Ltd. to provide my opinion on the patentability of U.S. Patent No. 12,163,947.
3. I understand that the U.S. Patent Trial and Appeal Board (the “Board”) has instituted post-grant review (“PGR”) of claims 1 to 18 (the “Challenged Claims”) of the ‘947 Patent.
4. I make this declaration in support of Bid Group Technologies Ltd.’s Response to Nicholson Manufacturing Ltd.’s Petition based on my personal knowledge, education, experience, and training.
5. I have no business interest in Nicholson Manufacturing Ltd. (“Nicholson”), which I understand to be the Petitioner in this case, and I have no business interest in Bid Group Technologies, Ltd. (d/b/a “Comact”), which I understand to be the owner of the ‘947 patent.
6. I am competent to make this declaration and, if called to testify, could and would do so.

I. QUALIFICATIONS

7. I summarize my educational background and career history in the following paragraphs. My complete qualifications are set forth in my curriculum vitae, which is attached hereto as **Appendix A**.
8. I am a professor of Forest Products at Mississippi State University (MSU). I served as Department Head of the Sustainable Bioproducts (formerly Forest Products) program from July 2008 through December 2025. From July 2004 through June 2008, I served as an Associate Professor of Forest Products at MSU. From July 2000 through June 2004, I

served as an Assistant Professor of Wood and Paper Science at the University of Minnesota, Twin Cities. From May 1998 through June 2000, I served as Visiting Instructor of Forest Products at Mississippi State University.

9. In my 30-year career as an educator, I have taught bachelors and graduate level courses covering lumber manufacturing (including debarking), wood technology and products, advanced wood drying, and other related curricula. I am also the co-author of a popular university-level textbook (now in its seventh edition) titled *Forest Products and Wood Science: an Introduction*. I have also taught short courses in lumber manufacturing and kiln drying.
10. In my 30-year career as an educator, I have had extension program and technical assistance outreach responsibilities. In this role, I necessarily visit sawmills, review their lumber processing operations (including debarking) and make recommendations for improvements.
11. I am active in numerous professional associations, including having served as Vice Chair and Chair of the Wood Physics and Drying Technical Interest Group within the Forest Products Society – an international trade organization founded in 1947. Previously, I have served on the Board of Directors of the Mississippi Lumber Manufacturers Association. I am an associate member of the Southern Lumber Manufacturers Association and the Southwest Hardwood Manufacturers Club. My membership role in these focuses on helping other members with technical issues and gleaning their input to steer the wood processing research at MSU.

12. I have published wood processing research in a variety of peer-reviewed journals. The complete list of publications is included within my curricula vitae at **Appendix A**. Some of my most pertinent research publications on the subject matter of debarking include:

- a. Quin, F. Jr., P. Steele, and R. Shmulsky. 1998. Locating knots in wood with an IR detector system. *For. Prod. J.* 48(10):80-84.
- b. Shmulsky, R., F. Taylor. 1999. Effect of water spray storage of southern pine logs on the drying and shrinkage of lumber. *For. Prod. J.* 49(11/12):75-77.
- c. Shmulsky, R. and J.M. Dahlen. 2007. Influence of sawing solution and pith location on warp in 2x4 lumber sawn from small diameter loblolly pine stems. *Forest Prod. J.* 57(7/8):73-75.
- d. Dahlen, J., P.D. Jones, R.D. Seale, R. Shmulsky. 2013 Mill variation in bending strength and stiffness of in-grade southern pine No. 2. 2x4 lumber. *Wood Science and Technology.* (2013) 47: 1153-1165.
- e. Snow, R.D., R. Shmulsky, G.S. Bobadilha, D.J.V. Lopes. 2022. Bending strength and stiffness of three-ply bolt-laminated mixed oak and hardwood industrial mats. *Bioresources.* DOI: 10.15376/biores.17.1.1354-1363.

13. I have prior experience as an expert witness in litigation matters, including patent litigation matters. This has included the drafting of expert reports or declarations, being deposed, and testifying at trial.

14. I am being compensated at \$450 per hour for my time spent on this matter, which is my standard rate for this type of consulting. My compensation is not contingent on the results of these or any other legal proceedings.

II. MATERIALS CONSIDERED

15. In forming my opinions, I have reviewed Nicholson’s Petition for Post Grant Review (“Petition”) along with the attached exhibits. Further, I have reviewed Bid Group’s Preliminary Response.
16. In forming my opinions, I have reviewed the Declaration of Alain Gingras (attached as Ex. 2034), including the appendices thereto, and spoken with him regarding the opinions expressed within his declaration.
17. Further, in forming my opinions, I have reviewed the following exhibits and any other document cited in this declaration:

Exhibit	Description
2001	Deposition of Dr. Michael Pazzani.
2002	Patent Owner Preliminary Response
2003	MSU BS in Forestry Information
2004	MSU Courses Department of Forestry
2005	MSU AI Stories
2006	Computer vision-based wood identification and its expansion and contribution potentials in wood science; A review (Hwang et al)
2007	Francis Clement Professional Profile (EN, FR)
2008	Post re BID Group Rebrands as Comact
2009	LogPro Drum Debarker Information
2010	U.S. Patent No. 4,061,166
2011	U.S. Patent No. 2,623,558
2012	Nicholson “Our Story” Page
2013	Scotia Historic Assessment Study

2014	Pulp and Paper Technology Post re Debarking Techniques
2015	Langlais “Riding Stud Mill” Post
2016	A Review of Wood-Bark Adhesion: Methods and Mechanics of Debarking for Woody Biomass (Chahal et al)
2017	Textbook of Wood Technology (Panshin et al)
2018	USDA Wood Handbook
2019	Valon Kone Post re Debarking Different Wood Species
2020	A Comparative Literature Review of Machine Learning and Image Processing Techniques Used for Scaling and Grading of Wood Logs (Sandvik et al)
2021	A review of the automated timber defect identification approach (Chun et al)
2022	U.S. Patent No. 6,526,154
2023	U.S. Patent No. 10,099,400
2024	Canadian Patent No. 2,327,141
2025	Peterson’s field guide to trees and shrubs (Petrides)
2026	IDS Trees and Shrubs Online Post re Alnus japonica
2027	Timbeter Blog Post re Log Diameter Measurement
2028	Timbeter Blog Post re Sawmill Owner Benefit from Digital Measurement
2029	Merriam Webster Definition of Stack
2030	USDA Compression debarking of wood chips (Arola et al)
2031	Australian Department of Agriculture, Fisheries and Forestry Page re Bark on timber packaging and dunnage
2032	ISPM No.5 Draft Supplement - Debarked and Bark-free Wood

2033	Abstract from pp. 213-231 of Integrated Systems: Data Driven Engineering
2034	Declaration of Alain Gingras
2035	Using DNA to assess errors in tropical tree identifications: How often are ecologists wrong and when does it matter? (Dexter et al)

18. I have also considered and attached the following appendices:

Appendix	Description
A	C.V. of Dr. Rubin Shmulsky

III. LEGAL STANDARDS

19. I am not an attorney. I have not independently researched the law on patentability. My knowledge of the legal standards below is based upon conversations with counsel and prior experience in litigation.

20. I understand that a patent claim is unpatentable if the claimed invention was anticipated by a prior art reference or would have been obvious to a person of ordinary skill in the art (“POSITA”) at the time of the purported invention.

A. Claim Construction

21. I understand that patent claims are to be interpreted in view of a patent’s specification and prosecution history. I understand that claim construction starts with the plain language of the claims as understood by a POSITA at the time the patent was filed.

22. I understand that a patentee may be its own lexicographer, so long as the definition of a specific term is clearly set forth in the specification, and it is clear the inventor intended to define the term.

B. Prior Art

23. I understand that in order to obtain a patent, the claimed invention must be new and nonobvious from the perspective of a POSITA at the time of the invention. I further understand that the information available to a POSITA as of the time of the invention is referred to as the “prior art.”

24. I have been informed by counsel that information is only considered prior art if it falls within one of the specific categories of prior art identified in the patent statutes. I further understand that for purposes of this proceeding before the United States Patent Trial and Appeal Board, only patents and other documents that have the legal status of a “printed publication” may be relied upon as prior art.

25. I have been informed by counsel that a patent or a published U.S. patent application is generally considered to become prior art as of the date the patent application is filed.¹

26. I have been informed by counsel that a printed publication qualifies as prior art based on the date when it becomes “publicly accessible.” I have been informed that information is publicly accessible as of the date it was disseminated or otherwise made available such that members of the relevant public interested in the subject matter could, using reasonable diligence, locate it.

27. I have been instructed to assume in my analysis that, for the purpose of determining what qualifies as “prior art” the effective filing date for the ’947 Patent (“Effective Filing Date”) is August 27, 2020.

¹ I have been informed that a patent or published patent application may also become prior art based on its date of conception or its date of publication. I have been informed that the different rules related to those statutory provisions are not relevant to this proceeding, and accordingly this Declaration treats patents and published patent applications as entering the prior art based on the filing date of the underlying patent application.

28. I understand that Dr. Pazzani's analysis was stated to have been based on an August 27, 2020, Effective Filing Date.

C. Obviousness

29. I understand that Petitioner has not alleged any claim of the '947 Patent is anticipated. I understand that Petitioner has challenged claims 1 to 18 of the '947 Patent on the grounds that the invention claimed would have been obvious to a POSITA at the time the applications were filed. I also understand the standard for obviousness in a PGR proceeding is "by a preponderance of the evidence." In other words, I understand that the party challenging validity (here, Nicholson) bears the burden of establishing the obviousness of the invention by a preponderance of the evidence.

30. I have been informed that there are two types of claims: (1) independent claims; and (2) dependent claims. I understand that independent claims stand alone and do not reference or depend upon other claims. I understand a dependent claim is a claim that refers to at least one other claim in the patent. I understand a dependent claim includes all the limitations recited in the dependent claim, as well as all of the limitations of the claim(s) upon which it depends. For example, claim 2 of the '947 Patent is a dependent claim because it refers to claim 1. Claim 2 thus includes all the limitations recited in claim 2 in addition to all the limitations described in claim 1. I have been informed that to establish obviousness of a dependent claim, the prior art must teach or render obvious each and every limitation of the dependent claim as well as the independent claim from which it depends.

31. I understand that the factors for an obviousness analysis include: (a) the scope and content of the prior art; (b) the differences between each of the claims of the patent and the prior art; (c) the level of ordinary skill in the art at the time the invention was made; and (d)

objective indicia (also called “secondary consideration or “secondary indicia”) of nonobviousness.

32. I understand the secondary considerations of nonobviousness which must be considered in evaluating obviousness include commercial success of the claimed inventions, whether others copied the invention, whether there was a long-felt but unmet need in a particular industry, and whether others in the field praised the invention. I understand secondary considerations can be evidence that the patent claims were not obvious. I understand that secondary considerations of nonobviousness support a finding of nonobviousness if the evidence of secondary considerations is sufficiently tied to the patented features. Where a patent claims a combination of features, I understand that the evidence of secondary considerations may be tied to the claimed combination as a whole. I understand secondary considerations of nonobviousness may overcome primary evidence of obviousness even if such primary evidence is strong.
33. I also understand that a POSITA is presumed to be a person who would have known about all relevant prior art, and that in examining the prior art, both what the art discloses and anything that inherently occurred as a result of practicing what was expressly disclosed in that prior art should be taken into account.
34. I understand that there must be a reason, suggestion, or motivation to modify a single prior art reference, or to combine multiple references, to achieve the claimed invention. I understand that this motivation may come from a teaching, suggestion, or motivation to combine. I also understand that a specific teaching, suggestion, or motivation is not required.

35. I understand the reason, suggestion, or motivation to modify or combine the teachings of a reference to the claimed invention can be either express or implied, and may be derived (for example) from the prior art reference itself, from the knowledge of a POSITA, or from the nature of the problem to be solved. I understand a claimed invention also is obvious if it would have been obvious to a POSITA to try a course of conduct—for example when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, and where a person of ordinary skill has a reason to pursue the known options within his or her technical grasp.
36. I also understand that the use of hindsight is not appropriate in determining whether a claimed invention would have been obvious. In other words, one cannot use the patents as a guide through the prior art references to assist in combining the right references in the right way so as to achieve the result of the claims of the patent. Rather, I understand one must consider only the thinking of a POSITA with knowledge of all the prior art at the time of the invention. I have been provided by counsel an opinion of the U.S. Court of Appeals for the Federal Circuit which explained that “[t]o imbue one of ordinary skill in the art with knowledge of the invention in suit when no prior art reference... of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.” *W.L. Gore & Assoc. v. Garlock, Inc.* 721 F.2d 1540, 1553 (Fed. Cir. 1983).
37. I understand that, in consideration of all those factors, a patent is not obvious unless the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA to which said subject matter pertains.

D. Indefiniteness

38. I understand that Petitioner has challenged claims 7 and 8 on the grounds that “considering the deep learning model trained if the identification score is different from a predetermined value” renders the claims indefinite. *See* Petition at 80-82.

39. I understand that the claims must particularly point out and distinctly claim the subject matter which the applicant for patent regards as his invention. I further understand that a claim may fail this requirement and be indefinite if, when read in light of the specification delineating the patent and the prosecution history, it fails to inform a POSITA about the scope of the invention with reasonable certainty. I understand that this does not require that a patent disclose information that is already well known to POSITA(s). I also understand this does not require the claims define the invention with mathematical precision. I understand definiteness is measured from the viewpoint of a POSITA at the time the patent was filed.

IV. SCOPE OF GROUNDS

40. I have been asked only to provide my independent opinions and analysis of the issues I specifically discuss in this declaration. I note that the Petition, including the evidence it cites, appears to refer to other issues regarding which I have not been asked to provide my opinions.

V. LEVEL OF ORDINARY SKILL IN THE ART

41. I understand that the Petitioner and Dr. Pazzani have proposed a definition of a POSITA: “[a] person of ordinary skill in the art (“POSITA”) before the effective filing date of the ’947 patent would have a Bachelor’s degree in Mechanical, Electrical, Computer, or Systems engineering, and at least two years of experience in the field of engineering

programming” or “[a]lternatively, a POSITA would have a Master’s degree in any of the above fields.” Further, “[t]he ’947 Patent is directed to the use of a deep learning AI model, and such a POSITA would have experience in the training and use of such a model.”
Petition at 7.

42. I understand that Bid Group disagrees with Nicholson’s proposal and submits that “a POSITA would require at least 2 years of experience in the field of wood log processing machines or at least in the wood industry.” Patent Owner’s Preliminary Response at 5 (attached as Ex. 2002).

43. I believe that a Person of Ordinary Skill in the Art would have:

- a. Bachelor’s degree in Mechanical, Electrical, or Computer engineering **and** at least four years of experience in the field of wood processing or logging; or
- b. a Bachelor’s Degree in Forest or Wood Products Sciences **and** at least two years of experience in the field of wood processing or logging; or
- c. Eight years of experience in the field of wood processing or logging.

44. Forest and wood science programs necessarily include courses in the use of computer applications for wood processing. For instance, undergraduate students at Mississippi State University would be required to take “Computer Application in Forest Resources” and “Spatial Technologies in Natural Resource Management.”² Students may also, optionally, take courses in remote sensing applications and technologies.³ These topics are stressed further in graduate programs through formal coursework and research. For example, the

² See Ex. 2003.

³ Ex. 2004.

graduate program at Mississippi State University has undertaken research related to the use of AI in wood identification.⁴

45. As Dr. Pazzani has stated, image recognition as a principle can be implemented by an individual with limited training in computer science: "I'm positive that any student that I taught... with a computer science background could easily implement what is in the claim."⁵ However, an accurate image classification machine learning system requires supervised learning where a POSITA trains the classification model with known or validated data.⁶

46. Thus, a POSITA would need vast knowledge regarding the identification and characteristics of debarked trees and logs in order to provide the initial classification set and validate the training sets within an image recognition system.⁷ This knowledge would be trained within a Forest Science program or through experience working within the industry.

47. Further, the neural network described by the patent, whereby the characteristics of the debarked log indicate ideal operating parameters for the debarking, would rely on a debarking parameters dataset created or at least validated by a POSITA. Thus, a POSITA would necessarily have knowledge of the ideal debarking parameters for different characteristics of debarked logs.

48. For these reasons, it would be illogical and inappropriate to determine a POSITA would have no experience or education within the Forest Science industry.

⁴ Ex. 2005.

⁵ Ex. 2001 at 63:6-14.

⁶ Ex. 2006 at pg. 7.

⁷ *Id.* at pg. 7-8, 11.

49. Notably, Francis Clement, the primary inventor of the '947 Patent has a Bachelor of Engineering and additional post-graduate coursework.⁸ However, he had worked within BID Group (or its parent company, Comact) for nearly two *decades* at the time of the filing of provisional application No. 63/070,887 on August 27, 2020. BID Group has been “a leader in the wood processing industry for more than a century[.]”⁹ Mr. Clement’s nineteen years with Comact would have provided the necessary training and experience for the inventor to properly understand the complexities of log characteristics and debarking parameters.

VI. TECHNOLOGY BACKGROUND

A. Debarking Machines

50. Living trees have a high moisture content to allow for the transport of sugars and nutrients, which is contained in the sap. The bark of a tree has different chemistry, anatomy, and physical properties than the interior wood. Thus, the bark is largely impervious and prevents the tree from drying out or the sap from washing away.

51. Removing the bark from a tree, or debarking, is used to increase the value of each felled tree or log by separating the wood and bark into two value-added product streams.

52. The debarking process can be, and in early history was, completed by hand. A debarking spud could be used to pull, peel, and/or pry the bark from the tree piece by piece which was slow and back-breaking work. Alternatively, slabs could be cut from the side of a log thereby rendering a square or rectangular cant, which reduced the amount of valuable wood fiber available in the final produce.

⁸ Ex. 2007 (reflecting the original and a machine translation).

⁹ Ex. 2008.

53. The earliest mechanical debarking machines, drum debarkers, began appearing in the late 1800s to early 1900s. Drum debarkers consist of rotating cylinder, sometimes with an abrasive or scalloped interior surface:¹⁰



54. Logs enter the drum and drop onto a pile at the bottom, where they are continuously tumbled and lifted before they fall again (not unlike clothes in a tumble dryer):¹¹



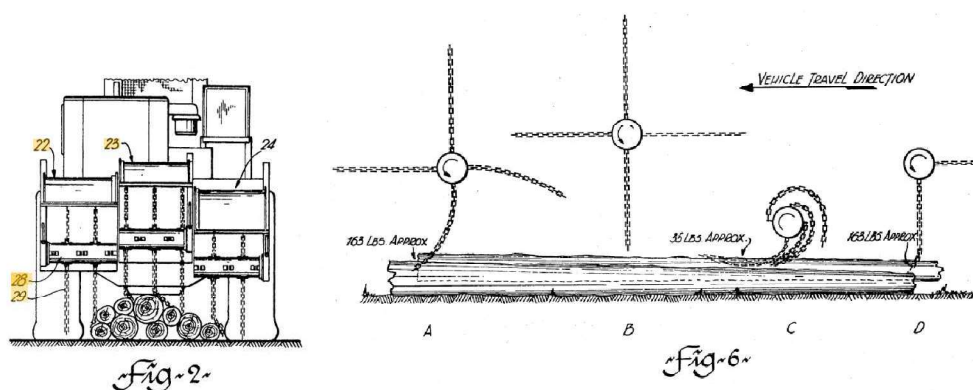
55. The more logs in the drum at a time, the greater the occurrence of log-to-log impacts, but too many logs can cause damage or increase the retention time. The continuous log-to-log

¹⁰ Ex. 2009.

¹¹ *Id.*

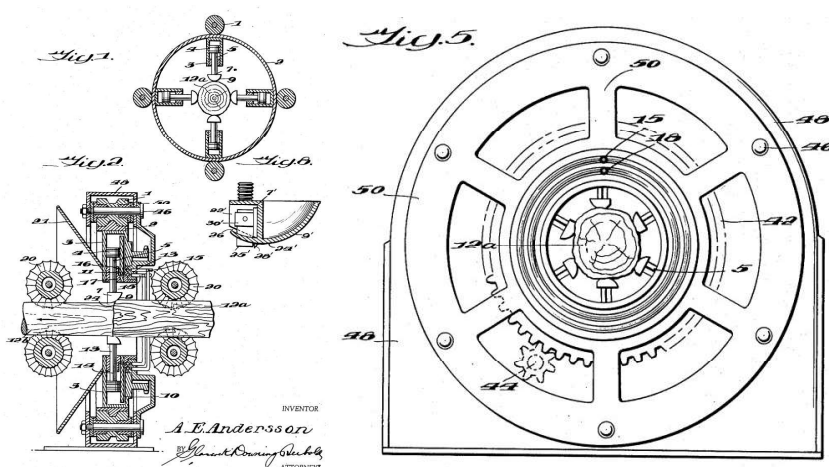
impact, and perhaps abrasive interior surface, removes the bark from the logs. The bark falls through the slots in the cylinder. The drum is typically tilted slightly downhill, thus the debarked logs are slowly pushed downhill and out as new logs are loaded in.

56. As early as the 1940s, flail tree processing units became available and minor improvements were developed for these machines over time.¹² These machines operate by spinning chains of varying weights and lengths at varying speeds in a manner which causes the chains to repeatedly impact the bark of the log, loosening the bark from the tree:¹³



57. In 1948, Andersson Axel Erland applied for what would become U.S. Patent No. 2,623,558

(“Erland Patent”) titled “Machine for removing bark from logs”:¹⁴



¹² Ex. 2010 at 1:10-62.

¹³ *Id.* at Fig. 2 and 6.

¹⁴ Ex. 2011 at Figs. 1, 2, 5 and 8.

58. The patent described a pneumatic machine which presses debarking tools to apply both friction and peel barking on hardwood or softwood logs regardless of diameter or deformities. The debarking tools would rotate along the log fed through the ring. This type of debarker is frequently called the rotary debarker or Cambium Shear.
59. In the 1950's, rotary debarkers entered the marketplace from various manufacturers. "The technology of feeding a non-rotating log through a multi-tool rotating ring proved to be a practical, highly effective method of removing bark."¹⁵
60. Hydraulic debarking became common for certain stringy barks, such as those found on redwood trees, in the mid-20th Century.¹⁶ Hydraulic or pressure-jet systems, "utilize[] high-pressure water jets to strip bark efficiently[.]"¹⁷ This is useful in achieving a "thorough clean without compromising the structural strength of the wood."¹⁸
61. While the fundamental methods of debarking—rotary, drum, flail, and hydro jet—have remained relatively constant, the machines have improved over time in response to industry demands. Automation of the infeed and outfeed of logs, improved precision to reduce lost fibers, and decreased water or energy usage have driven technological advancement in debarking machines.

B. The Process of Logging

62. Trees grow in a forest. To be converted from a tree to a log, the tree is severed (killed for harvest) in a rugged, if not violent, process which fundamentally alters the appearance of the bark.

¹⁵ Ex. 2012.

¹⁶ Ex. 2013 at pg. 6-7.

¹⁷ Ex. 2014.

¹⁸ *Id.*

63. **Felling.** First, a tree is felled or cut to the ground. In one example, a feller-buncher tree cutting machine uses a rotating cutter and steel pinchers to fell a tree and then places the felled tree in a pile:¹⁹



This process necessarily involves scraping, sloughing, and knocking bark off the stem. The felling process necessarily changes the outer appearance of the stem. This is evidenced by the amount of bark on the ground near the felled trees.

64. **Skidding.** The felled tree is then dragged along the dirt forest floor and skid trails to a landing. The skidding process not only continues to scrape, slough, and knock bark off the stem, but also grinds dirt into the bark, reducing the visible appearance variation among different tree species. As shown in the image below, bark sometimes sloughs off the log surface during the skidding process:

¹⁹ See also, Feller Buncher John Deere 1, ForestoIndustria, YOUTUBE, <https://www.youtube.com/watch?v=l6zyCvAd1po> (May 10, 2024).



65. **Delimbing and Processing.** A tree is then gripped with multiple knurled rolls and processed along the entire length, knocking off its limbs and potentially cutting the stem into fixed length logs. Delimbing and processing necessarily rips, scrapes, crushes, or knocks bark off the stem, again changing the appearance of the bark.



66. **Loading.** Logs, either modified to tree length or cut to length, are then grappled and loaded onto log trucks with upright steel stanchions. The process of loading the log with a steel

grapple slashes, scrapes, or otherwise modifies the appearance of or removes bark from the stem. This loading process occurs once at the felling and processing site and again at the mill.



67. **Hauling.** The logs are then hauled to a mill over rough terrain, which jostles the logs against one another, eroding or otherwise modifying the structure of the bark.



68. Unloading, piling, and feeding logs into the mill is accomplished through the use of heavy equipment, such as cranes and forklifts. The steel implements and force associated with this type of equipment can alter and abrade the surface bark of the log, necessarily changing the appearance.

69. At the landing or conclusion of the logging site or route, *i.e.* the area where trees are processed into logs, a large volume of bark is left on the ground evidencing the immense amount of abrasion and modification of the tree surface that occur.²⁰



²⁰ Ex. 2015.

70. Soaking, ponding, and/or sprinkling. Logs are often stored under water or water spray as a means of preserving log quality. During this period the bark typically darkens as does the exposed wood as algae and bacteria grow on the surface. This action makes the logs appear more uniformly dark and makes it harder to differentiate among species or other characteristics. Further, the water may freeze, expand, and partially knock the bark off as part of the freezing induced expansion.



C. Log Sourcing

71. Large, industrial mills may specialize in specific types of wood, for instance spruce or pine softwoods used for construction. This allows the mill to specifically calibrate the machinery for high-volume, efficient, and uniform production.
72. Smaller or custom mills may accept a wide variety of wood logs, including both hardwoods and softwoods. Often, smaller mills process whatever logs are brought in by the general public. Some smaller mills presort the logs into various batches to avoid mixing species and the need to frequently change machine settings.

D. Wood Species

73. Wood species identification is critical in the wood products industry.
74. At the outset, certain species of trees are restricted or protected from logging, such as through the Endangered Species Act or similar legislation, which means that they must be identified and left unfelled. Similarly, trees that grow near water in stream management zones must not be felled.
75. Identification of wood species is also important in evaluating wood products used in civil and structural engineering, as not all wood products are appropriate for all uses.
76. Inside a sawmill, wood species can control wood-bark adhesion strength.²¹ The wood-adhesion strength can affect ideal parameters for a debarking machine, such as the log feed rate, speed, and pressure.

1. Hardwoods versus softwoods.

77. Identification can first sort woods into two categories: hardwoods and softwoods.

²¹ “Several characteristics are important to mechanical strength of wood-bark bond that are likely related to variation in morphology from species to species, including wood-specific gravity, bark-specific gravity, percent bark fiber, percent sclereids, wood toughness, total bark strength, and inner bark strength.” Ex. 2016.

78. Softwoods evolved on the order of 300 million years ago whereas hardwoods evolved approximately 140 million years ago. Softwoods are necessarily more primitive and less diverse.

79. Hardwoods are more diverse anatomically with specialized cells, from which bark is made.²² For this reason, the appearance of hardwoods from species to species is more diverse visually (*e.g.*, color, texture, roughness, flutedness, sheen, etc.) than softwoods.

80. As a result of their more recent evolution, softwoods have a simpler and more primitive basic structure than hardwoods. Softwoods have only two cell types and very little variation in the structure of the cell types.²³ This fact makes machine-vision based identification and speciation of softwoods much more difficult than that of hardwoods.

2. Species Identification in Debarking

81. Certain species are easier to debark than others. Softwoods are generally considered to be “easier” to debark with traditional machines.

82. Stringy barks, such as eucalyptus or spruce, occur on both hardwood and softwood species. When stringy bark is removed, it creates long strips of bark which can become easily entangled with the mechanical components of debarking machines, disabling the machine.²⁴

E. Use of Neural Networks in the Lumber Industry

83. Forestry programs began pondering the use of neural networks, machine learning, and artificial intelligence in the late 2010s. Primarily, these studies related to the identification or evaluation of *lumber* at the end of the logging and milling process or the identification

²² Ex. 2017 at pg. 151; Ex. 2018 at Ch. 3, PL GTR 190, P3-2.

²³ Ex. 2018 at Ch. 3, PL GTR 190, P3-2.

²⁴ Ex. 2019.

of live trees.²⁵ “Deep learning models started being used in studies in 2018 and were the most common between 2020 and 2023. They were used among the studies in every goal category *except for individual log* scaling.”²⁶

84. With respect to the implementation of convolutional neural network (“CNN”) architecture for image recognition, “CNNs are highly dependent on hardware and resources, where high amounts of random-access memory (RAM) and graphics processing unit (GPU) are required for extensive training processes.”²⁷

VII. THE ‘947 PATENT

85. I have reviewed the claims, specification, and prosecution history of the ‘947 Patent. The ‘947 Patent is titled “Method and System for Characterizing Undebarked Wooden Logs and Computing Optimal Debarking Parameters in Real Time.” The ‘947 Patent describes a method where an undebarked log is scanned upstream of the debarker. A deep learning algorithm model, perhaps trained with human assistance, identifies certain characteristics of the log, such as wood species. The characteristics of the log are used to determine optimized parameters for debarking.

86. As relevant in these proceedings, the earliest priority date for the challenged claims is August 27, 2020, the date on which provisional application No. 63/070,887 was filed. Application No. 17/445,974, which was later granted as the ‘947 Patent, claimed the benefit of the earlier filed provisional.

87. A key invention of the ‘947 Patent is the collection of data upstream to adjust the debarker in real-time to each incoming log. The prior art merely included using downstream data to

²⁵ Ex. 2020.

²⁶ *Id.* at 1243 (emphasis added).

²⁷ Ex. 2021 at pg. 2162.

predict debarking parameters for logs still upstream. These feedback systems “cannot predict sudden unexpected changes in the incoming undebarked logs.”²⁸ Rather, they rely on logs that are pre-sorted manually such that the upcoming logs will be significantly similar to the last debarked log(s).²⁹

88. Two feedback loop systems were described on the face of the patent:³⁰

- a. “Method and apparatus for determining the portion of wood material present in a stream of bark,” U.S. Patent No. 6,526,154 (attached as Ex. 2022) describes a method or machine which photographs a debarked log to determine the amount of wood material in a bark flow, which is used to control the debarking process.
- b. “Method and system for detecting the quality of debarking at the surface of a wooden log,” U.S. Patent No. 10,099,400 (the “’400 Patent”) (attached as Ex. 2023). The ’400 Patent reference was disclosed, in its various forms, in the August 26, 2021 initial application and Information Disclosure Statement by Applicant.³¹ In fact, the entirety of the equivalent Canadian application was submitted with the August 26, 2021 Information Disclosure Statement by Applicant.³² Further, the examiner acknowledged that Gagnon was “made of record and not relied upon [but] considered pertinent” within the Notice of Allowability and Corrected Notice of Allowability.³³

VIII. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART REFERENCES

A. WO 2013/188948 (“Gagnon”)

²⁸ ’947 Patent at 2:59-62.

²⁹ *Id.* at 2:64-67, 1:67-2:5.

³⁰ *Id.* at 1:52-56; 2:47-57.

³¹ Ex. 1003 at pg. 311.

³² *Id.* at pg. 155-243.

³³ *Id.* at 14-15, 42.

89. “Method and System for Detecting the Quality of Debarking at the Surface of a Wooden Log,” WO 2013/188948, was disclosed by Gagnon et. al with a claimed earliest priority date of June 19, 2012. (Ex. 1004). Gagnon claims priority to U.S. patent application No. 13/614,761, which later issued as U.S. Patent No. 10,099,400.

90. Gagnon’s methods involve the use of a rotary ring debarker,³⁴ which is just one of multiple types of debarking machines.³⁵ Gagnon has three sets of data which drive the operating parameters: (1) data input by a human operator; (2) upstream sensors for aperture opening; and (3) downstream sensors to determine debarking quality.

91. The invention of Gagnon lies in the downstream sensors which detect output surface quality—fiber loss and residual bark—to control debarker settings for the next log to be debarked.³⁶

1. Gagnon requires human operators to pre-sort logs and program the debarker according to wood species.

92. Gagnon acknowledges “different wood species have their own characteristics that may affect the debarking process”³⁷ and “knowing or measuring upstream the intrinsic characteristics of the each log entering the debarker such as diameter and wood species, ... may be used to automatically perform in feedback the required debarker adjustments, ... to provide optimal performance in real time.”³⁸

³⁴ Gagnon at, e.g., ¶ 3 (“The performance of a *rotary ring debarker* depends on log characteristics such as wood species, moisture content, freshness, mean diameter, and bark thickness.”); ¶ 14 (“**Fig.1** represents a log being subjected to debarking through the action of cutting tools provided on a typical *rotary ring debarker*.”); ¶ 47 (“logs processed with a typical *rotary ring debarker*, debarking quality characteristics are substantially uniform along the log circumference at any given scanning position”), Cl. 50, 66, and 69 (emphasis added).

³⁵ See § VI.A.

³⁶ Gagnon at ¶¶ 10, 12.

³⁷ Gagnon at ¶ 3.

³⁸ Gagnon at ¶ 6.

93. Gagnon has no method through which species would be detected before or after debarking, except through “visual[] inspect[ion] by the skilled operator[.]”³⁹ Thus, Gagnon’s efficiency relies upon the presorting of logs by wood species.
94. After this presorting occurs, the selected species population is loaded into the debarking machine. A scrolling list on the machine “enable[s] the *operator* to select” the “species under production.”⁴⁰ The predictive model assumes that wood species will remain constant.⁴¹
95. For example, within the test described in Gagnon’s specification, “a log population of at *least 300 logs of a common species* such as black spruce was considered for the calculation (moving average) of mean values for each quality-related parameter.”⁴² As the wood species remained constant, the algorithm was able to adjust simply the debarking parameters (rotational speed, pressure, and log feed speed) in response to the quality output.⁴³
96. This is further shown through Figures 14-17 wherein the species remains constant for either 3 hours or the “whole” period for which data is collected related to, for example, quality parameter, tool pressure, diameter, or mean log surface temperature.

2. Gagnon’s downstream sensors provide retrospective controls.

97. Gagnon describes the use of a camera which can detect ‘debarking quality’ by image capture and analysis which “generates data indicative of the texture of the log surface” based upon “detected fiber tear and residual bark[.]”⁴⁴

³⁹ Gagnon at ¶ 93.

⁴⁰ Gagnon at ¶ 68 (emphasis added).

⁴¹ Gagnon at ¶ 49.

⁴² Gagnon at ¶ 92 (emphasis added).

⁴³ Gagnon at ¶¶ 100-101, Table 3.

⁴⁴ Gagnon at ¶ 48.

98. The quality data collected from the log *exiting* the debarker is compared to a pre-determined set point. If the quality is below expectations, the predictive model changes an operating parameter for the next log *entering* the debarker including “mean pressure applied to the cutting tools, log feed speed, ring rotational speed and cutting tool tip overlap.”⁴⁵ This is retrospective control making future decisions based on past performance. Essentially, this system is analogous to driving by looking in the rear-view mirror.

99. Retrospective controls, or feedback controls, are less complex than predictive, or feedforward, controls. Retrospective controls focus on reacting to current errors, such as low debarking quality, rather than predicting future states. Retrospective systems work best in environments with a high degree of uniformity. Retrospective models are generally easier to implement initially because they do not require perfection of the model upfront.

100. As another industry example, retrospective process control is used in the veneer drying industry, whereby the moisture of veneer exiting the dryer is used to change the belt speed (*i.e.* drying time) to which incoming veneer is exposed. However, a major drawback of the use of retrospective controls with veneer drying is not always effective, as the machine routinely overshoots or undershoots drying because the incoming material never perfectly reflects the previous material. The incoming veneer moisture content fluctuates thereby introducing unpredictable and sudden unexpected changes. The resultant dried veneer is then routinely too wet and must be redried or too dry and subject to downgrade.

⁴⁵ Gagnon at Cl. 66-67.

101. The drawback to Gagnon's retrospective controls is clearly noted in the '947 Patent: retrospective controls "cannot predict sudden unexpected changes in the incoming unbarked logs."⁴⁶

3. Gagnon's upstream sensors used for aperture opening were known in the art.

102. "It has been observed that for a same wood species and when debarking operation parameters are kept constant, some physical characteristics such as log diameter, taper shape and environmental conditions such as log temperature state (frozen or non-frozen) have significant influence over debarking quality."⁴⁷

103. Some embodiments of Gagnon reflect presorting of the diameters of logs and manual selection by the operator.⁴⁸ Other embodiments contain sensors upstream used to detect the diameter, length, and taper of a log entering the debarker:⁴⁹

For that purposes, as shown in Fig. 4A in view of Fig. 4, the debarking line 20 may be provided with a **log conveyer 13 located upstream the debarker 24**, and having an outfeed end 106 aligned with the travel path axis 33, so that a next log 10' to be debarked is transported toward the front V-shaped press rolls 23, 23' at the infeed end of the debarker 24. **Located adjacent the conveyer 13 is a log diameter and length measurement device 17 having its output operatively connected to the controller 67 shown in Fig. 3 for sending thereto signals indicative of the diameter and length of the log 10'** as it is moved past the measuring device 17.

104. A rotary ring debarker, as described *supra*, involves an aperture ring containing blades which the log is inserted into. The diameter, length, and taper of a log would

⁴⁶ '947 Patent at 2:59-67.

⁴⁷ Gagnon at ¶ 49.

⁴⁸ Gagnon at ¶ 68.

⁴⁹ Gagnon at ¶ 49 (emphasis added).

necessarily impact how the rotary ring blades would need to be positioned to debark the logs. For example, a log of smaller diameter would require a smaller opening of the aperture ring blades.

105. This change in diameter is why the ends of the debarked logs often have different debarking quality “due to different cutting tool attack conditions that prevail at log leading and trailing ends.”⁵⁰

106. As the sample data in Gagnon did not involve the upstream sensors to generate data for the describe neural network, Gagnon’s data excluded logs outside of the “chosen diameter range” for debarking quality analysis.⁵¹

107. Notably, Gagnon did not claim the use of these upstream measurements alone, only in combination with the retrospective controls, likely because the use of diameter and length measurement in rotary ring debarking was well-known in the art. For example, Canadian Patent No. 2,327,141, filed in November 2000, describes a system where “the logs are fed automatically into a debarker where the diameter and volume are scanned and debarker-operating parameters are set for optimum bark removal.”⁵²

B. CNN Based Tree Species Identification from Bark Image (“Ido”)

108. “CNN-Based Tree Species Identification from Bark Image” was authored by Junya Ido and Takeshi Saitoh and published in May of 2019.⁵³ A declaration from Patrick Franzen states that the particular publishing volume reflects “the conference record of the Tenth

⁵⁰ Gagnon at ¶ 92.

⁵¹ Gagnon at ¶ 93.

⁵² Ex. 2024 at 6:22-24.

⁵³ Ex. 1005.

International Conference on Graphics and Image Process” which was held by the Society of Photo-Optical Instrumentation Engineers in December of 2018.⁵⁴

109. Notably, a POSITA seeking to solve a forestry problem in debarking would be unlikely to look to the Society of Photo-Optical Instrumentation Engineers. Not only does this not describe the focus of the problem, but there would be little to no overlap between SPIE and the forestry industry.

110. The focus of Ido’s research is to determine how “to use a special tree image in which a colorful tag is st[u]ck on the bark... extract a region (ROI) excluding the tag” and use such image to identify the tree species using a well-known CNN model.⁵⁵ Essentially, “[t]his paper proposes a ROI extraction method” only.⁵⁶ For the authors, recognition of species is just a “future task to develop the system that implements the proposed method.”⁵⁷

111. In 2020, a POSITA attempting to implement an efficient debarker through the assistance of artificial intelligence would not have looked to Ido. If a POSITA attempting to implement artificial intelligence for efficient control of a debarking machine did discover Ido in or around 2020, the POSITA would have omitted Ido from consideration.

4. Ido lacks reliability and rigor.

112. One of the reasons Ido would not be considered relevant prior art by a POSITA is that Ido is experimental and was presented at a conference proceeding without peer-review. That is, there is no evidence the findings or methodology of Ido underwent the rigor of scientific examination by peers. A POSITA would understand the bar for acceptance to present and publish such information is low.

⁵⁴ Ex. 1013 at ¶¶ 1, 8.

⁵⁵ Ex. 1005 at Abstract.

⁵⁶ *Id.* at Conclusion.

⁵⁷ *Id.*

113. Ido specifies no controls for factors such as light control, image size, and distance, which would prevent repetition of Ido's methods. As such, there would be no method by which Ido's results could be replicated or validated, nor is there any suggestion that the conference required such.

114. At best, Ido is a demonstrative of the concept which falls far short of proof of concept. Ido would be considered unreliable by a POSITA.

5. Ido focuses on hardwoods. The '947 Patent focuses on softwoods.

115. Hardwoods, which are the subject of Ido, are more visually diverse than softwoods. See § VI(c)(1). The respective bark characteristics of the species analyzed in Ido are shown below:

Species	Characteristic	
	Bark Color	Bark texture
Ulmus (elm) ⁵⁸	Grayish	Vertical, often cross-thatched ridges
Quercus (oak) ⁵⁹	Red oaks: dark in color White oaks: light in color	Deeply ridged
Salix (willow) ⁶⁰	Yellow	Ridged
Betula (birch) ⁶¹	White, gray, or dark	Shiny, smooth Often separable into sheets.
Itaya amicorum	Palm, grass, monocot	
Alnus japonica (alder)* ⁶²	Grey-brown	Smooth to somewhat corky Numerous short warty stripes

116. These five tree species (and one grass) in Ido are very diverse in appearance. Their barks range from light white and gray to dark gray and brown. They range from smooth to ridged to deeply ridged. Some are striped. As hardwoods are more evolutionarily advanced

⁵⁸ Ex. 2025.

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² Ex. 2026.

than softwoods, it is not surprising that their respective barks have such variation. This wide variation renders hardwood identification and separation easier than that of softwoods.

117. Due to the cellular differences between hardwoods and softwoods, the hardwoods of Ido would be far easier to differentiate than the softwoods addressed by the '947 Patent. As such, a POSITA would understand that the tree species identification findings of Ido are not applicable to the softwood log species identification as described in the '947 Patent.

118. Even with the easier to identify hardwoods, Ido still only “obtained [a] highest recognition accuracy of 74.7%.”⁶³ This relatively low accuracy would tend to suggest that Ido’s technology, when tasked with differentiating between the similar looking softwoods, would have an even lower accuracy rating and should not be used.

6. Ido’s database is unrealistic.

119. Ido uses approximately 100 images per class (species). In my experience, artificial intelligence or deep learning models related to wood identification would require a far greater number of images, on the order of thousands per class. These images would need to encompass photos of thousands of samples in varying conditions, which is a significant investment of resources alone.

120. Accounting for the large variation in bark appearance after the processing of a tree into a log, an even greater number of photos reflecting various conditions of bark for the same species would need to be acquired.

7. Ido’s identification solution is focused on valuation and taxonomy, which is irrelevant to debarking.

⁶³ Ex. 1005 at § 4.

121. Ido's solution to quickly classifying tree species was two-fold: (1) remove the tag from the image to create a region of interest and (2) in the future, use such regions of interest with a CNN-model to generate taxonomy information. This process is focused on identifying the taxonomy of a tree for the purpose of timberland valuation or conservation. As described in Ido, the process generally involves a crew of operators going into the forest, taking photos of each tree with an assigned tag as to avoid duplication, and then determining the identity of the tree at a later point by evaluating the images.⁶⁴ Ido uses CNN to cut out the last step, human identification of species. This is a problem separate and unrelated to the actual processing of lumber once the trees are felled.

122. First, in timberland valuation or conservation, it may be practical to tag each and every tree at intake. However, in the processing of the trees, one would not tag each log. At the start, this would be incredibly labor intensive and would provide no known benefit. Second, such tags could impede the actual debarking process in the machines. As such, the solution of Ido—isolating a region of interest to remove the tag—is completely irrelevant.

123. Second, in timberland valuation or conservation, Ido's substantial error rate (at best, over 25%) may still provide a commercially valid solution. Such an error rate within a debarking machine could disable and damage million-dollar machines, shutting down a factory for up to several weeks, and potentially cause bodily injury to the staff operating the mill floor. Further, the error rate could render entire shipments unusable. Looking at Ido's error rate, a POSITA would reject Ido's proposals given the substantial and unnecessary risks.

124. As such, Ido is completely irrelevant to the debarking task at hand.

⁶⁴ Ex. 1005 at § 2.1.

C. U.S. Patent Publication No. 2019/0003829 (“Kambla”)

125. Timbeter OU, on behalf of inventors Martin Kambla and Tanel Sirp, filed U.S. Patent Application No. 2019/0003829 on January 2, 2017 which has a § 371 date of June 28, 2018. Kambla describes “[a] system for determination of the volume of a stack of logs” through the use of image analysis.⁶⁵ Timbeter has a product embodying the patent which is described throughout the patent and also in marketing materials.

126. With respect to Kambla’s invention, before you can begin collecting log diameters, you must prepare a known reference dimension. “The reference is a physical object of a known length placed in the photo...Without a correctly placed and entered reference, precise diameter and volume calculations are not possible.”⁶⁶



Timbeter urges that this is the most important step. The reference must be “clearly visible and unobstructed” as an “[a]ngled, floating, or partially hidden reference[] can affect scaling accuracy.”⁶⁷

⁶⁵ Ex. 1006 at Abstract.

⁶⁶ Ex. 2027.

⁶⁷ *Id.*

127. This physical, manually entered reference dimension is what Kambla describes as distinguishing itself from the prior Fovea measurement system:

Fovea's system doesn't allow to measure diameters less than 10 cm and doesn't include adjustable reference size, it uses the width of the stack and automatically places the reference in the back-end. The Fovea's system doesn't allow to measure the end of the truck, because the reference size (~2.5 meters) is not enough, the calculation formula of measuring the volume of timber is limited only by one predefined formula, instead of showing the diameter of the log....⁶⁸

128. The operator then takes a photo of the stack and reference. The application prompts the user "reference dimension image data through the interactive screen"⁶⁹ including "log length and select tree species" and, optionally, wood type:⁷⁰

129. The user is then instructed "enter[] stratification parameters"⁷¹ by dragging the two control points to the end of the reference object. "The reference defines scale, so accuracy here is critical."⁷²

⁶⁸ Ex. 1006 at [0005].

⁶⁹ Ex. 1006 at Claim 1[c].

⁷⁰ Ex. 2027.

⁷¹ Ex. 1006 at Claim 1[d].

⁷² Ex. 2027.

130. The application then generates circles and diameters over each log end.
131. Kambla’s “[t]ransparent volume calculations support fair trade practices, while better data quality improves logistics planning, safety and waste reduction.” Kambla is “especially valuable when measuring roadside or terminal log piles, truck load, or ... for markets with strict diameter-based pricing and for cases where transparency is critical such as audits or dispute resolution.”⁷³
132. Kambla’s only application to a sawmill would be elimination of manual measuring, such as with tape measures, for inventory and production planning.⁷⁴ However, Kambla’s solution would have been far less efficient than the diameter measurements already known in the art of debarking.⁷⁵ First, Kambla would require the placement of a physical reference marker on the logs prior to entering the debarker. As logs are debarked one by one within rotary machines, this would require placing a marker on each log, which would be highly inefficient. Further, Kambla would require measurement of the logs while still piled, which would be difficult to match with the individual logs as they entered the machines. The log-by-log conveyor measurements of the prior art would be preferred by a POSITA.
133. Thus, the solution of Kambla is fundamentally different from and irrelevant to the ‘947 Patent:
 - a. Kambla’s diameter measurement problem was already solved in the debarking industry.

⁷³ *Id.*

⁷⁴ Ex. 2028.

⁷⁵ *See, e.g.*, Ex. 1004 at [49] (“Located adjacent to the conveyor 13 is a log diameter and length measurement device 17 having its output operatively connected to the controller 67 shown in **Fig. 3** for sending thereto signals indicative of the diameter and length of the log 10’ as it is moved past the measuring device 17.”).

- b. Kambla speaks to the estimation of the volume of timber in a stack, a solution for “audits, logistics, or trade[.]”⁷⁶ Kambla is not geared towards process control within a mill environment.
 - c. Kambla focuses on general characteristics of the timber stack as a whole, not towards the characteristics of individual logs.
 - d. Kambla is for use on static stacks or piles of logs and fails to address the continual need for adjustment faced by operators of mills who have logs moving through conveyor belts.
134. I disagree with Dr. Pazzani’s assertion that Kambla’s ‘stack’ may include a single log.⁷⁷ At no point within Kambla are logs referred to singularly, rather Kambla is always directed to a *stack of logs*.⁷⁸ A stack—defined as (a) an orderly pile or heap or (b) a large number or quantity⁷⁹—is necessarily plural and would not exist when the number of logs is one. When addressing the results of the scan, Kambla describes the *circles* plural.⁸⁰ Dr. Pazzani’s assertion that Kambla merely *can* be a stack of logs, rather than *requires* a stack of logs is without support. Kambla should be understood to be directed at a *stack* of logs alone.

D. Programmable Logic Controllers (“Petruszella”)

135. Petruzella is a limited snapshot of a 2017 textbook describing programmable logic controllers (PLC).⁸¹ Petruzella describes generic and elemental characteristics of computer science. PLCs were well known in the industry and widely incorporated into everyday

⁷⁶ Ex. 2027.

⁷⁷ Ex. 1002 at ¶ 80.

⁷⁸ Ex. 1006 *passim*.

⁷⁹ Ex. 2029.

⁸⁰ *E.g.*, Ex. 1006 at [0105].

⁸¹ Ex. 1007.

machines. In the present patent, Dr. Pazzani alleges that the characteristics of the undebarked log “will be stored in the memory of the PLC at a memory address” and then “the PLC will [] retrieve these values so that they can be transmitted to the debarker via the communication port.”⁸² Dr. Pazzani further alleges the “input file would correspond to tree species and the values of the output file would correspond to debarker operating parameters.”⁸³

136. Notably, Dr. Pazzani testified that Petruzella merely reflects basic computer science principles, which would be easy for any undergraduate student with a computer science background to implement.⁸⁴ Petruzella stands, essentially, for basic knowledge of neural networks alone and provides no mention of forestry, logs, or debarking. A POSITA would not need any such information.

IX. OPINIONS ON VALIDITY

A. A POSITA would not have been motivated to combine Gagnon with Kambla, Ido, or Petruzella.

137. All the grounds alleged by Petitioner involve combining Gagnon with one or more of Kambla, Ido, or Petruzella. In my opinion as a POSITA, there would be no motivation to combine Gagnon with any one or more of Kambla, Ido, or Petruzella.

1. A POSITA would not have been motivated to combine Gagnon and Kambla.

138. A POSITA would have no reason to combine the teachings of Gagnon and Kambla. Gagnon already describes tools for the measurement of diameter and volume prior to the undebarked log entering the debarking machine:

⁸² Ex. 1002 at ¶ 177.

⁸³ Ex. 1002 at ¶ 178.

⁸⁴ Ex. 2001 at 63:6-14; 136:9-21.

Located adjacent the conveyer 13 is a log diameter and length measurement device 17 having its output operatively connected to the controller 67 shown in Fig. 3 for sending thereto signals indicative of the diameter and length of the log 10' as it is moved past the measuring device 17. Any appropriate non-contact sensor may be used as diameter and log length measurement device 17. Conveniently, a mean diameter can be derived from measurements of minimum log diameter D_{MIN} and a maximum log diameter D_{MAX} as shown in Fig. 2, or can be derived from a plurality of measured diameter values obtained along the log 10' from its leading end to its trailing end.⁸⁵

139. Kambla's innovation assists with measuring the diameter of logs in a stack on the truck or in the yard but is not described as providing a single log measurement on a conveyor belt. To the extent a POSITA would even consider adapting Kambla to a single log measurement system, it would require taking additional steps, such as placing a reference object for measurement on the log prior to scanning. This step would not be required in the diameter measurements already known for debarking machines.

140. A POSITA would have no reason to apply Kambla's measurement solution to Gagnon because Gagnon already contained an efficient, well-known solution for diameter measurement of debarked logs.

2. Petruzella is redundant.

141. Petruzella generally, and without depth, describes the fundamentals of Programmable Logic Controllers (PLC). Gagnon described the use of a computer "connected to the controller (PLC) 67 of the debarker 24 using link 70 to receive

⁸⁵ Ex. 1004 at [0049].

information on debarker operating parameters that could be used by the programmed computer 66 or displayed to the operator.”⁸⁶

142. As admitted by Dr. Pazzani, Gagnon discloses a PLC.⁸⁷ Dr. Pazzani appears to be using Petruzella simply to provide a definition of PLC as found within Gagnon.⁸⁸

143. However, a POSITA would already understand the acronym and function of a programmable logic controller. Dr. Pazzani relies on ‘advantages’ of PLCs as described by Petruzella to determine there would be a motivation to combine Petruzella with Gagnon. However, these advantages would be known and incorporated by the PLC disclosed in Gagnon without any need or motivation to look to Petruzella.

144. Petruzella is simply redundant information. A POSITA would have no need to find redundant information, much less a need or motivation to combine redundant information with Gagnon.

3. A POSITA would not expect success in combining Ido with Gagnon.

145. Gagnon describes error tolerance for fiber loss and remaining bark at 5-10%.⁸⁹ Within the industry, the tolerance for fiber loss and remaining bark can be much lower. For instance, the U.S. Department of Agriculture proposed that compression debarking should be limited to 1.5-3% remaining chip bark content by weight and wood loss of 5% or less.⁹⁰ The Australian Department of Agriculture, Fisheries and Forestry has a standard requiring “solid timber packaging and dunnage material to be free of bark” but tolerates “small pieces of bark” with more stringent, bark free requirements for “timber imported as a

⁸⁶ Gagnon at ¶ 49.

⁸⁷ Ex. 1002 at ¶ 171.

⁸⁸ *Id.*

⁸⁹ Gagnon at ¶ 93.

⁹⁰ Ex. 2030 at 3.

commodity.”⁹¹ A presentation by Latvian officials suggest that “after normal industrial processes it may remain up to 3 percent of bark on coniferous logs and up to 10 percent of bark on non-coniferous logs.”⁹²

146. As Gagnon notes, “[i]n particular, different wood species have their own characteristics that may affect the debarking process[.]”⁹³ For example, “It is also well known that bark thickness varies between wood species, parts of the tree, as well as harvesting areas, and thus influences the choice of debarking operating parameters[.]”⁹⁴ Gagnon’s remaining bark rate was 3.5-5.1% and fiber loss was 8.1-10.3% after 1812 logs.⁹⁵ Thus, Gagnon’s error rate, while already working under a tightly controlled species population, was at the top of the acceptable fiber loss and remaining bark rate.

147. Ido, across the tests, achieved a maximum of 74.7% success in successfully identifying tree species.⁹⁶ This is despite the fact that Ido’s population contained specimens with highly diverse bark characteristics.⁹⁷ Ido’s low success rate, combined with the large role wood species plays in proper debarking parameters, would dissuade any POSITA from attempting to combine Ido with Gagnon. A POSITA would have no expectation of success.

148. Further, a POSITA would understand that the *tree* recognition of Ido would present substantially different challenges than the *log* recognition of Gagnon.⁹⁸

149. For the foregoing reasons, a POSITA would have no motivation to combine Ido with Gagnon.

⁹¹ Ex. 2031.

⁹² Ex. 2032.

⁹³ Gagnon at ¶ 3.

⁹⁴ *Id.*

⁹⁵ Gagnon at Table 4.

⁹⁶ Ex. 1005 at § 4.

⁹⁷ *Supra* at § VIII.B.5.

⁹⁸ *Supra* at § VI.B.

B. Grounds 1 to 3: Gagnon in light of Ido, Kambla and/or Petruzella does not disclose each element of the claims.

150. In my opinion as a POSITA, the combination of Gagnon with Kambla and/or Petruzella does not render any of the independent claims of the '947 Patent obvious and also does not render any dependent claims obvious.

151. As noted above, Kambla's diameter solution is redundant to the diameter measurement solution outlined in Gagnon and known in the art. Incorporating Kambla's camera-based measurement would add unnecessary steps to the solution already proposed in Gagnon for measuring diameter.

152. As noted above, Petruzella is similarly redundant as a PLC is already incorporated and discussed within Gagnon. Petruzella provides no novel information or insight over Gagnon and, thus, is irrelevant.

153. As Kambla and Petruzella are redundant of Gagnon, Grounds 1 and 3 can be assessed by determining if Gagnon alone discloses each element of the '947 Patent.

154. Gagnon was disclosed to and considered by the examiner prior to issuing the '947 Patent.⁹⁹ Gagnon is even referenced within the Background of the Invention within the '947 Patent.¹⁰⁰

1. Gagnon does not use a computer-implemented method of detecting claimed log characteristics.

155. **Wood species.** Dr. Pazzani claims that the preamble is not limiting without any analysis.¹⁰¹ Regardless, he claims that Gagnon's disclosure of "knowing or measuring

⁹⁹ Ex. 1003 at pg. 155-243, 311.

¹⁰⁰ '947 Patent at 1:52-56; 2:47-57.

¹⁰¹ Ex. 1002 at ¶ 96.

upstream the intrinsic characteristics of each log entering the debarker such as diameter and wood species”¹⁰² discloses the preamble of Claim 1.¹⁰³ However, the preamble of Claim 1 declares an important limitation: “A *computer-implemented* method for characterizing an *undebarked* log in real time[.]”¹⁰⁴ Further, Claim 4 specifically notes “identifying the species of the log.”¹⁰⁵ While Gagnon discloses “knowing or measuring upstream the intrinsic characteristics of each log entering the debarker such as diameter and wood species,” wood species is input by a skilled, human operator in Gagnon who *knows* the species.¹⁰⁶ Gagnon involves no *computer-implemented* characterization of wood species.

156. **Knot presence.** In respect to the dependent claims, Gagnon makes no mention of detecting the “intensity of knot presence on the log”¹⁰⁷ for log characterization, before or after debarking.

157. **Moisture level.** While Gagnon makes repeated mention of the importance of moisture content and the existence of “appropriate moisture sensor[s.]”¹⁰⁸ Gagnon’s specification, claims, and figures do not show any methodology in which the moisture data would be used or monitored by the system.¹⁰⁹

1. Gagnon’s computer-implemented detection of diameter and length is non-analogous.

¹⁰² Gagnon at ¶ 6.

¹⁰³ Ex. 1002 at ¶ 96.

¹⁰⁴ ’947 Patent at Claim 1[pre].

¹⁰⁵ ’947 Patent at Claim 4[a].

¹⁰⁶ Gagnon at ¶ 68.

¹⁰⁷ ’947 Patent at Claim 4[c].

¹⁰⁸ Gagnon at ¶ 99.

¹⁰⁹ *Cf.* ’947 Patent at Claim 4[b].

158. Gagnon, in some embodiments, detects two variables through sensors upstream: log length and log diameter.¹¹⁰ As Gagnon notes, these factors are secondary to wood species and setting the proper initial parameters based upon wood species.¹¹¹ Further, this inspection is primarily important in the use of a rotary debarker, the focus of Gagnon.¹¹² However, there is no such limiting language within the '947 Patent.

2. Gagnon does not disclose “identifying characteristics of the undebarked log” and “computing operating parameters of a debarker based on the identified characteristics.”

159. As noted *supra*, Gagnon uses a retrospective control rather than a predictive control to determine appropriate operating parameters.¹¹³ Simply put, Gagnon uses data from the outgoing log to control parameters for the incoming log. Petruzella similarly describes a retrospective control: “automatic control involves maintaining a desired set point at an output... if there is deviation from that set point, an error is determined by comparing the output against the set point and using this error to make a correction. This requires feedback from the output to the control for the input.”¹¹⁴

160. The '947 Patent rather uses data from the incoming log to control the debarking parameters for the incoming log, which is a predictive control. Petruzella, being a beginners-level textbook, does not attempt to explain machine-learning predictive controls.

161. Dr. Pazzani incorrectly oversimplifies the conversion from a retrospective to predictive control, alleging that “a person of ordinary skill would be able to take the

¹¹⁰ *Supra* at § VIII.A.3.

¹¹¹ *Supra* at § VIII.A.1.

¹¹² *Supra* at § VIII.A.3.

¹¹³ *Supra* at § VIII.A.2.

¹¹⁴ Ex. 1007 at 75.

cameras used in Ido (or any other type of camera capable of capturing suitable images), mount those cameras to capture images on the input side of the debarking machines, and couple the output of those cameras to the controller/computer already disclosed in Gagnon, and expect such an implementation to be successful and operate correctly.”¹¹⁵

162. Retrospective models are easier and cheaper to build. They work backwards, using historical data that already exists, to examine and apply relationships and patterns that already exist. However, retrospective models have no ability to adapt to change. Retrospective models can only attempt to fix an error after it has been made and are prone to over or under correction. This is why “abnormal disturbances affecting operating conditions... or significant variation of moisture content ... characterizing the batch of logs under debarking cannot be handled by the MPC to achieve the desired performance.”¹¹⁶

163. Predictive models can adapt quickly to abnormalities if they are properly trained. However, predictive models are time consuming and complicated to generate as the models are only as good as the data on which it was trained. A predictive model can be trained through (1) manual entry of inputs matched with corresponding parameters derived through historical data and knowledge;¹¹⁷ (2) training the algorithm through human validation or correction of predictions;¹¹⁸ and/or (3) setting predetermined output variables by which the algorithm learns independently through a continuous feedback loop.¹¹⁹

¹¹⁵ Ex. 1002 at ¶ 160.

¹¹⁶ Gagnon at ¶ 99.

¹¹⁷ See '947 Patent at Claim 14.

¹¹⁸ See '947 Patent at Claim 12.

¹¹⁹ See '947 Patent at Claim 13.

164. In Petitioner’s Exhibit 1012, the complexity of teaching an algorithm to not only predict results of new inputs based on the results of past inputs, while also learning from prediction errors which may not repeat is highlighted in the robotics context.¹²⁰

165. Essentially, while Gagnon’s controls react based on output data alone, the algorithm of the ’947 Patent acts according to present input data *and* past results.

166. In my opinion, a POSITA would not assume that Gagnon’s retrospective model, which was otherwise used in the wood science industry, would have been easily converted to a predictive model with success. This is further confounded by the substantial error rate in the predictive models for wood species shown in Ido.

C. Objective Indicia Confirm Non-Obviousness of the Claimed Debarking Methods

167. While the use of machine learning may not be long felt in many industries today, the forestry industry often operates in remote settings with decades old equipment. For this reason, and “[d]espite the unprecedented opportunities, the lumber industry struggles to leverage big data analytics value and power.”¹²¹

168. As noted within Gagnon, the ability to predictively change operating parameters based upon upstream data was a long-felt need in industry. While Gagnon was able to incorporate the upstream sensors already known in the art for log length and diameter, Gagnon failed to provide predictive operating parameters for wood species and moisture level, amongst other factors. The ’947 Patent solves this long-felt and recited need by providing a system for predictive operating parameters based upon incoming undebarked log characteristics.

¹²⁰ Ex. 1012 at § 4.1.

¹²¹ Ex. 2033.

169. I have reviewed the Declaration of Alain Gingras and believe the success of the embodiment sold by Comact further proves non-obviousness.

170. The accuracy rate of the embodiment claimed far exceeds what a POSITA would expect given the results achieved by Gagnon, Ido, and other industry experts.

D. Ground 5: Claims 7 and 8 Are Definite

171. Dr. Pazzani alleges that a POSITA would not understand the term “predetermined value” within the ’947 Patent Claims 7 and 8. I disagree.

172. The summary of the invention described training a model to identify log characteristics, where the analysis outputs a score. “[I]f the identification score is different from a predetermined value[,]” the model is considered trained.¹²² Similarly, the model is considered trained if the “identification score on the characteristics of the sample data” is satisfying and “may be considered ready and used for determined log characteristics in production.”¹²³

173. Dr. Pazzani cited to Fawcett, Ex. 1011, which describes receiver operating characteristics (ROC) graphs that provide “a richer measure of classification performance than scalar measures such as accuracy, error rate or error cost.”¹²⁴ This is “especially useful for domains with skewed class distribution and unequal classification error costs” such as in medical diagnostic testing.¹²⁵ Dr. Pazzani has made no arguments or attempted analysis as to why there would be unequal classification error costs with respect to false negatives versus false positives within the debarking process. Primarily, Dr. Pazzani ignores that ROC graphs are simply another way to show simple classification accuracy or precision.

¹²² ’947 Patent at 3:35-45.

¹²³ *Id.* at 8:7-12.

¹²⁴ Ex. 1011 at 13.

¹²⁵ Ex. 1011 at 1.

174. Dr. Pazzani acknowledges that representative of Nicholson informed him “the industry typically looks for wood chips containing less than 1 percent bark.”¹²⁶ A POSITA would understand that, based upon industry norms for the amount of bark present, a certain accuracy threshold in identifying the characteristics and selecting the corresponding best debarking parameters would be tolerated. When the identification score is below, or different from, the accepted accuracy tolerance, the model will need to undergo training. When the identification score is above, or equal to, the accepted accuracy point, the model is considered to be trained and production ready.

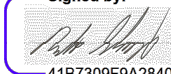
175. This could also be set at a level simply above the average skilled-human operator. Human-error rates for species identification in one study was 6.8-7.6% which could suggest that an acceptable accuracy point for wood species identification would be above 94% or the human-error rate.¹²⁷

176. As a POSITA would understand the acceptable error tolerance in classification which would result in an acceptable debarking quality, a POSITA would understand what predetermined value or satisfactory score would be acceptable with respect to identification accuracy.

X. CONCLUSION

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Dated: 5/13/2026

Signed by:

 41B7309E9A2840A

Dr. Rubin Shmulsky

¹²⁶ Ex. 2001 at 74:1-7 (quoting Ex. 1002 at ¶ 30).

¹²⁷ Ex. 2035.

APPENDIX A

Curriculum Vitae

March 2026

Dr. Rubin Shmulsky
President, Timber Technology Authority, LLC
377 Bent Tree Road
Starkville, MS 39759

Tel: 662-617-4607
Email: timbertechnology@yahoo.com

Education:

Ph.D. in Forest Products. Mississippi State University, Starkville.
M.S. in Forest Products. Mississippi State University, Starkville.
B.S. in Building Materials & Wood Tech. Forestry minor. University of MA, Amherst. Cum Laude.
New England Kiln Drying Assoc. (NEKDA) workshop on seasoning hardwood lumber. 1994.

Experience:

Private Sector:

8/2000 – Present: President, Timber Technology Authority, LLC.
6/94 - 8/2000: Professional forest products and light frame construction consultant
7/94 - 5/95: Forest Products Associates, custom dry kiln.
3/94 - 7/94: Architectural Timber and Millwork.
1/88 - 1/94: Shmulsky Construction and Home Inspection Service.

Public Sector:

- 4/2008 – Present: MS State Univ., Professor and Head of Department, Sustainable Bioproducts (formerly Forest Products)
- 5/2007 – 3/2008: MS State Univ., Interim Head of Department, Forest Products
- 7/2004 – 3/2008: MS State Univ., Associate Professor of Forest Products
- Research and development of wood products and production systems
- Courses: Lumber Manufacturing
Physical Properties of Wood
Wood Technology and Products
Introduction to Statics and strength of wood materials
- 6/2000 – 6-2004: Univ. of MN, Twin Cities, Wood and Paper Science Dept., Assistant Professor.
- Wood and biobased products, performance, applications, and materials science research
- Courses: Wood-Based Panel Technology Wood Composites
Statics & Engineering Mechanics Mechanics and Structural Design
Advanced Wood Drying Advanced Panel Products Technology
Mechanics of Wood and Wood Composites
- 7/98 - 6/2000: MS State Univ., Forest Products Department, Instructor.
- Research and Technical Assistance: wood products, production systems, environmental issues
- Courses: Lumber Manufacturing Furniture Production I
Furniture Production II Introduction to Forest Industries: Sawmilling

7/95 - 7/98: MS State Univ. Forest Products Lab. Research and Teaching Assistant.

Patent:

Separator for dewatering particulate matter suspended in water. U.S. Patent #9,675,915. Inventors: Warden, T.W., S. Miller, R. Shmulsky, J. Finn, and R. Lane.

Textbooks:

- Shmulsky, R., and P.D. Jones. 2019. Forest Products and Wood Science, an Introduction, 7th ed. J.W. Wiley Publishing, Hoboken, NJ.

- Shmulsky, R., and P.D. Jones. 2011. Forest Products and Wood Science, an Introduction, 6th ed. J.W. Wiley Publishing, New York, NY.

- Bowyer, J.L., R. Shmulsky, and J.G. Haygreen. 2007. Forest Products and Wood Science, an Introduction, 5th ed. Blackwell Publishing, Ames, IA.

- Bowyer, J.L., R. Shmulsky, and J.G. Haygreen. 2003. Forest Products and Wood Science, an Introduction, 4th ed. ISU Press, a Blackwell Company.

Professional Activities:

Forest Products Society

International Conference Chair: 2017.

Executive Board Member: 2010-2012

Chair: Softwood Lumber Group: 2006-2009, 2001-2003.

Vice Chair: Wood Physics and Drying Group: 1998-2000, 2004-2006.

Trustee, Mid South Section, Forest Products Society: 2004-2006.

Chair, Mid South Section, Forest Products Society: 2007

Society of Wood Science and Technology

Board member: 2016-2018

Chair Accreditation Committee 2007-2009

Vice Chair Accreditation Committee: 2005-2007, member 2001-present.

Education Committee: 2001-present.

Active member in:

ANSI Accredited Standards Committee O5 (2022-present)

ANSI O5.1: Wood Poles: Specifications and Dimensions

ANSI O5.2: Wood Poles – Structural Glued Laminated Timber for Utility Structures

Vice chair 2025-2028

ANSI O5.3: Solid-Sawn Wood Crossarms, Braces, and Ground Wired Moulding: Specifications and Dimensions

ANSI O5: Wood Poles Package

American Society of Civil Engineers

American Wood Protection Association

Mississippi Forestry Association (former Board member)

Society of American Foresters

Southern Pressure Treaters' Association

North American Matting Association (Chair, technical committee)

Southern Forest Products Association

Composite Panel Association

Mississippi Lumber Manufacturers Association (former Board member).

Fellow: International Academy of Wood Science.

Refereed Manuscripts:

- Laisa, A., L. Khademibami, C.E. Stokes, S.A. Fatemi, R. Shmulsky. 2026. Characterization of guayule resin as a natural wood preservative: carrier system and leaching rate analysis. *Bioresources*. 21(2):3207-3230p.
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- Khademibami, L., R. Shmulsky, F. Rezaei, N. Irby, C.A. Senalik, S.A. Fatemi. 2025. Nondestructive and destructive testing of wood railroad ties. *Forest Products Journal*. 75(2):129-135.
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Paper FPL-RP-720. Madison, WI.: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 7p. <https://doi.org/10.2737/FPL-RP-720>.

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- Ross, R.J., C.A. Senalik, R. Shmulsky, B.K. Brashaw. 2021. Development of field Inspection Practices for Wood structures on fire-prone lands – Application of state-of-the-art condition assessment techniques. General Technical Report FPL-GTR-285. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 15 p.
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Professional Experience/Testimony/Consultations

Description	City	State	Report / other	Depo	Trial	Side
Wood utility pole failure (Grigsby et al. v ATT et al.)	Los Angeles	CA	X			Defense
Wood utility pole failure (Thomas et ux. v NIPSCO et al.)	Jasper Co.	IN	X			Defense
Kiln patent infringement. (USNR v Amer. Wood Dryer)	Portland	OR	X			Defense
Wood flooring performance (Foster v. Emmerton)	Hollis	NH	X		X	Plaintiff
Wood utility pole failure. Wrongful death. (Sidebottom & Wood v. Arkansas Elec. Coop, et al. v. United Underground et al.	Washington, County	AR	X			Defense
Wood utility pole failure. Wrongful death. (Mendoza v NLC CA, Inc. et al.)	Oroville	CA	X			Plaintiff
Material/WIP shrinkage, Mantelcraft v Dunn	Florence	AL	X			Plaintiff
Interior water damage on wood, Toby Johnson	Jackson	TN	X			Umpire
Wood utility pole failure (Mojica-Hichez v. Delmarva et al.	Wilmington	DE	X			Defense
Wood utility pole failure (Gauge v Entergy)	Silsbee	TX	X			Defense
Truss software IP (Paragon v Qualtim)	Chattanooga	TN	X			Plaintiff
Wood utility pole failure (Osage Valley Electric Coop)	Butler	MO	X			Defense
Walnut log delivery contract dispute (Missouri Walnut Trading LLC v Florian Legno SPA)	Neosho	MO	X			Plaintiff
Wood crossarm failure (Shuba v West Penn Power)	Lawrence	PA	X			Defense
Wood identification and grading of historic covered timber bridge	Elizabethton	TN	X			Owner / Municipality / State
Structural evaluation protocol for hurricane damaged timber piles	Long Beach	MS	X			Owner / Municipality
Wood utility pole failure (Butler Dairy Farm v Consumer Energy)	Big Rapids	MI	X			Defense
Wood utility pole failure (Guzzo v. Entergy, Arkansas)	Searcy	AR	X			Defense

Wood utility pole failure / apartment fire (Consumer Energy)	Comstock Park	MI	X			Defense
Wood utility pole failure (Angel et al. v Midwest Energy et al.)	Hays	KS	X			Defense
Treated glulam failure / performance (Unicorp, LLC v. BRaDD, LLC, et al.)	Lake Charles	LA	X			Plaintiff
Wood utility pole failure (Various v. Hawaii Telecom et al.)	Maui	HI	X			Defense
Reclaimed building materials valuation (Pate v. Rusk)	Rusk	TX	X	X	X	Defense
Fractured chair leg (Briana Legaspi v Living Spaces)	Woodland Hills	CA	X			Plaintiff
Historic timber frame building structural condition assessment post bombing	Nashville	TN	X			Owner
Evaluation of treated plywood (Wallace v. Swift)	Range	AL	X			Defense
Wood utility pole failure (Williams v. Entergy)	Lake Charles	LA	X			Defense
Wood transmission pole failures (Barrett v. Great River Energy)	Worthington	MN	X			Defense
Wood utility pole failure (Cherry v. Entergy)	Lake Charles	LA	X			Defense
Termite structural damage evaluation, Historic timber frame, Basilica of Immaculate Conception	Mobile	AL	X			Owner / Plaintiff
Wood cooling tower structural service life estimation (Dow v. Trinseo, International Arbitration)	New York	NY	X	X	X (arbitration)	Defense
Wood utility pole failure. Black Warrior power cooperative	Demopolis	AL	X			Defense
Wood truss failure / roof collapse	Starkville	MS	X			Consulting / Owner
Discoloration in hardwood panels	Denton	TX	X			Defense
Patent infringement (Dasso & Easoon v. Moso N.A. & Moso International)	Wilmington	DE	X	4X	1X (+2 hearings)	Plaintiff
Porch rail structural failure (Shapleigh v. Parsons)	Kittery	ME	X			Defense
Wood utility pole failure (Raffield v Entergy)	Spurger	TX	X			Defense
Asbestos evaluation (Stehlin v. Pecora)	Florham Park	NJ	X			Defense

Plank roof tornado/straight line wind/water damage (Grand Valley v Auto Owners Insurance)	Saulsbury	TN	X			Plaintiff
OSB sheathing performance / moisture intrusion	Atlanta	GA	X			Plaintiff
Wood Utility Pole failure. S.E. Mississippi Electric Power Coop	Lorman	MS	X			Defense
Flooring copyright infringement (Mannington v L.A. Hardwood Flooring)	Los Angeles	CA	X			Defense
Wood plastic composite decking failure (Porter)	Hermitage	TN				Plaintiff
Wood flooring finish failure (Williamson v. Auto Owners Insurance Company)	Humboldt	TN	X			Plaintiff
Structural failure wood / rope ladder	Philadelphia	PA				Defense
Structural failure chair evaluation (Sawhill v Hyatt)	San Diego	CA				Plaintiff
Flooring copyright infringement (Mannington v Home Legend)	Rome	GA	X			Defense
Wood lath packaging failure issue	Buffalo	NY				Defense
Structural failure chair evaluation (Planet Hollywood)	Las Vegas	NV	X			Defense
Kiln fire / business interruption (mediation)	Graceville	FL				Umpire
Wood frame floor / moisture evaluation	Oxford	MS	X			Defense
Wood composite patent review and infringement	Augusta	GA	X			Defense
Machine Stress Rating audit	Mansfield	AR	X			Consulting / Owner
Moisture / flood damaged timber frame and flooring assessment (Faraday Capital Ltd. V 325 Goodrich Ave LLC)	Thomaston	GA	X	2X		Plaintiff
Outdoor wood staircase decay / structural failure	Jackson	MS	X			Defense
Building panel / asbestos evaluation. Plaintiff v Homasote (75+ cases)	Various	Through out USA	X	8X		Defense
Scaffold plank structural failure / moisture evaluation	Gulfport	MS	X			Plaintiff
Cooling tower insect and decay structural assessment	Broken Bow	OK	X			Consulting / Owner
Wood truss structural failure (Cahill v. Universal)	Tampa	FL				Plaintiff

Fingerjointed cooling tower beam structural evaluation	Canton	OH	X			Consulting / Owner
Wood window moisture performance (Coastal v. Sabana)	West Palm Beach	FL	X	X		Plaintiff
Wood truss structural failure / collapse. (Simmons v. Heartland)	Dexter	MO		X	X	Plaintiff
Pine trim performance	Orlando	FL	X			Mediation
Pallet failure (Avera v. Hood Oil)	Tupelo	MS		X		Defense
Wood barstool structural fracture	Houston	TX	X			Plaintiff
Television cabinet collapse	Chula Vista	CA	X			Plaintiff
Wood and composite stability		Japan	X			Consulting / Owner
Wood moisture / decay building piling structural evaluation	Chicago	IL	X			Consulting / Owner
Wood I-joist moisture mold/decay (Campbell, et ux. v. Teague, et al.)	Jackson	TN	X		X	Plaintiff
Fractured wagon coupling pole (various v. Proctor)	Springfield	MO	X	X	X	Defense
Wood implement failure	Las Angeles	CA	X			Plaintiff
Timber piling decay / evaluation	Pine brook	NJ	X			Defense
Timber trespass investigation	Lee	MA				Defense
Wood cabinet performance (Objectwave v. Charlestowne)	Chicago	IL	X		X	Defense
Glued wood product / molded plywood performance	Memphis	TN	X			Consulting / Owner
Fractured ladder structural failure evaluation	Lafayette	LA	X			Plaintiff
Timber piling moisture / structural performance (E.L. Enterprises v. MMSD)	Milwaukee	WI	X	X		Defense
Imported wood quality (Vorka v. Zodax)	Las Angeles	CA	X		X	Defense
Composite moulding patent infringement	Washington	DC	X			Defense
Wood dunnage structural failure (Dinn v. U.S. Ecology et al.)	Corpus Christi	TX	X	X		Plaintiff
Wood window moisture / failure (Humphrey v. House of Windows)	Houston	TX	X	X		Plaintiff
Wood composite quality control and assurance	Sheridan	AR	X			Consulting / Owner

Fingerjoint lumber inspection	Houston	TX	X			Defense
Moisture / composite siding analysis in Mobile, AL	Starkville	MS	X			Defense
VOC emissions testing	Commerce	GA	X			Consulting / Owner
Truss structural failure / roof collapse. Community Bio-Resources, Inc v. Hoffman Corp.	Ames	IA	X			Defense
Lumber kiln asbestos	Newton	MS				Defense
Fractured commercial chair (Shanley v. Hy-Vee et al.)	Davenport	IA	X	X		Defense
Treated timber shipping accident	Phoenix	AZ	X			Consulting / Insurance carrier
Composite flooring patent infringement	Chicago	IL	X			Plaintiff
Porous nature of wood for laser ablation, patent infringement & interpretation	San Clemente	CA	X			Defense
Oak dunnage fracture / structural failure	Chicago	IL				Defense
Yellow pine trim performance, interior (West v. Kleas et al.)	Austin	TX	X		X	Defense
Firearm parts improvement	Kingfield	ME				Consulting / Owner
Wood ladder structural failure	Las Cruces	NM	X			Plaintiff
Outdoor porch / decking decay and damage	St. Paul	MN	X			Plaintiff
Wood composite porch deck failure	Minot	ND	X			Defense
Yacht wood plywood paneling performance (Valiant v. Greenline et al.)	Gordonville	TX	X	X		Plaintiff
Air pollution emissions from plywood (U.S.A. vs. Coastal Lumber)	Tallahassee	FL	X			Plaintiff
OSB sheathing failure	Portland	OR				Plaintiff
Solid lumber purlin failure (Plese v. Weyco.)	Lemont	IL	X	X		Plaintiff
Window moisture / decay (Brightwood v. California Insurance)	Minneapolis	MN	X	X		Plaintiff
Performance / evaluation of 3 timber bridges	Schroon Lake	NY	X			Defense
Heavy timber decay & structural failure (Infinity v. Granite)	San Diego	CA	X	X		Plaintiff
Porch deck and frame structural failure (Getty v. Nilles et al)	St. Paul	MN	X		X	Defense

Marina decking performance / moisture	Biloxi	MS	X			Plaintiff
Ladder structural failure (Rosen v. Davidson)	Ft. Lauderdale	FL	X	X		Plaintiff
Stepstool structural failure	Brooklyn Park	MN	X			Plaintiff
Ladder structural failure (Lavish v. Archibald)	Philadelphia	PA	X		X	Plaintiff
Composite I-joist performance (Netwig v. G.P. et al.)	Kansas City	KS	X	X	X	Plaintiff
Composite wood siding performance / moisture	Palo Alto	CA	X			Defense
Wood floor performance, interior	Tuscaloosa	AL	X	X		Defense