Paper No. __

UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

INARI AGRICULTURE, INC.,
Petitioner,

v.

CORTEVA AGRISCIENCE LLC,
Patent Owner.

_____

Case No. IPR2024-00179
Patent No. 10,947,555

_____

PETITION FOR INTER PARTES REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.1 et seq

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I. INTRODUCTION

Inari Agriculture, Inc. ("Petitioner") requests *inter partes* review of claims 1-34 of U.S. Patent No. 10,947,555 (the "'555 patent") (EX1001). The '555 patent is assigned to Corteva Agriscience LLC ("Corteva" or "Patent Owner"), and claims transgenic plants and plant cells containing recombinant DNA encoding an AAD-1 protein with certain requirements, including (1) an amino acid sequence with at least 85% sequence identity to SEQ ID NO: 9, (2) an "AAD-1 motif" defined by specific amino acid residues and positions, and (3) herbicide-degrading enzymatic activity.

The '555 patent, which issued in March 2021, was filed as a continuation in a series of applications dating back to April 2004. Before October 7, 2016, when Corteva's predecessor filed U.S. Application No. 15/288,406 (the "'406 application"), which later issued as the '555 patent, no one—not the applicant, nor the examiner in any of those prosecutions—suggested that the '555 patent's parent applications supported claims to amino acid sequences with less than 95% sequence identity to SEQ ID NO: 9 or any other sequence listed in the specification, much less as little as 85%.

Corteva's overreaching compels a finding of unpatentability. First, as a result of the '555 applicant's efforts to redefine their invention, the '555 patent's predecessors do not support the claims, including the claimed "AAD-1 motif" and

the requirement of at least 85% sequence identity. As a consequence, the claims cannot claim priority prior to the filing of the ’406 application in 2016, at the earliest, and are therefore anticipated and obvious over Corteva’s prior International Patent Publication No. WO 2005/107437 (“Corteva ’437”). EX1021.

Second, even assuming *arguendo* that the ’406 application’s predecessors do support the ’555 patent’s claims, those expanded claims are obvious based on the prior art that existed in April 2004. By that time, and as reflected in Saari 1999, Saari 1998 (collectively, the “Saari References”), Schleinitz, Streber, and Jepson (EX1040-1043, EX1030), researchers had identified AAD-1 (then known as “RdpA”)—on whose amino acid sequence the ’555 patent’s claims are based—and confirmed that certain enzymes in the same family could be expressed in transgenic crops to improve their herbicidal resistance.

Petitioner’s expert, Dr. Aron Silverstone, explains the prior art’s disclosures and the bases for Inari’s challenges. EX1054, ¶¶ 1-642.

Accordingly, Petitioner respectfully requests that the Board institute trial and cancel the claims.

II. STANDING (37 C.F.R. § 42.104(A)) AND PROCEDURAL STATEMENTS

Petitioner certifies: (1) the ’555 patent is available for IPR; and (2) Petitioner is not barred or estopped from requesting IPR of any ’555 patent claim on the grounds identified herein. Petitioner is submitting a Power of Attorney and an Exhibit List pursuant to 37 C.F.R. § 42.10(b) and § 42.63(e), respectively, and all required fees pursuant to 37 C.F.R. § 42.15(a), concurrently with this Petition. The Office is authorized to charge any additional fees to Deposit Acct. No. DA23628.

A Motion for Joinder is filed herewith requesting joinder with IPR2023-01036, which was filed by Bayer CropScience LP and Monsanto Company (“Bayer”) on June 15, 2023. The instant Petition is substantively identical to the petition filed by Bayer, challenging the same claims of the ’555 patent on the same grounds and relying on substantively identical expert testimony.

III. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real party-in-interest is Petitioner Inari Agriculture, Inc.

B. Related Matters (37 C.F.R. § 42.8(b)(2))

To the best of Petitioner’s knowledge, the ’555 patent is, or has been, involved in the following judicial or administrative matters:

Corteva Agriscience LLC v. Monsanto Co., No. 22-cv-1046-GBW (D. Del.) (the “District Court Action”);

Bayer CropScience LP et al v. Corteva Agriscience LLC, Case No. IPR2023-01036 (PTAB).

Petitioner is concurrently filing IPR petitions challenging related U.S. Patent Nos. 11,149,283 (the "'283 patent") (EX1002) and 11,299,745 (the "'745 patent") (EX1003), which also claim priority to the '406 application, and which Bayer has also challenged in IPR2023-01037 and -01038. Petitioner is concurrently filing motions to join those proceedings.

In addition, Petitioner has requested *ex parte* reexamination of the '555 patent: *In re Wright*, Control No. 90/019,130.

The following U.S. patent application also claims priority to the '406 application: U.S. Patent Application No. 17/143,824.

C. Lead and Backup Counsel and Service Information (37 C.F.R. § 42.8(b)(3) and (b)(4))

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Counsel for Petitioner consents to service of all documents via electronic mail.

IV. STATEMENT OF THE PRECISE RELIEF REQUESTED AND THE REASONS THEREFOR (37 C.F.R. § 42.22(A))

Petitioner requests institution of IPR and cancellation of claims 1-34. Petitioner's statement regarding the relief requested is set forth below.

V. THE '555 PATENT

The '555 patent is entitled "Herbicide Resistance Genes." The '406 application, which issued as the '555 patent, was filed on October 7, 2016, as a "continuation" in a series of applications including U.S. Patent Application Nos. 14/820,893 (the "'0893 application"), 12/951,813 (the "'813 application") and 11/587,893 (the "'7893 application"). EX1001, Cover Page. Those applications claim priority to U.S. Provisional No. 60/567,052 (the "'052 provisional"), filed April 30, 2004. *Id.*

The '555 patent's claims are directed to transgenic plants and plant cells that have been modified to express what the '555 patent calls an "AAD-1 protein." Functionally, the recited AAD-1 protein must exhibit aryloxyalkanoate dioxygenase activity that enzymatically degrades a "phenoxy auxin" and an "(*R*)-aryloxyphenoxypropionate" herbicide. Structurally, the AAD-1 protein must comprise an "amino acid sequence having at least 85% sequence identity with SEQ

ID NO: 9," the amino acid sequence encoded by the naturally occurring AAD-1 gene, and it must comprise an "AAD-1 motif" having the form "$HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R$". These concepts are described in further detail below.

A. Phenoxy Herbicides

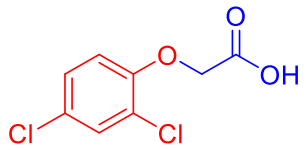
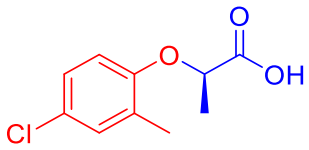
Herbicides and herbicide-resistant crops have been used for decades; as of April 2004, researchers had successfully modified crop plants to protect them from glyphosate and other herbicides. EX1001, 1:21-2:11; EX1030, [0012], [0024], [0026]-[0027], Ex. 1-2; EX1037, 61-65; EX1054, ¶ 210. Researchers knew that certain enzymes naturally expressed in soil bacteria were capable of degrading herbicides and had expressed those enzymes in crops to do just that. EX1001, 3:3-42; EX1040, 93; EX1041, 422; EX1043, 1:41-48, 2:52-62, 4:19-6:62, 7:58-12:67, 22:56-32:9, claim 6; EX1044-1045; EX1032-1033; EX1037; EX1054, ¶¶ 45, 210.

By April 2004, widespread emergence of glyphosate-resistant weeds had generated interest in alternative herbicide resistance genes. EX1001, 1:63-3:2. Researchers knew that plants could be transformed to include multiple herbicide resistances, which would help decrease the likelihood that weeds would become resistant to any particular herbicide. EX1030, [0012], [0026]-[0027], [0054], [00135]-[00180], claim 4; EX1039, 308-309; EX1054, ¶ 282.

Phenoxy herbicides, used for decades, presented a promising alternative to glyphosate. EX1001, 2:27-29, 2:42-43; EX1039, 69, 88-92; EX1022, 6-10 & Fig.

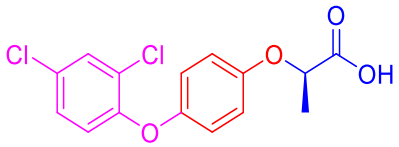
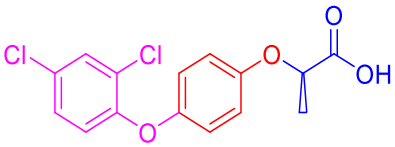
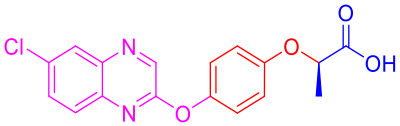
1.6; EX1026; EX1054, ¶¶ 38, 210. All phenoxy herbicides share certain structural features, including a phenoxy group and a carboxylic acid. EX1001, 3:49-56; EX1039, 69, 88-92; EX1022, 6-10 & Fig. 1.6; EX1026; EX1054, ¶¶ 38-44; *see also* EX1028, ¶¶ 158-161.

One group of phenoxy herbicides, the "phenoxy auxins," includes the well-known herbicide 2,4-dichlorophenoxyacetic acid ("2,4-D"). EX1001, 3:49-56, 8:26-41, Tbl. 1; EX1054, ¶¶ 39-41. Certain phenoxy auxins exhibit chirality and therefore exist as enantiomers. The (*R*)-enantiomers are herbicidally active; the (*S*)-enantiomers are not. EX1001, 8:10-17; EX1054, ¶¶ 40-41. The structures of the non-chiral 2,4-D and the chiral (*R*)-mecoprop are depicted below:

2,4-D	**(*R*)-Mecoprop**
	

EX1001, Tbl. 1; EX1054, ¶ 41.

Another group of phenoxy herbicides is the "aryloxyphenoxypropionates" ("AOPPs" or "FOPs"). Aryloxyphenoxypropionates include the herbicides diclofop and quizalofop. EX1001, 3:49-56, 11:15-12:15, Tbl. 2; EX1054, ¶¶ 42-43. Aryloxyphenoxypropionates share the phenoxy (red) and carboxylic acid (blue) groups characteristic of phenoxy herbicides, as well as an aryloxy group (purple):

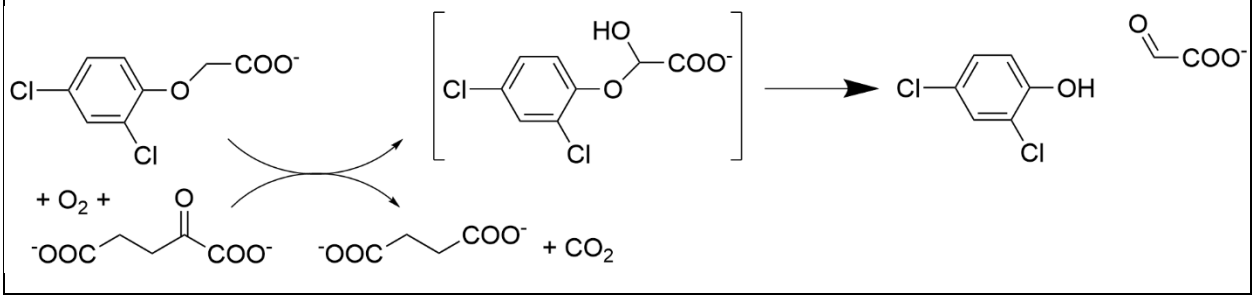
(*R*)-Diclofop	(*S*)-Diclofop	(*R*)-Quizalofop
		

EX1001, Tbl. 2; EX1054, ¶ 42. Like the phenoxy auxins, aryloxyphenoxypropionates may be chiral, in which case the (*R*)-enantiomers are herbicidally active. EX1054, ¶ 42.

The ’555 patent uses the term “aryloxyalkanoate” to refer collectively to achiral phenoxy auxins (*e.g.*, 2,4-D), chiral phenoxy auxins (*e.g.*, (*R*)-mecoprop), and chiral aryloxyphenoxypropionates (*e.g.*, (*R*)-diclofop). EX1001, 3:49-56, claims 6-10; EX1054, ¶ 44.

B. *α*-Ketoglutarate-Dependent Dioxygenase Enzymes

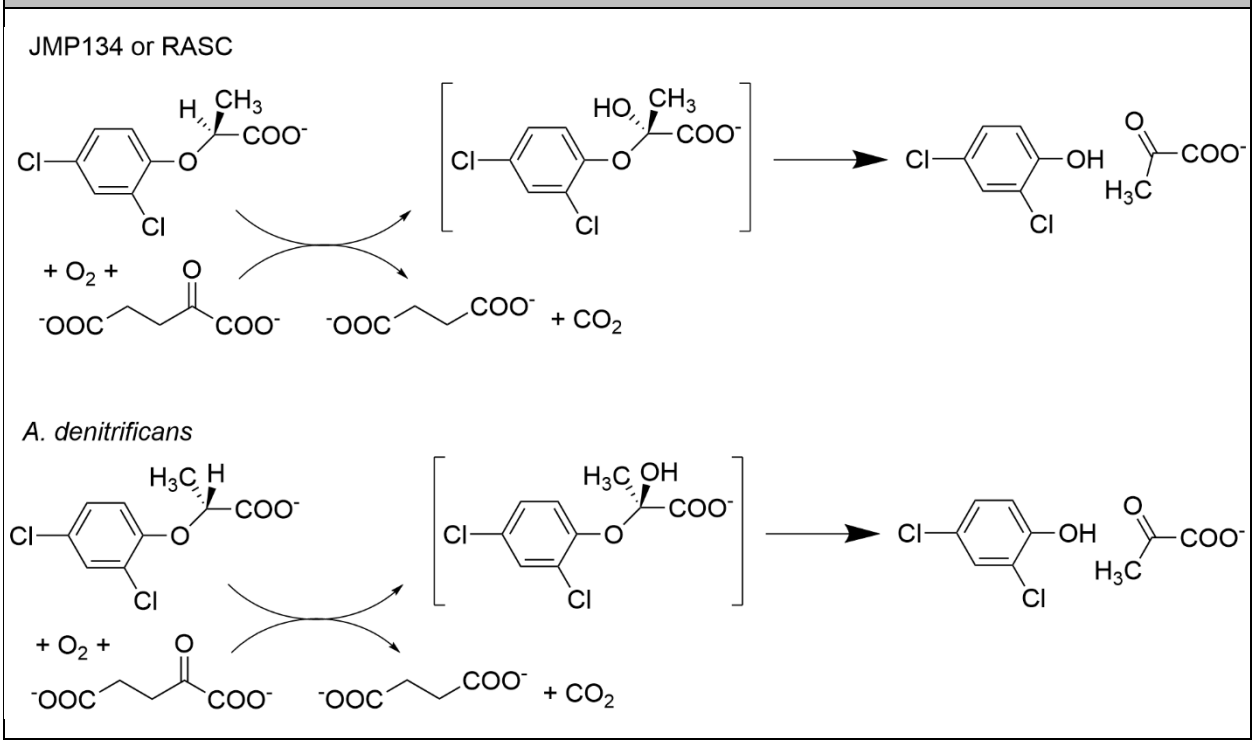
As of April 2004, researchers had reported that certain bacterial enzymes in the α-ketoglutarate-dependent dioxygenase family, such as TfdA, could degrade various phenoxy herbicides. EX1054, ¶¶ 45-46; EX1001, 3:3-14, 17:66-18:2. α-ketoglutarate-dependent dioxygenases catalyze oxidation reactions by incorporating oxygen into their substrates. EX1025, 21, 29-38; EX1040, 16-18; EX1054, ¶ 47. As shown below, TfdA enzymatically degrades 2,4-D by cleaving it into its phenoxy and carboxylic acid components:

2,4-D + Fe^{2+} TfdA


EX1001, Fig. 1; EX1054, ¶ 48; EX1024, 2084-85, Fig. 2.

Prior art as of April 2004 disclosed that some α-ketoglutarate-dependent dioxygenases, including TfdA, could degrade chiral phenoxy herbicides like mecoprop and dichlorprop. EX 1001, 3:26-32; EX1054, ¶ 54. However, the enzymes acted in a stereospecific manner, *i.e.*, a given enzyme would catalyze reactions involving the (*R*)- or (*S*)-enantiomer of the herbicide, but not both. EX1001, 3:26-38; EX1054, ¶¶ 54-55; EX1041, 422-27; EX1040, ch. 3, 70-95; EX1036, 6678; EX1034, 228, 240; EX1047, 317; EX1048, 10-11, 15. Each of the Saari References (discussed in Grounds IIA-IIB) reported that TfdA from the bacteria JMP134 and RASC degraded (*S*)-dichlorprop, but a relative of TfdA from *A. denitrificans* degraded (*R*)-dichlorprop. EX1041, 422-27; EX1040, ch. 3, 70-95; EX1054, ¶¶ 54-55, 211-213:

(*S*)- and (*R*)-Dichlorprop + Fe^{2+} TfdA Variants



EX1041, 426-27; EX1054, ¶ 54.

The prior art, including each of the Saari References, further reported that relatives of TfdA found in *S. herbicidovorans*, SdpA and RdpA, were selective for (*S*)- and (*R*)-enantiomers. EX1001, 3:26-38, 19:18-23; EX1054, ¶¶ 55, 214; EX1036, 6678; EX1034, 228, 240; EX1047, 317; EX1040, 127; EX1041, 426-427; EX1048, 10-11, 15; EX1031. The amino acid sequence of *S. herbicidovorans* RdpA corresponds to SEQ ID NO: 9 in the ’555 patent. EX1001, 6:56-58; SEQ ID NO: 9; EX1054, ¶ 55; *see also* EX1013-1016; EX1012; EX1046. Each of the Saari References suggested transforming plant cells and plants using (*R*)-enantiomer

selective enzymes to impart resistance to phenoxy herbicides. EX1041, 427; EX1040, 92-93, 127; EX1054, ¶¶ 213-214.

Before April 2004, researchers succeeded in applying this information to create herbicide-resistant crops. By combining known information about *α*-ketoglutarate-dependent dioxygenases with known methods for gene modification and insertion, researchers successfully expressed TfdA in crop plant cells and plants, including cotton, tobacco, and tomato, thereby imparting resistance to 2,4-D and other phenoxy herbicides. EX1001, 19:7-10; EX1041, 422; EX1040, 93; EX1043, 3:10-6:61, 11:40-21:28, 25:9-43, 27:39-29:4; EX1018, 65; EX1037; EX1044-EX1045; EX1032-EX1033; EX1038; EX1054, ¶¶ 58, 216.

C. Prosecution History

1. The ’052 Provisional

The ’052 provisional was filed on April 30, 2004. EX1004. It discloses that the amino acid motif “$HX(D/E)X_{23\text{-}26}(T/S)X_{114\text{-}183}HX_{10\text{-}13}R$” was recognized by the prior art to characterize the “overall family of a-ketoglutarate-dependent dioxygenases,” but does not disclose an “AAD-1 motif” as recited in the claims. *Compare* EX1004, [0059], *with* EX1001, claims 1-2, 34. It further lists nineteen amino acid sequences, including the same SEQ ID NO: 9-11 listed in the ’555 patent. EX1004, [0040]-[0042], SEQ ID NO: 9-11. The provisional does not refer specifically to amino acid sequences with as little as 85% sequence identity to any

particular sequence, let alone SEQ ID NO: 9. Rather, it sets forth a laundry list of possible sequence identities or similarities with fifty values ranging from 49% to 99%, "as compared to a sequence exemplified or suggested herein," wherein "[a]ny number listed above can be used to define the upper and lower limits." EX1004, [00116]. That encompasses more than 1,000 possible combinations. EX1054, ¶ 71. Within that range of percentages, the '052 provisional refers to typical or preferred sequence identities or similarities, none of which is "at least 85%." EX1004, [00116] (at least 60%, 75%, 80%, 90%, or 95%).

2. The '7893, '813, and '0893 Applications

The '7893, '813, and '0893 applications were filed between May 2, 2005, and August 7, 2015. EX1005-1007. Like the '052 provisional, they set forth the prior-art motif, but not the '555 patent's "AAD-1 motif." EX1005-1007, [0085]. Also like the '052 provisional, they do not refer to amino acid sequences with as little as 85% sequence identity to SEQ ID NO: 9, but instead repeat the same laundry list of possible sequence identities and similarities, with the same typical and preferred percentages. EX1005-1007, [0142].

3. The '406 Application

The '406 application was filed on October 7, 2016, and issued as the '555 patent on March 16, 2021. The preliminary amendment filed with the application included amended claims reciting AAD-1 proteins with AAD-1 motifs (although

different from the AAD-1 motifs recited in the issued claims). EX1008, COR-AAD1-00000003, COR-AAD1-00000005-9. The claims further recited proteins comprising amino acid sequences with as little as 85% percentage identity to SEQ ID NO: 9. *Id.*

The examiner rejected the '406 application's claims on various grounds, including (1) lack of written description support for the AAD-1 motif recited in claim 1; (2) anticipation by U.S. Patent Pub. No. 2016/0108422 (EX1017) and by the European counterpart to Corteva '437; (3) obviousness over various references, including Jepson; and (4) obviousness-type double patenting. *See* EX1008, COR-AAD1-00000270-271, COR-AAD1-00000274-275, COR-AAD1-00000501-506, COR-AAD1-00000277-278, COR-AAD1-00000512-514, COR-AAD1-00000275-276, COR-AAD1-00000506-512, COR-AAD1-00000271-273, COR-AAD1-00000498-501. The anticipation rejections rested on a finding that the claims were not entitled to claim priority to the '406 application's predecessors because those applications did not describe the claimed subject matter. *See* EX1008, COR-AAD1-00000270-271, COR-AAD1-00000277-278, COR-AAD1-00000502-506, COR-AAD1-00000512-514, COR-AAD1-00000577-578.

In traversing the rejections, the applicant initially submitted two declarations, one from the applicant's lead inventor, Dr. Terry Wright; and one from Dr. Satish

Nair, one of the applicant's research collaborators. EX1008, COR-AAD1-00000457-474, COR-AAD1-00000590-622. The declarations relied on information that was not prior art and not disclosed by the specification. *See infra* Section VII.A. Dr. Wright's first declaration enclosed a summary purporting to show the results of experiments he directed, while Dr. Nair submitted excerpts from a structural analysis published in 2019. *Id.* The applicant also amended the specification to refer to the newly claimed AAD-1 motif. EX1008, COR-AAD1-00000480.

After submission of the first two declarations, the examiner withdrew the anticipation rejections "in view of Applicant's arguments," without further explanation. EX1008, COR-AAD1-00000631. However, the examiner maintained a written description rejection, finding that, even as amended, the '406 application's specification did *not* support the claims. EX1008, COR-AAD1-00000634-638.

To overcome the written description rejection, the applicant submitted a second declaration from Dr. Wright enclosing additional test data. EX1008, COR-AAD1-00000655-670. The declaration referenced the purported percentage identity of the tested amino acid sequences to SEQ ID NO: 9, but did not disclose the sequences themselves. EX1008, COR-AAD1-00000660-662, COR-AAD1-00000670. It also relied on a prior-art article Hotopp 2002 (EX1029) cited nowhere in the specification. EX1008, COR-AAD1-00000659.

The examiner withdrew the written description rejection in reliance on the applicant's submissions, including the second Wright declaration and the applicant's arguments, which referred to both Wright declarations. EX1008, COR-AAD1-00000649-652, COR-AAD1-00000676-687, COR-AAD1-00003844. In doing so, the examiner offered conflicting statements. He first stated that the tested sequences in Dr. Wright's second declaration had "multiple modifications throughout the polypeptide sequence." EX1008, COR-AAD1-00000650. However, when withdrawing the written description rejection, the examiner stated that the sequences were "produced by truncations of both the N and C termini." EX1008, COR-AAD1-00003844. The latter statement prompted the applicant to assert that the former description was correct. EX1008, COR-AAD1-00003897.

VI. IDENTIFICATION OF THE CHALLENGE (37 C.F.R. § 42.104(b))

Petitioner respectfully requests IPR of claims 1-34.

Ground	Assumed Priority Date	References	Basis	Claims Challenged
IA	October 7, 2016	Corteva '437	§ 102	1-34
IB	October 7, 2016	Corteva '437	§ 103	1-34

IIA	April 30, 2004	Saari 1998 or Saari 1999 in combination with Schleinitz and Streber	§ 103	1-10, 13-16, 34
IIB	April 30, 2004	Saari 1998 or Saari 1999 in combination with Schleinitz, Streber, and Jepson	§ 103	11-12, 17-33

A. Priority Date

As discussed in Grounds IA-IB, none of the claims can claim priority to an earlier application. As such, the earliest possible priority date is October 7, 2016, when the '406 application was preliminarily amended. The claims are therefore unpatentable over Corteva's own prior published application. Even were the Board to conclude that the claims could claim priority to April 30, 2004, they remain unpatentable, as demonstrated in Grounds IIA-IIB.

B. Claim Construction

"[C]laim terms need only be construed 'to the extent necessary to resolve the controversy.'" *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed.

Cir. 1999)). Addressing the Grounds raised in this Petition does not require an express construction of any claim term recited in the claims.[1]

C. The Person of Ordinary Skill in the Art

The ’745 patent is directed to plant cells or plants that possess polynucleotides encoding an enzyme which has a particular amino acid “motif” and herbicide-degrading enzymatic activity. Accordingly, across all potential priority dates, the person of ordinary skill in the art (“POSA”) would have had knowledge and experience regarding protein biochemistry, including expression and characterization, amino acid sequences, three-dimensional structure, and enzyme

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[1] The parties have proposed claim constructions in the District Court Action related to the breadth of the AAD-1 motif, EX1056, but resolution of those disputes does not affect any issue here because, irrespective of which constructions are applied, (1) the claims cannot claim priority before October 2016, at the earliest, for the reasons set forth herein; and (2) the claims are anticipated and obvious based on subject matter that falls within their scope under the grounds presented, EX1045, ¶ 66 n.5; *Eli Lilly & Co. v. Barr Labs*, 251 F.3d 955, 971 (Fed. Cir. 2001); *Aventis Pharma Deutschland GmbH v. Lupin, Ltd.*, 499 F.3d 1293, 1300 (Fed. Cir. 2007). Indeed, adopting Patent Owner’s proposed constructions would only increase the breadth of the claims and thus enhance the case for invalidity. EX1045, ¶ 66 n.5.

activity and substrate selectivity, as well as methods of evaluating those properties. EX1054, ¶ 29. The POSA would be able apply these concepts to expression of enzymes in transgenic plant cells and plants and degradation of herbicides. *Id.* The POSA generally would have an advanced degree in a relevant discipline and several years of advanced academic (*e.g.*, post-doc or higher) and/or professional experience. *Id.*

D. Legal Standards

A claim is anticipated "if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). "Prior art patents and printed publications are presumed enabling," *Impax Labs., Inc. v. Aventis Pharms., Inc.*, 545 F.3d 1312, 1316 (Fed. Cir. 2008), and it is "error" to shift the burden to prove enablement to the petitioner, *Apple Inc. v. Corephotonics, Ltd.*, 861 F. App'x 443, 449 (Fed. Cir. 2021).

A claim would have been obvious if the differences between the claim and the prior art are such that the claim as a whole would have been obvious at the relevant time to the POSA to which the claim pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

E. References in the Grounds

1. WO 2005/107437 ("Corteva '437") (EX1021)

Corteva '437 is the publication of the '555 patent's international application. Corteva '437 published on November 17, 2005, and therefore qualifies as prior art under at least 35 U.S.C. § 102(a)(1) (post-AIA).[2]

Corteva '437 shares a specification with the '555 patent's parent applications. Accordingly, Corteva '437 discloses transgenic plants and plant cells "comprising a polynucleotide that encodes an AAD-1 protein comprising the amino acid sequence of SEQ ID NO:9" or variants of SEQ ID NO:9, which have "at least 95% sequence identity with SEQ ID NO:9," and related methods. *See infra* Sections VII.B-VII.C. Although, those disclosures do not support the '555 patent's claims, *see infra* Section VII.A, they suffice for anticipation because they disclose plants and plant cells that fall within the scope of those claims, *see Eli Lilly*, 251 F.3d at 971; *infra* Sections VII.B-VII.C.

Notably, during prosecution of the '406 application, the claims were rejected for obviousness-type double patenting over the '733 patent that issued from Corteva '437. *E.g.*, EX1008, COR-AAD1-00000273. The examiner found that "the genus claimed in the '733 Patent represents a subgenus of the instantly claimed invention

[2] The 2016 priority date for Grounds IA-IB means post-AIA § 102 applies.

and thus both anticipates and renders obvious the instantly claimed invention." *Id.* He also rejected the claims for anticipation based on Corteva '437's European counterpart. EX1008, COR-AAD1-00000278. The examiner withdrew the double-patenting rejection after the applicant filed a terminal disclaimer. EX1008, COR-AAD1-00004691. Neither the examiner nor the applicant distinguished the '733 patent or the European counterpart on any substantive ground. EX1008, COR-AAD1-00000273, COR-AAD1-00000499-500, COR-AAD1-00000562, COR-AAD1-00000632-633, COR-AAD1-00000676, COR-AAD1-00003897, COR-AAD1-00004691.

2. Saari 1998 (EX1040)

Saari 1998 is a doctoral thesis by Dr. Ruth Saari, and submitted to Michigan State University. EX1040; EX1054, ¶ 212. Prior to April 2004, the POSA could have searched for and accessed Saari 1998 both through the MSU Library System and the ProQuest/UMI database. EX1040, Copyright Page; EX1054, ¶ 212; EX1057-1060; EX1061 ¶¶ 1-5; EX1062. Indeed, a worldwide catalog of library holdings shows that Saari 1998 was indexed, and thus available to the POSA, by at least April 1999. EX1061 ¶¶ 4-5; EX1059. It is therefore prior art under 35 U.S.C. §§ 102(a)-(b) (pre-AIA) or § 102(a)(1) (post-AIA). *In re Hall*, 781 F.2d 897, 898-90 (Fed. Cir. 1986); *Seabery N. Am. v. Lincoln Glob., Inc.*,

IPR2016-00840 (PTAB Oct. 6, 2016), Paper 11, at 7-8 (Informative). Saari 1998 was not before the examiner.

3. Saari 1999 (EX1041)

Saari 1999 is an article authored by Dr. Saari, Dr. Robert Hausinger, and Dr. Deborah Hogan. EX1041; EX1054, ¶ 212. Saari 1999 was published in 1999 in the *Journal of Molecular Catalysis B: Enzymatic*. It is therefore prior art under 35 U.S.C. § 102(a)-(b) (pre-AIA) or 35 U.S.C. § 102(a)(1) (post-AIA). Saari 1999 was never discussed during prosecution. It was one of more than 230 references placed before the examiner, and was one of 150 referenced listed in a single IDS. EX1001, "References Cited"; EX1008, COR-AAD1-000002825.

4. Accession No. AF516751 ("Schleinitz") (EX1013)

Schleinitz is an entry in the National Center for Biotechnology Information database which contains the nucleotide and amino acid sequences for RdpA. Schleinitz was published on August 2, 2002, and therefore qualifies as prior art under 35 U.S.C. § 102(a)-(b) (pre-AIA) or 35 U.S.C. § 102(a)(1) (post-AIA). The examiner cited Q8KSC8, a similar entry by the same research group, as disclosing the same nucleotide and amino acid sequences, *e.g.*, EX1008, COR-AAD1-00000275-276, which the applicant did not contest, *e.g.*, EX1008, COR-AAD1-00000490-493.

5. U.S. Patent No. 6,153,401 ("Streber") (EX1043)

Streber issued on November 28, 2000, and therefore qualifies as prior art under § 102(a)-(b) and (e) (pre-AIA) and § 102(a)(1)-(2) (post-AIA). The '555 patent admits that Streber discloses the use of bacterially derived α-ketoglutarate-dependent dioxygenase enzymes to impart resistance to 2,4-D in transgenic plants. EX1001, 3:3-14. Although Streber was disclosed on an IDS, the examiner never discussed it.

6. U.S. Publication No. 2003/0041357 ("Jepson") (EX1030)

Jepson was filed on February 23, 2001, and published on February 27, 2003. It therefore qualifies as prior art under § 102(a)-(b) and (e) (pre-AIA) and § 102(a)(1)-(2) (post-AIA). The examiner cited Jepson as disclosing a method of controlling a weed in an area containing a transgenic plant encoding a protein having aryloxyalkanoate dioxygenase activity by applying a phenoxy auxin herbicide—a proposition the applicant did not contest. *E.g.*, EX1008, COR-AAD1-00000275-276; EX1008, COR-AAD1-00000490-493. Neither the applicant nor the examiner considered Jepson's disclosure in combination with any of the references cited herein.

VII. Claims 1-29 Are Unpatentable.

A. The Claims Have a Priority Date of No Earlier than October 17, 2016.

For the claims to be entitled to a priority date earlier than October 17, 2016 (*i.e.*, the date of the preliminary amendment in the '406 application), each application in the '555 patent's priority chain must describe the claimed invention "in sufficient detail that one skilled in the art *can clearly conclude* that the inventor invented the claimed invention as of the filing date sought." *Anascape, Ltd. v. Nintendo of Am. Inc.*, 601 F.3d 1333, 1335 (Fed. Cir. 2010) (emphasis added).

To adequately describe the '555 patent's genus claims, the '555 patent's predecessors must disclose "either a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can 'visualize or recognize' the members of the genus." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350 (Fed. Cir. 2010) (en banc) (quoting *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997)). This "requires an objective inquiry into the four corners of the specification." *Id.* at 1351. "[A] description that merely renders the invention obvious does not satisfy the requirement." *Id.* at 1352. Where, as here, the claims include both structural and functional limitations, the specification must provide information sufficient to "distinguish" which species within the scope of the structural limitations also have the claimed function. *Juno Therapeutics, Inc. v. Kite*

Pharma, Inc., 10 F.4th 1330, 1338 (Fed. Cir. 2021). The ’555 patent’s predecessors fail these requirements. EX1054, ¶¶ 60-110.

1. The ’555 Patent’s Predecessors Fail to Support the Claimed “AAD-1 Motif.”

Each of the claims requires an “amino acid sequence” which has an “AAD-1 motif” that differs from the motif disclosed in the ’555 patent’s original specification and those of its predecessors. Independent claims 1 and 34 require the “amino acid sequence” to have “an AAD-1 motif having the general formula of: $HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R$,” where X can be any amino acid, and the subscripts refer to positions of the amino acids. EX1001, claims 1, 34. Claim 2 depends from claim 1 and further requires the “amino acid sequence” to have an “AAD-1 motif” having the formula “$HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R(X)_{282\text{-}284}R$”—*i.e.*, the amino acid sequence specified in claims 1 and 34, with four additional amino acids: $(X)_{282\text{-}284}R$. EX1001, claim 2.

1. The ’555 patent’s predecessors do not *disclose* the claimed AAD-1 motifs. Instead, each application refers to a broader prior-art motif characteristic of the “overall family of α-ketoglutarate-dependent dioxygenases”—$HX(D/E)X_{23\text{-}26}(T/S)X_{114\text{-}183}HX_{10\text{-}13}R$. EX1004, [0059] (provisional); EX1005-1007, [0085] (non-provisionals); EX1054, ¶¶ 64-70.

The prior-art and claimed motifs are summarized below:

Prior-art motif in original specification (EX1001, 18:2-7; EX1008, COR-AAD1-00000052 ([0085]))	$HX(D/E)X_{23\text{-}26}(T/S)X_{114\text{-}183}HX_{10\text{-}13}R$[3]
’555 Patent, Claims 1, 34	$HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R$
’555 Patent, Claim 2	$HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R(X)_{282\text{-}284}R$

The prior-art and claimed AAD-1 motifs differ in several respects. For example, whereas the prior-art motif permits the series of unspecified amino acids (denoted by X) to vary in length, the claimed AAD-1 motifs require them to have specific numbers of amino acids. (Unlike the claimed AAD-1 motifs, the prior-art motif uses subscript notation to indicate the number of unspecified amino acids present in the sequence, not to provide information about their positions, reflected in the fact that in the prior-art motif, the segment $X_{10\text{-}13}$ appears after the segment $X_{114\text{-}183}$. EX1054, ¶¶ 65-66. Thus, whereas the series “$X_{23\text{-}26}$” in the prior-art motif permits anywhere from 23 to 26 unspecified amino acids, the series “$(X)_{114\text{-}137}$” in claim 1 requires exactly 24 amino acids and references positions 114-137. *Id.*) Additionally, the prior-art motif permits certain amino acid selections (D/E, T/S)

[3] The ’555 patent and its predecessors misattribute the prior-art motif to Hogan 2000 (EX1027). It appears in Elkins 2002 (EX1023). EX1054 ¶ 50.

prohibited by the claimed motifs. EX1054, ¶ 67. The prior-art motif also omits any information corresponding to the additional residues $(X)_{282\text{-}284}R$ in the claim 2 motif. EX1054, ¶ 68.

The prior-art motif indisputably does not support the claimed AAD-1 motifs. The ’555 patent admits, and the applicant emphasized during prosecution, that many proteins that have the prior-art motif do not have the claimed functional activities. For example, the ’555 patent states that AAD-2, which has the prior-art motif, is specific for (*S*)-enantiomers, not the herbicidal (*R*)-enantiomers at issue in the claims. EX1001, 112:42-115:27, 6:66-67, Tbl. 33, SEQ ID NO: 13; EX1054, ¶¶ 64, 100-101. During prosecution, the applicant emphasized that assertion. *See, e.g.*, EX1008, COR-AAD1-00000487, COR-AAD1-00000491-492, COR-AAD1-00000461 (¶ 12), COR-AAD1-00000470-471 (App’x II), COR-AAD1-00000594 (¶ 10).

Tacitly admitting that the prior-art motif does not support a genus of AAD-1 proteins, the applicant relied on other parts of the specification to justify the new claims reciting the AAD-1 motifs: “Support for the new claims is found throughout the specification, including for example in paragraphs [0050], [0078], [0079], [0082], [0085], [0089], [0093], [0099], [00107] and the original claims.” EX1008, COR-AAD1-00000010. But the applicant’s citations provide no such support. EX1054, ¶ 93. Seven of the cited paragraphs describe the naturally occurring RdpA

protein, which the patent renames "AAD-1" (SEQ ID NO: 9), EX1008, COR-AAD1-00000044, COR-AAD1-00000049-50, COR-AAD1-00000053-54, COR-AAD1-00000057 ([0050], [0078]-[0079], [0089], [0093], [00107]), or two AAD-1 variants, EX1008, COR-AAD1-00000055 ([0099]), which the prior specification identifies as AAD-1 v2 and v3 (SEQ ID NO: 10-11); EX1008, COR-AAD1-00000044, COR-AAD1-00000102-119 ([0051]-[0052], [00242]-[00288]).[4] The remaining paragraph contains a generic discussion that the POSA would "see the benefit of combining" multiple resistance traits. EX1008, COR-AAD1-00000051 ([0082]). Moreover, the original claims also mention only AAD-1 v1-v3 (SEQ ID NO: 9-11) and the polynucleotides that encode them (SEQ NO: 3-5), not a genus of proteins characterized by an AAD-1 motif. EX1008, COR-AAD1-00000043-44, COR-AAD1-00000194-195 ([0045]-[0047], [0050]-[0052], claims).

Although the '555 patent's specification as issued *does* contain a paragraph disclosing the version of the AAD-1 motif in claims 1 and 34, EX1001, 18:20-28,

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[4] AAD-1 v2 and v3 differ from AAD-1 v1 by just one or two amino acids. In AAD-1 v2, an alanine is substituted for the histidine at position 2, and a cysteine is "inadvertent[ly]" substituted for arginine at position 212; in AAD-1 v3, an alanine is inserted at position 2, before the histidine. EX1001, 6:38-47, SEQ ID NO: 9-11; EX1008, COR-AAD1-00000470-471 (App'x II); EX1054, ¶ 81.

the applicant *added that paragraph during prosecution*. EX1008, COR-AAD1-00000480. The new portion of the specification states: "Mapping the α-ketoglutarate-dependent dioxygenase motif disclosed in the previous paragraph to the sequence of SEQ ID NO: 9 reveals the AAD-1 motif"; the applicant presented the same argument as the basis for amending the specification. EX1001, 18:20-28; EX1008, COR-AAD1-00000480, COR-AAD1-00000486-489. But that does not support a priority date earlier than October 2016. It suggests only that the pre-amended specification disclosed a *species within* the prior-art motif (*e.g.*, SEQ ID NO: 9), not a *subgenus of* the prior-art motif characterized by the AAD-1 motif. EX1054, ¶¶ 94-95. The POSA would recognize (as the prior art taught) that SEQ ID NO: 9 is a member of the *α*-ketoglutarate-dependent dioxygenase family. *Id.* But that does not disclose a new *subgenus* of that family characterized by an "AAD-1 motif," *i.e.*, a particular universe of variants having specified intervening segment lengths and positions. *Id.*

Moreover, the applicant's "mapping" argument is flawed. While the residues required by the α-ketoglutarate-dependent dioxygenase motif are important to its oxidization activity, nothing in the prior specification or file history reflects that the motif possesses the claimed activity against both phenoxy auxins (including (*R*)-enantiomers) and (*R*)-aryloxyphenoxypropionates—to the contrary, the specification discloses that species within the broad α-ketoglutarate-dependent

dioxygenase motif possess *different enantioselective activity*, such as AAD-2's activity against **(*S*)**- rather than **(*R*)**-aryloxyphenoxypropionates. EX1054, ¶¶ 94-95; *supra* p. 26. Thus, there is no basis to assert that mapping the α-ketoglutarate-dependent dioxygenase motif onto SEQ ID NO. 9 would reveal what structural features within SEQ ID NO. 9 are necessary for the (*R*)-enantioselective activity against chiral phenoxy auxins and aryloxyphenoxypropionates covered by the claims, let alone sufficient to support a claim to 85% identity to SEQ ID NO. 9. *Id.*

The '555 patent's predecessors reinforce the absence of support for the claimed AAD-1 motif. Those applications discuss variation in general terms ("variants" or "% sequence identity"), without applying those variations to specific sequences, let alone identifying specific amino acid positions or intervening segments that should or should not be varied or how they should or should not be varied. EX1004, [00112]-[00117] (provisional); EX1005-1007, [00138]-[00143], claims (non-provisionals). Their discussion of amino acid substitutions is likewise generic, EX1004, [00118]-[00119] (provisional); EX1005-1007, [00144]-[00145] (non-provisionals), confirming the lack of support for the AAD-1 subgenera as recited in the '555 patent claims and the amendment to the specification. *See Biogen Int'l GmbH v. Mylan Pharms. Inc.*, 18 F.4th 1333, 1343 (Fed. Cir. 2021) ("specification's sole reference to [the claimed DMF concentration]" "at the end of one range among a series of ranges," including other preferred ranges, was "a

significant fact that cuts against" a finding of adequate written description).

2. The '555 patent's predecessors also do not disclose the representative number of species or common structural features needed to support a genus of proteins possessing the functional activities that the '555 patent attributes to the claimed AAD-1 proteins. *Ariad*, 598 F.3d at 1350. Nor do they contain "blaze marks" or other information sufficient to "guide attention" to such a genus. *Regents of the Univ. of Minn. v. Gilead Scis., Inc.*, 61 F.4th 1350, 1357 (Fed. Cir. 2023).

Each of the claims requires, *inter alia*, the AAD-1 protein to enzymatically degrade (1) a phenoxy auxin herbicide, and (2) an (*R*)-aryloxyphenoxypropionate herbicide. Nevertheless, the claimed AAD-1 motifs encompass an enormous number of proteins, which may or may not possess the claimed functional activities (a problem that the percentage identity limitations, as discussed *infra*, do little to mitigate). EX1054, ¶¶ 76-80. The claimed AAD-1 motifs specify only 5 or 6 amino acids within their sequences (H, D, T, H, R, R); the remainder are undefined. EX1054, ¶¶ 67, 74. Indeed, as Dr. Silverstone explains, the claim 1 and 2 motifs cover at least 20^{44} amino acid sequences, respectively, even accounting for the percentage identity limitations. EX1054, ¶¶ 77-80.

The '555 patent's predecessors do not support such breadth. During prosecution, the applicant cited only three proteins disclosed by the '555 patent's predecessors that the applicant asserted fell within the scope of the claims: AAD-1

v1-v3 (SEQ ID NO: 9-11). EX1054, ¶¶ 81-91. The two "variants" differ from SEQ ID NO: 9 by just one or two amino acids. *See* EX1054, ¶ 83. Given the minimal differences between SEQ ID NO: 9 and the two "variants," these examples cannot represent the breadth of the claimed genus of "AAD-1" proteins, especially given the lack of three-dimensional structural data. EX1054, ¶ 88; EX1019; EX1052. At best, the examples demonstrate the inventors possessed only "a corner" of that genus. *AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1300 (Fed. Cir. 2014) (no support where example antibodies "share[d] 90% or more sequence similarity in the variable regions and over 200 of those antibodies differ from Y61 by only one amino acid"); EX1054, ¶¶ 87-91; EX1041, 426-47 & Fig. 5; EX1023, 5185-5190 & Fig. 5; EX1035, 1358-66; EX1040, 21.

3. The applicant's arguments during prosecution, which were based on extrinsic and post-priority date evidence, cannot support an earlier priority date. Whether a claim has adequate written description support is a "four corners" inquiry. *Ariad*, 598 F.3d at 1351. Although post-priority date evidence can be used to demonstrate that the inventors lacked possession *at the time of filing*, an applicant cannot rely on the POSA's "background knowledge" to "supplement the teaching in the specification." *Rivera v. ITC*, 857 F.3d 1315, 1322-23 (Fed. Cir. 2017). It is the application's disclosures "that count, not those of uncited references." *L.A. Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v. Eli Lilly & Co.*, 849 F.3d 1049,

1058 (Fed. Cir. 2017). As such, the inventor and expert testimony submitted during prosecution is "legally irrelevant" to establishing that the disclosure conveyed possession by the inventors, and thus written description, at the time of filing. *Juno*, 10 F.4th at 1335.

Even if one were to consider such legally irrelevant information, it reinforces the absence of support for claim 1 in the '555 patent's predecessors.

First, Dr. Wright's experiments confirm the lack of priority before October 2016, at the earliest. In his first declaration, Dr. Wright submitted test results for nine additional "AAD-1 variants," three of which had the claim 2 motif and ~94-95% sequence identity to SEQ ID NO. 9, and six of which included a modification disrupting the claim 2 motif. EX1008, COR-AAD1-00000462-63, COR-AAD1-00000472-474 (¶¶ 14-15, App'x III). However, the declaration proves too much: it demonstrates that the last "R" in the claim 2 motif is necessary to the claimed enzymatic activity, because without it the protein is inactive, as reflected in the data for Seq09, which lacks an arginine (R) at that position. EX1008, COR-AAD1-00000472-474 (App'x III); EX1054, ¶¶ 96-97. Accordingly, the claims other than claim 2—which do not even mention that position in the protein, much less require that amino acid to be "R"—are inadequately supported.

Moreover, Dr. Wright's data do not support his conclusion. One of the variants having that motif (Seq02) exhibited less activity than one of the variants

without the motif (Seq06). EX1008, COR-AAD1-00000472-474 (App'x III); COR-AAD1-00000455. Dr. Wright attributed this discrepancy to "protein insolubility." EX1008, COR-AAD1-00000474. But that proves the point: Neither the '555 patent nor its predecessors address modifications resulting in insolubility or otherwise impacting the claimed activities. That proves them inadequate to claim priority to the predecessor applications. *See Amgen Inc. v. Sanofi*, 872 F.3d 1367, 1375 (Fed. Cir. 2017).

Dr. Wright's second declaration likewise does not support a pre-October 2016 priority date. The declaration provides test results purporting to show that eight AAD-1 variants with the "AAD-1 motif" and "82 to 90% amino acid" identity to the naturally occurring protein had the claimed activity. EX1008, COR-AAD1-0000660-661, COR-AAD1-000670 (¶¶ 17-21, App'x IV). Dr. Wright did not disclose the actual amino acid sequences he tested, and thus failed to establish that they were representative of the claimed genus. *See In re Wallach*, 387 F.3d 1330, 1335 (Fed. Cir. 2004) (affirming rejection for lack of an adequate written description where applicant disclosed only a partial sequence of approximately 10 of 200 amino acids); EX1054, ¶ 110. Moreover, Dr. Wright's reliance on examples with 82-90% sequence identity punctuates that the examples disclosed in the patent (SEQ ID NO: 9-11), which differ at most by two amino acids, are far from representative of the claimed genus. *See supra* p. 30.

Second, because the prior-art motif ("$HX(D/E)X_{23\text{-}26}(T/S)X_{114\text{-}183}HX_{10\text{-}13}R$") does not even generically disclose "$(X)_{282\text{-}284}R$" in claim 2, Dr. Wright argued that the uncited article Hotopp 2002 disclosed its importance. EX1008, COR-AAD1-0000659-660 (¶ 13). Dr. Wright's emphasis on amino acids recited in claim 2 only reinforces that the other claims are inadequately supported. EX1054, ¶ 96. Moreover, Dr. Wright's citation to Hotopp 2002 confirms that there is no support for claim 2 either. Despite containing a literature review of more than 100 references, the '555 patent's predecessors never once mention Hotopp 2002, much less discuss its relevance to a subgenus. *See L.A. Biomedical*, 849 F.3d at 1058; EX1004, [0095] (provisional); EXS1005-1007, [00152] (non-provisionals); EX1054, ¶ 96.

Third, the applicant's attempt to derive the claimed AAD-1 motifs from prior disclosures further confirms the lack of priority before October 2016, at the earliest. Both the applicant and its declarants asserted that the POSA could derive the AAD-1 motifs by (1) comparing the amino acid sequences of AAD-1 v1-v3 (SEQ ID NO: 9-11) and another protein, "AAD-2" (SEQ ID NO: 13); and (2) combining that comparison with the prior-art motif. EX1008, COR-AAD1-00000461-462 (¶¶ 12-13), COR-AAD1-00000593-594 (¶¶ 9-10), COR-AAD1-00000657 (¶ 7). They further asserted that because AAD-1 v1-v3 had the motif and degraded (*R*)-aryloxyphenoxypropionates, but AAD-2 did not have the motif and instead degraded

(*S*)-aryloxyphenoxypropionates, the POSA would have understood that proteins capable of degrading (*R*)-aryloxyphenoxypropionates would have the motif. EX1008, COR-AAD1-00000461-462 (¶ 12), COR-AAD1-00000594 (¶ 10). Those arguments are inadequate.

The ’555 patent’s predecessors contain no disclosures that would “guide” the POSA to perform the convoluted analysis that the applicant and its declarants suggested. *Regents*, 61 F.4th at 1357; EX1054, ¶¶ 98-110. Although the ’555 patent’s predecessors contain an example purporting to describe experiments regarding AAD-1 v1-v3 and AAD-2, they do not attribute the differences in their activities to any particular structural feature, much less one that the applicant emphasized, *i.e.*, the length of the third intervening segment in the claimed AAD-1 motifs. EX1008, COR-AAD1-00000161-167 (Example 17), COR-AAD1-00000461-462 (¶ 12); EX1054, ¶¶ 98-99. Even crediting the applicant’s after-the-fact explanations, they at best demonstrate that the inventors came to that realization during prosecution of the ’406 application.

Furthermore, the comparison between AAD-1 v1-v3, and AAD-2 does not support the applicant’s position. Were the POSA to conduct that comparison, the POSA could reach any number of conclusions that would not result in the claimed AAD-1 motifs. EX1054, ¶¶ 100-102. There are *many* differences between AAD-1 v1 and AAD-2; the applicant characterized AAD-2 as having about 27% sequence

identity to AAD-1. EX1008, COR-AAD1-00000492. Although the applicant emphasized that in AAD-2, ten amino acids are missing from the third intervening segment, corresponding to $(X)_{139\text{-}269}$ in the claimed motif, the applicant never explained why the POSA would have understood that difference, and not the others, to be essential, let alone provided such information in the specification. *Id.*; EX1054, ¶¶ 100-109. Moreover, the applicant never explained why the POSA would have understood the *length* of the third segment to be important, rather than the particular amino acids within it, let alone provided such information in the specification. *Id.* This is especially true because, as of April 2004, there were no structural data available that would inform the POSA to attribute the difference to a particular part of the protein. *Id.*

If anything, based on the prior art, the POSA would have understood that the difference in selectivity for (*R*) vs. (*S*) forms was *not* attributable to the particular difference identified by the applicant, *i.e.*, the length of the third segment. Saari 1999 (*see* Grounds IIA-IIB) disclosed that two members of the α-ketoglutarate dependent enzyme family had opposite selectivity for (*R*)- and (*S*)-enantiomers. EX1054, ¶ 109; EX1041, Abstract, Fig. 5. Despite their opposite enantioselectivities, *both* of those enzymes have intervening segments similar to AAD-2's. *Id.* Although the '555 patent cites Saari 1999, EX1001, "Other

Publications," the applicant never identified this information to the examiner, nor attempted to reconcile it with their arguments supporting the motif.

Finally, the inventors' subsequent publications reflect that they did not understand the relevant structure-activity relationships until many years later, and thus confirm the absence of support in the predecessor applications. Dr. Nair opined that the claim 1 motif was "required" based on crystal structure data published by Dr. Wright and others in 2019. EX1008, COR-AAD1-00000594-596 (¶ 11) (citing EX1019). The 2019 publication, however, reinforces the absence of support in the applications filed before October 2016, as it admits that, *"[t]o date, no crystal structure has been reported for any member of the AAD family, and there is, therefore, an insufficient knowledge base to distinguish bona fide AADs from other enzymes of the Fe(II)/αKG dioxygenase class*." EX1019, 13300 (emphasis added); EX1054, ¶ 105.

Whether or not the claim 1 motif is "required" says nothing about whether the '555 patent's predecessors support that claim. But the 2019 publication proves that the claimed AAD-1 motifs have little connection to the claimed activities. For example, it identifies as important multiple residues (*e.g.*, Arg104, Asp108, Asp109) that fall outside the prior-art motif. EX1019, 13301-03 & Figs. 3-4; EX1054, ¶ 106. It also attributes AAD-2's selectivity for (*S*)-enantiomers primarily to an insertion

in AAD-2 that falls outside the AAD-1 motifs (because it precedes the first conserved histidine). EX1019, 13303; EX1020, Fig. 10; EX1054, ¶ 106.

2. The ’555 Patent’s Predecessors Fail to Support Amino Acid Sequences with as Little as 85% Sequence Identity.

Even were the Board to decide that the ’555 patent’s predecessors adequately support the claimed AAD-1 motifs, the claims would still not be entitled to a priority date earlier than October 17, 2016, because they fail to support a subgenus of AAD-1 proteins comprising “an amino acid sequence having at least 85% sequence identity with SEQ ID NO:9.”

According to the applicant, the ’555 patent’s predecessors disclose, at most, three examples of AAD-1 proteins that have (1) amino acid sequences satisfying the ’555 patent’s AAD-1 motifs and (2) the requisite functional activity: the naturally occurring AAD-1 protein (AAD-1 v1) and two variants (AAD-1 v2 and v3) that differ from SEQ ID NO: 9 by two and one amino acids, respectively. EX1008, COR-AAD1-00000487; *supra* p. 30. Those disclosures cannot support a claimed subgenus of AAD-1 proteins having as little as 85% sequence identity to SEQ ID NO: 9. EX1054, ¶¶ 76-86. By definition, AAD-1 v1, which corresponds to SEQ ID NO: 9, has 100% sequence identity to itself. EX1001, 6:56-58, SEQ ID NO: 9. And by the ’555 patent’s admission, the disclosed variants have nearly 100% sequence identity—far greater than 85%. *See* EX1001, 6:56-63, 7:56-63, 58:35-37 (“The proteins encoded by the native (v1) and plant-optimized (v3) coding regions are

99.3% identical, differing only at amino acid number 2."), SEQ ID NO: 9-11; EX1054, ¶ 83. Those examples lack the diversity needed to support the claims. *See AbbVie*, 759 F.3d at 1300.

The remaining disclosures in the '555 patent's predecessors support no different result. The applications refer to the general possibility of 85% sequence identity as only one of a series of values ranging from 49% to 99%, wherein "any number listed above can be used to define the upper and lower limits." *See, e.g.*, EX1004-1007, [00142]. That paragraph does not mention SEQ ID NO: 9, and it refers to values other than 85% as typical or preferred. *Id.* Such "laundry list" disclosures fail as a matter of law because they "would not 'reasonably lead' [the POSA] to any particular species." *Regents*, 61 F.4th at 1357 (quoting *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1571 (Fed. Cir. 1996)); *see Purdue Pharma L.P. v. Iancu*, 767 F. App'x 918, 924 (Fed. Cir. 2019) ("Such 'laundry list' disclosures do not provide adequate specificity to constitute written description support for Purdue's claim of priority."); EX1054, ¶ 71.

The applicant's prosecution arguments likewise fail. Information outside the "four corners" of the specification cannot establish possession. *Ariad*, 598 F.3d at 1351. But even if considered, none of these data establish support for a claim with as little as 85% sequence identity prior to October 2016 (at the earliest). The three examples submitted with Dr. Wright's first declaration are described as having "~94-

95%" sequence identity to the naturally occurring protein, much more than the at least 85% sequence identity recited in the claims. EX1008, COR-AAD1-00000462-463, COR-AAD1-00000472-473 (¶¶ 14-15, App'x III); EX1054, ¶ 97. Moreover, the eight variants in Dr. Wright's second declaration (two of which purportedly have <85% sequence identity) lack amino acid sequences or other information necessary to evaluate Dr. Wright's description of those examples' sequence identity and his assertions based upon them. EX1008, COR-AAD1-00000660-661, COR-AAD1-00000670 (¶¶ 17-21, App'x IV); EX1054, ¶ 110. Even if such sequence information were provided, the POSA would not regard the total number of variations—fourteen, if Dr. Wright's first declaration and SEQ ID NO. 9-11 are included—to support a claim with at least 20^{44} permutations. EX1054, ¶¶ 79, 110.

During prosecution, the applicant defended the 85% sequence identity limitation by analogizing it to Example 11B of the Written Description Training Materials (Rev. 1, Mar. 25, 2008). EX1008, COR-AAD1-00000570-572. The applicant conceded that the training materials had been archived in view of *Amgen*, 872 F.3d 1367, which held a broad functionally defined genus claim invalid for inadequate written description, but argued that this did not matter because *Amgen* was limited to "antibodies." *Id.* That argument has no bearing on the priority analysis here, but even if it did, the Federal Circuit has applied *Amgen* to cases outside the antibody context, *including transgenic plants*. *BASF Plant Sci., LP v.*

CSIRO, 28 F.4th 1247, 1268 (Fed. Cir. 2022). In any event, Example 11B assumes that the specification at least discloses the limitations in question—which the prior specification fails to do. *In re Baum*, 2013 WL 3805036 (PTAB June 26, 2013).

B. Ground IA: Corteva '437 Anticipates Claims 1-34.

Corteva '437 is the publication of the '555 patent's international application. Accordingly, Corteva '437 and the '555 patent have significantly overlapping disclosures, including regarding the AAD-1 proteins corresponding to SEQ ID NO: 9-10. Although Corteva '437 does not support the '555 patent's broad genus claims, *supra* Section VII.A, it discloses transgenic plants and plant cells within their scope. It therefore anticipates claims 1-34 because "a later genus claim limitation is anticipated by, and therefore not patentably distinct from, an earlier species claim." *Eli Lilly*, 251 F.3d at 971. EX1054, ¶¶ 111-207.

1. Claim 1

a. "A transgenic plant cell comprising a recombinant polynucleotide that encodes an AAD-1 protein"

Corteva '437 discloses this limitation. EX1054, ¶¶ 112-116. Like the '555 patent, Corteva '437 discloses and claims transgenic plant cells modified to comprise a recombinant polynucleotide that encodes an AAD-1 protein. EX1021, [00018]-[00020], [00095]-[00105], [00149]-[00151], claims 1-4; EX1054, ¶ 114. Corteva '437 discloses that such encoded AAD-1 proteins include AAD-1 v1 and v2, which correspond to SEQ ID NO: 9-10. EX1021, [0050]-[0051], SEQ ID NO: 9-10;

EX1054, ¶¶ 114-116; *infra* Section VII.B.1.c. Corteva '437 states: "The transgenic expression of the subject AAD-1 genes is exemplified in, for example, *Arabidopsis*, corn (maize), tobacco, cotton, rice, soybean, and canola," and "can be applied to any other desired types of plants." EX1021, [00104]. Corteva '437 therefore discloses plant cells that satisfy this limitation. EX1054, ¶¶ 114-116.

b. "that exhibits aryloxyalkanoate dioxygenase activity wherein said activity enzymatically degrades a phenoxy auxin herbicide and an (R)-aryloxyphenoxypropionate herbicide"

Corteva '437 likewise discloses this limitation. EX1054, ¶¶ 117-120. Corteva '437 discloses that transgenic plant cells expressing AAD-1 proteins enzymatically degrade phenoxy auxin and (*R*)-aryloxyphenoxypropionate herbicides, EX1021, [0020], [0074]-[0076], [0092]-[0099], [00179]-[00215], [00260]-[00264], Tbls. 6-8, 16 claims 1-4; EX1054, ¶ 117, which both Corteva '437 and the '555 patent describe as aryloxyalkanoate dioxygenase activity. EX1021, claim 1, [0020], [0086]-[0087], [0097]; EX1001, claim 1; EX1054, ¶ 117.

Corteva '437 states that one "benefit" of "AAD-1" is that it "is able to degrade the (R)-enantiomers (herbicidally active isomers) of the chiral phenoxy auxins (*e.g.*, dichlorprop and mecoprop)" and "achiral phenoxy auxins (*e.g.*, 2,4-D, MCPA, 4-chlorophenoxyacetic acid)." EX1021, [0074]. It also states that an "additional benefit of the AAD-1 gene" is its ability to "degrade a host of commercial and non-commercial graminicidal compounds of the general class

aryloxyphenoxypropionates (AOPPs)," which "may allow the use of any of a number of AOPP compounds in transgenic crops containing *AAD-1*," including "corn, rice, wheat, barley, rye, oats, sorghum, warm and season turf species, grass pasture species, and many others." *Id.*

Corteva '437 discloses that transgenic *Arabidopsis* plants expressing AAD-1 v2 (SEQ ID NO: 10) imparted "resistance" to phenoxy auxin herbicides (including 2,4-D). EX1021, [00260]-[00264] & Tbl. 16; EX1054, ¶ 119. It also discloses that AAD-1 v1 degrades both phenoxy auxin herbicides (including 2,4-D) and (*R*)-aryloxyphenoxypropionate herbicides (including (*R*)-diclofop, (*R*)-haloxyfop, and (*R*)-quizalofop), EX1021, [00107]-[00109], [00185]-[00215] & Tbls. 3-4, 6-9, Figs. 5-6B; EX1054, ¶ 119. It asserts that the same principles "can be applied to any other desired types of plants." EX1021, [00104]. Claim 1 also claims a plant cell transformed to express AAD-1 v1 ("SEQ ID NO: 9") and "variants" that have "aryloxyalkanoate dioxygenase activity."

c. "further wherein said AAD-1 protein comprises: i) an amino acid sequence having at least 85% sequence identity with SEQ ID NO: 9; and ii) [the claim 1 AAD-1 motif]"

Corteva '437 also discloses this limitation. EX1054, ¶¶ 121-122. Corteva '437 discloses proteins having the amino acid sequence represented by SEQ ID NO: 9-10. EX1001, SEQ ID NO: 9-10; EX1021, SEQ ID NO: 9-10. By definition, SEQ ID NO: 9 is 100% identical to itself. SEQ ID NO: 10 is identical to SEQ ID NO: 9

except that an alanine is substituted for the histidine at position 2, and a cysteine is substituted for the arginine at position 212. EX1021, [0046], [0051], SEQ ID NO: 10; EX1008, COR-AAD1-00000470-471. That sequence thus has approximately 99% identity to SEQ ID NO: 9—much greater than 85%. EX1054, ¶ 121.

Corteva '437 also discloses and claims proteins having the claim 1 AAD-1 motif. The applicant represented during prosecution that SEQ ID NO: 9-10 share the claimed AAD-1 motif. EX1008, COR-AAD1-00000487-489 ("This disclosed AAD-1 motif is embodied in the disclosed AAD-1 sequences of SEQ ID Nos: 9, 10 . . . "), COR-AAD1-00000679. SEQ ID NO: 9-10 have a histidine (H) at position 111, aspartic acid (D) at position 113, threonine (T) at position 138, histidine (H) at position 270, and arginine (R) at position 281. EX1021, [0051]-[0052], SEQ ID NO: 9-10; EX1054, ¶ 122.

2. Claim 2

Claim 2 depends from claim 1 and requires the AAD-1 motif to have "the general formula of: $HX_{112}D(X)_{114\text{-}137}T(X)_{139\text{-}269}H(X)_{271\text{-}280}R(X)_{282\text{-}284}R$, wherein $(X)_{282\text{-}284}$ represents a sequence of 3 amino acids." Corteva '437 anticipates this claim. EX1054, ¶¶ 123-126. The AAD-1 motifs recited in claims 1 and 2 are identical except claim 2 also requires $(X)_{282\text{-}284}R$. SEQ ID NO: 9-10 have a sequence of 3 amino acid residues (X) at positions 282-284 and an arginine (R) at position 285. EX1021, [0051]-[0052], SEQ ID NO: 9-10; EX1054, ¶ 126.

3. Claim 3

Claim 3 depends from claim 1 and requires that the "AAD-1 protein comprises an amino acid sequence having at least 90% sequence identity with SEQ ID NO: 9." Corteva '437 anticipates this claim. EX1054, ¶¶ 127-129. As explained above in connection with claim 1, AAD-1 v1 (SEQ ID NO: 9) is 100% identical to itself, and AAD-1 v2 (SEQ ID NO: 10) is more than 99% identical to SEQ ID NO: 9. *See* EX1054, ¶ 129; *supra* Section VII.B.1.c.

4. Claims 4-5

Claims 4-5 depend from claim 1 and require the plant cell to be "dicotyledonous and selected from the group consisting of a cotton cell, a tobacco cell, a canola cell, a soybean cell, and an *Arabidopsis* cell"; or "a monocotyledonous cell selected from the group consisting of a rice cell and a maize cell," respectively. Corteva '437 anticipates these claims. EX1054, ¶¶ 130-134. Corteva '437 discloses and claims that the plant cell may be dicotyledenous, for example, an *Arabidopsis* cell, EX1021, [00104], [00242]-[00263], claim 3; EX1054, ¶ 134, or monocotyledonous, for example, a rice cell or a maize cell, EX1021, [0104], claim 4; EX1054, ¶ 134.

As the above citations illustrate, dependent claims 2-43 and 57-60 of Corteva '437 disclose the additional limitations recited in claims 4-33 of the '555 patent and therefore anticipate them. As Dr. Silverstone explains, Corteva '437's

dependent claims 2-43 and 57-60 depend from claim 1, which encompasses at least "SEQ ID NO: 9" (AAD-1 v1); thus, the POSA would understand Corteva '437's dependent claims apply to that protein. EX1054, ¶ 116. The POSA would also understand that the disclosures in Corteva '437's dependent claims to apply to the exemplary AAD-1 v1 and AAD-1 v2 (SEQ ID NO: 10) proteins. EX1054, ¶ 116. In this case, the POSA would understand that claims 3-4 of Corteva '437 anticipate the corresponding claims 4-5 of the '555 patent. The following sections similarly identify Corteva '437's relevant dependent claims.

5. Claims 6-10

Claim 6 recites: "A transgenic plant comprising a plurality of the plant cells of claim **1**, wherein expression of said polynucleotide renders said plant tolerant to an aryloxyalkanoate herbicide." Claims 7-10 depend from claim 6 and require the herbicide to be a phenoxy auxin herbicide; "selected from the consisting of 2,4-dichlorophenoxyacetic acid, MCPA, dichlorprop, and mecoprop"; an (*R*)-aryloxyphenoxypropionate herbicide; or an (*R*)-aryloxyphenoxypropionate "selected from the group consisting of (R)-fluazifop, (R)-haloxyfop, (R)-diclofop, (R)-quizalofop, (R)-fenoxaprop, (R)-metamifop, (R)-cyhalofop, and (R)-clodinofop," respectively. Corteva '437 discloses that expressing AAD-1 v1-v2 (SEQ ID NO: 9-10) in at least some plants renders the plant tolerant to phenoxy auxin and (*R*)-aryloxyphenoxypropionate herbicides in each of these groups. *See*

EX1021, [0074]-[0078], [00104], [00107]-[00110], [00185]-[00215], [00260]-[00264], Tbls. 1-4, 6-9, 16, claims 5-10, Figs. 5-6B; EX1054, ¶¶ 135-147.

6. Claims 11-12

Claim 11 depends from claim 6 and requires the plaint to comprise "a second herbicide resistance gene." Claim 12 depends from claim 11 and requires the second herbicide resistance gene to render the plant resistant to an herbicide selected from a group that includes glyphosate. Corteva '437 anticipates these claims. EX1054, ¶ 148-152. Corteva '437 discloses and claims that plants expressing AAD-1 proteins, which include AAD-1 v1 and v2 (SEQ ID NO: 9-10), can be modified to comprise a second herbicide resistance gene that renders those plants resistant to glyphosate (*e.g.*, a "glyophosate resistance gene/AAD-1 stack"). EX1021, [0078]-[0080], claims 11-12; EX1054, ¶ 152.

7. Claim 13

Claim 13 recites: "A method of controlling at least one weed in a field, wherein said field contains at least one plant of claim **6**, wherein said method comprises applying to at least a portion of said field a first herbicide selected from the group consisting of a phenoxy auxin herbicide and an (R)-aryloxyphenoxypropionate herbicide." Corteva '437 anticipates this claim. EX1054, ¶¶ 153-155. Corteva '437 discloses that combinations "of these different chemistry classes and herbicides with different modes of action and spectra in the

same field (either sequentially or in tank mix combination) shall provide control of most potential weeds." *See* EX1021, [0078]; EX1054, ¶ 155. Claims 13-39 of Corteva '437 also disclose and claim methods of applying these herbicides to a field for the purposes of weed control. EX1021, claims 13-39; EX1054, ¶ 155.

8. Claims 14-16

Claims 14-16 depend from claim 13 and require the herbicide to be "an R-enantiomer of a chiral phenoxy auxin"; "an achiral phenoxy auxin selected from the group consisting of 2,4-D and MCPA"; or an (*R*)-aryloxyphenoxypropionate "selected from the group consisting of (R)-fluazifop, (R)-haloxyfop, (R)-diclofop, (R)-quizalofop, (R)-fenoxaprop, (R)-metamifop, (R)-cyhalofop, and (R)-clodinofop," respectively. Corteva '437 anticipates these claims. EX1054, ¶¶ 156-161. Corteva '437 discloses and claims using (*R*)-enantiomers of chiral phenoxy auxins, such as (*R*)-dichlorprop and (*R*)-mecoprop, to control weeds in a field. EX1021, [0074]-[0076] & Tbl. 1, claims 14-15; EX1054, ¶ 161. It also discloses and claims using 2,4-D and MCPA for this purpose. EX1021, [0074]-[0076] & Tbl. 1, claim 17; EX1054, ¶ 161. And it discloses and claims using (*R*)-fauzifop, (*R*)-haloxyfop, (*R*)-diclofop, (*R*)-quizalofop, (*R*)-fenoxaprop, (*R*)-metamifop, (*R*)-cyhalofop, and (*R*)-clodinofop for the same. EX1021, [0077]-[0078], [00109], [00206], [00214], Tbls. 2, 4, 9, claim 36; EX1054, ¶ 161.

9. Claims 17-20

Claim 17 recites: "The method of claim **13** wherein said method comprises applying a second herbicide." Claims 18-19 depend from claim 17 and require the first and second herbicide to be "applied sequentially" and "concurrently," respectively. Claim 20 depends from claim 17 and specifies that "the first herbicide is a phenoxy auxin and said second herbicide is an (R)-aryloxyphenoxypropionate." Corteva '437 anticipates these claims. EX1054, ¶¶ 162-168. Corteva '437 discloses and claims that herbicides, including combinations of a phenoxy auxin herbicide and an (*R*)-aryloxyphenoxypropionate herbicide can be applied "sequentially or tank mixed" (*i.e.*, concurrently) in methods of controlling weeds. *See* EX1021, [0078], claims 22-25; EX1054, ¶ 168.

10. Claims 21-23

Claims 21-23 depend from claim 17. Claim 21 requires the second herbicide to be "selected from the group consisting of glyphosate, glufosinate, dicamba, acetolactate synthase (ALS) inhibitors, protoporphyrinogen oxidase (PPO) inhibitors, and 4-hydroxypheny 1-pyruvate-dioxygenase (HPPD) inhibitors." Claim 22 requires the first herbicide to be 2,4-D and the second herbicide to be glyphosate or glufosinate. Claim 23 requires the first herbicide to be an aryloxyphenoxypropionate and the second herbicide to be glyphosate or glufosinate. Corteva '437 anticipates these claims. EX1054, ¶¶ 169-174. Corteva '437 discloses

and claims applying each of these combinations of herbicides to fields containing plants modified to express an AAD-1 gene (such as SEQ ID NO: 9-10) and a resistance gene for the second herbicide, for example, a glyphosate or glufosinate resistance gene. EX1021, [0079]-[0083], [0098], claims 30, 34-35; EX1054, ¶ 174.

11. Claim 24

Claim 24 recites: "The method of claim **17** wherein said plant further comprises a second herbicide resistance gene that renders said plant resistant to said second herbicide." Corteva '437 anticipates this claim, including for the reasons stated above in connection with claims 17 and 21-23. *See* EX1021, [0079]-[0083], [0098], claim 28; EX1054, ¶¶ 175-178; *supra* Sections VII.B.9, VII.B.10.

12. Claims 25-26

Claim 25 depends from claim 24 and requires that the "second herbicide resistance gene is selected from the group consisting of a modified acetolactate synthase (ALS) gene, a glyphosate resistance gene, a glufosinate resistance gene, and a dicamba-degrading enzyme gene." Claim 26 depends from claim 25 and requires the ALS gene, glyphosate resistance gene, glufosinate resistance gene, or dicamba-degrading enzyme gene to be further selected from subgroups of those genes. Corteva '437 anticipates these claims. EX1054, ¶¶ 179-183. Corteva '437 discloses and claims that AAD-1 genes can be stacked with resistance genes from

each of the groups and subgroups specified in claims 25-26. *See* EX1021, [0082]-[0083], [0098], claim 29; EX1054, ¶ 183.

13. Claims 27-29

Claim 27 recites: "The method of claim **17** wherein said method further comprises applying a third herbicide." Claim 28 depends from claim 27 and requires that the "third herbicide is selected from the group consisting of glyphosate, glufosinate, HPPD-inhibitors, PPO-inhibitors, ALS inhibitors, and dicamba." Claim 29 depends from claim 28 and requires that the "first, second and third herbicides are 2,4-D, quizalofop, and glyphosate." Corteva '437 anticipates these claims. EX1054, ¶¶ 184-189. Corteva '437 discloses that plants transformed with an AAD-1 gene (such as SEQ NO: 9-10) can be treated with combinations of a phenoxy auxin (such as 2,4-D) and an (*R*)-aryloxyphenoxypropionate herbicide (such as quizalofop). EX1021, [0078]. Corteva '437 further discloses these genes and herbicides can be stacked with glyphosate resistance genes and glyphosate. EX1021, [0079]-[0083], [0098]; EX1054, ¶ 189. Claims 38-39 of Corteva '437 disclose and claim applying three herbicides, including 2,4-D, quizalofop, and glyphosate, specifically.

14. Claim 30

Claim 30 recites: "A seed comprising a plurality of the plant cells of claim **1**." Corteva '437 anticipates this claim. EX1054, ¶¶ 190-193. Corteva '437 discloses

and claims seeds produced by or used to generate the plants containing the plant cells of claim 1. EX1021, [00151], claim 57; EX1054, ¶ 193. Corteva '437 further discloses experiments involving planting seeds containing plant cells transformed to express proteins corresponding to SEQ ID NO: 9-10. EX1021, [00253]; EX1054, ¶ 193.

15. Claim 31

Claim 31 recites: "A method of controlling weeds in a field, wherein said method comprises applying an aryloxyalkanoate herbicide to said field and planting a seed of claim **30** in said field within 14 days of applying said aryloxyalkanoate herbicide." Corteva '437 anticipates this claim. EX1054, ¶¶ 194-197. Corteva '437 discloses the seed of claim 30. *See supra* Section VII.B.14. In addition, claim 40 of Corteva '437 discloses and claims a "method of controlling weeds in a field, wherein said method comprises applying a first herbicide to said field and planting a seed in said field within 14 days of applying said first herbicide," "wherein said first herbicide is selected from the group consisting of a phenoxy auxin and an aryloxyphenoxypropionate." Corteva '437 (and the '555 patent) identify phenoxy auxins and aryloxyphenoxypropionates as aryloxyalkanoates. EX1001, 3:49-56, claims 1, 6-10, 34; EX1021, [0015]; EX1054, ¶ 197.

16. Claims 32-33

Claim 32 recites: "A plant grown from the seed of claim **30**." Claim 33 recites: "A part, progeny, or asexual propagate of the plant of claim **32**, wherein said part, progeny, or sexual propagate comprises said polynucleotide." Corteva '437 anticipates these claims. EX1054, ¶¶ 198-202. Corteva '437 discloses that seeds containing the claimed AAD-1 proteins can be used to generate additional plants comprising the polynucleotides that encode them. *See* EX1021, [00151]; EX1054, ¶ 202. Claims 58 and 59 of Corteva '437 likewise disclose and claim these limitations. EX1054, ¶ 202.

17. Claim 34

Claim 34 is similar to claim 1, but requires (1) the transgenic plant cell to be an "(R)-aryloxyphenoxypropionate herbicide tolerant transgenic plant cell" and (2) the AAD-1 motif to have "90% sequence identity with corresponding amino acids of position 111 to 281 of SEQ ID NO: 9." Corteva '437 anticipates this claim. EX1054, ¶¶ 203-207. As explained in connection with claims 6 and 9-10, Corteva '437 discloses that at least some plant cells transformed with AAD-1 proteins, such as AAD-1 v1 and v2, are tolerant to (*R*)-aryloxyphenoxypropionate herbicides. EX1021, [0076]-[0078], [00109], [00206], [00214], Tbls. 2, 4, 9, claims 5, 8-9; EX1021 ¶ 205; *supra* Section VII.B.5. With respect to the additional sequence identity limitation, AAD-1 v1 corresponds to SEQ ID NO: 9 and is therefore 100%

identical to it at position 111 to 281. Except at position 212, AAD-1 v2 (SEQ ID NO: 10) is identical to SEQ ID NO: 9 in that range; it thus also has more than 90% sequence identity in that range. EX1001, SEQ ID NO: 9-10; EX1054, ¶ 206; *supra* Section VII.B.1.c. Corteva '437 also discloses the remaining limitations of this claim, which are also present in claim 1. *See supra* Section VII.B.1.

C. Ground IB: Corteva '437 Renders Obvious Claims 1-34.

As set forth in Ground IA, Corteva '437 anticipates claims 1-34. It therefore renders them obvious because "anticipation is the epitome of obviousness." *Realtime Data, LLC v. Iancu*, 912 F. 3d 1368, 1373 (Fed. Cir. 2019); EX1054, ¶ 209.

D. Ground IIA: Saari 1998 or Saari 1999 in Combination With Schleinitz and Streber Render Obvious Claims 1-10, 13-16, 34.

Even assuming the claims are entitled to a priority date of April 2004, claims 1-10, 13-16, and 34 would have been obvious over the prior art. EX1054, ¶¶ 209-276. Each of Saari 1998 and 1999 (collectively, the "Saari References") suggests that the naturally occurring RdpA protein (which the '555 patent renames "AAD-1") can be used to transform plants and plant cells to have resistance to phenoxy herbicides. Schleinitz discloses the nucleotide and amino acid sequences for RdpA; and Streber further discloses standard methods for achieving the transformation. As such, and as discussed further below, the POSA would have been motivated to practice the claims with a reasonable expectation of success.

1. Claim 1

The prior art as of April 2004 would have motivated the POSA to transform plant cells and plants to express RdpA. EX1054, ¶¶ 210-216, 219-235. The Saari References singled out RdpA (which the Saari References refer to as the TfdA-like gene from *S. herbicidivorans*) as having the ability to degrade phenoxy herbicides, including the (*R*)-chiral phenoxy herbicides (*R*)-mecoprop and (*R*)-dichlorprop. EX1041, 422, 427; EX1040, 92-93, 127; EX1054, ¶ 227. The Saari References recommended transforming plants to express *α*-ketoglutarate-dependent dioxygenase enzymes with RdpA's reported activity, to impart resistance to phenoxy herbicides. *See* EX1041, 422 ("[T]he genes encoding an enzyme specific for the R isomer could be used to develop genetically engineered crops that are resistant to the herbicide of interest."), 427; EX1040, 93 ("A potential application for *A. denitrificans* or the tfdA-like gene it contains would be protection of crops from mecoprop and dichlorprop . . . since its gene product degrades the R-enantiomer."); EX1054, ¶ 226.

The POSA would have reasonably expected success in transforming plant cells to express RdpA. EX1054, ¶¶ 217-222, 228-231. The Saari References disclosed that researchers had successfully expressed TfdA, a member of the same enzyme family, in cotton, imparting resistance to 2,4-D and other phenoxy herbicides. EX1040, 93; EX1041, 422; EX1054, ¶ 230. These disclosures would

have led the POSA to Schleinitz, which discloses the nucleotide and amino acid sequences for RdpA, EX1013, 2; EX1054, ¶¶ 228-229; and Streber, which discloses methods that researchers used to transform plants and plant cells using TfdA and to test those transformations. EX1043, 7:58-9:23, 11:30-32:9; EX1054, ¶¶ 230-231. The POSA would have understood that such methods could be applied to RdpA; and indeed, the '555 patent admits that a "wide variety of methods . . . for introducing a gene encoding a desired protein . . . are well known to [the POSA]." EX1001, 39:37-42; *see id.* 3:11-14, 31:24-27, 32:23-33:9, 35:45-37:27, 38:42-55; EX1054, ¶ 231; *Koninklijke Philips NV v. Google LLC*, 948 F.3d 1330, 1339 (Fed. Cir. 2020).

The remaining limitations are obvious based on that transformation. AAD-1 (*i.e.*, SEQ ID NO: 9) has the recited "AAD-1" motif and 100% sequence identity to itself. EX1001, 6:56-58, SEQ ID NO: 9; EX1054, ¶ 234; EX1013, 2. And the recited aryloxyalkanoate dioxygenase activities are inherent properties of RdpA. EX1054, ¶¶ 120, 227, 232; *supra* Section VII.B.1.b. That suffices to establish obviousness. *See Hospira, Inc. v. Fresenius Kabi USA, LLC*, 946 F.3d 1322, 1331-32 (Fed. Cir. 2020); *Ex parte Hirashi*, 2021 WL 2549655, at *3 (PTAB June 18, 2021) ("The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious."). Moreover, the Saari References disclosed that RdpA degraded (*R*)-dichlorprop and (*R*)-mecoprop;

and the POSA would expect that RdpA would degrade other phenoxy auxin herbicides, as well as (*R*)-aryloxyphenoxypropionate herbicides, via the same mechanism. EX1042, 422-23, 427; EX1040, 71-72 & Scheme 13, 93, Fig. 72; EX1054, ¶¶ 210-215, 219-222, 226-227, 232.

2. Claim 2

Claim 2 requires the AAD-1 motif to comprise the additional segment $(X)_{282\text{-}284}R$. Because RdpA satisfies this requirement, EX1054, ¶ 238; *supra* Sections VII.B.1.c, VII.D.1, this claim is obvious, EX1054, ¶¶ 236-241.

3. Claim 3

Claim 3 depends from claim 1 and requires at least 90% sequence identity with SEQ ID NO: 9. Because RdpA has the amino acid sequence listed in SEQ ID NO: 9, EX1054, ¶ 244; *supra* Sections VII.B.1.c, VII.D.1, this claim is obvious, EX1054, ¶¶ 242-245.

4. Claim 4-5

These claims relate to common plant types that the POSA would have desired to transform with a phenoxy herbicide resistance gene for agricultural or scientific purposes. EX1001, 1:21-29, 1:63-2:19; EX1040, 92; EX1041, 422, EX1043, 9:13-23, 30:36-31:35; EX1054, ¶ 250. They are obvious. EX1054, ¶¶ 246-250.

5. Claims 6-10

Claims 6-10 recite further limitations regarding plant tolerance and herbicide type. The Saari References disclose that RdpA degraded (*R*)-dichlorprop and (*R*)-

mecoprop; and the POSA would expect that RdpA would degrade other phenoxy auxin herbicides, as well as (*R*)-aryloxyphenoxypropionate herbicides, via the same mechanism. EX1042, 422-23, 427; EX1040, 71-72 & Scheme 13, 93, Fig. 72; EX1054, ¶¶ 210-215, 219-222, 226-227, 232, 252-262; *supra* Section VII.D.1. Saari 1998 identifies herbicides listed in each of the claims. EX1040, 71-72 & Scheme 13, Fig. 72; EX1054, ¶ 260. And the '555 patent admits that RdpA degrades these herbicides. EX1001, Fig. 4, Tbls. 3-4; EX1054, ¶ 261; *Hospira*, 946 F.3d at 1329-30.

6. Claims 13-16

Claims 13-16 relate to methods of controlling weeds by applying specified herbicides. The Saari References disclose the use of 2,4-D, (*R*)-fluazifop, (*R*)-diclofop, (*R*)-fenoxaprop as "herbicides," EX1041, Abstract, 421; EX1040, 72; EX1054, ¶ 260, and the POSA would recognize that 2,4-D, MCPA, (*R*)-fluazifop, (*R*)-haloxyfop, (*R*)-diclofop, (*R*)-quizalofop, and (*R*)-fenoxaprop were used for weed control, EX1054, ¶ 269; *see also* EX1039, 69, 88-92, Tbl. 5.1. As discussed above in connection with claims 1 and 6-10, based on the Saari References, the POSA would have expected that RdpA would degrade these herbicides. EX1054, ¶ 269; *supra* Sections VII.D.1, VII.D.4. Thus, it would have been obvious to apply these herbicides in conjunction with at least some plants expressing RdpA. EX1054, ¶¶ 263-270.

7. Claim 34

Claim 34 differs from claim 1 in requiring (1) the plant cell to be "(R)-aryloxyphenoxypropionate herbicide tolerant" and (2) the AAD-1 motif to have "90% sequence identity with corresponding amino acids of position 111 to 281 of SEQ ID NO: 9." As explained in connection with claims 1, 6, and 9-10, the Saari References would have motivated the POSA to transform plant cells to express RdpA, in order to confer tolerance to (*R*)-aryloxyphenoxypropionate herbicides in at least some plant cells. EX1054, ¶ 273; *supra* Sections VII.D.1, VII.D.5. RdpA (AAD-1 v1) also satisfies the claim 34 motif. EX1054, ¶ 274; *supra* Sections VII.B.17, VII.D.1. Thus, this claim is obvious. EX1054, ¶¶ 271-276.

E. Ground IIB: Saari 1998 or Saari 1999 in Combination With Schleinitz, Streber, and Jepson Render Obvious Claims 11-12, 17-33.

The remaining claims would have been obvious over the references cited in Ground IIA in further view of Jepson, which discloses transforming plants with multiple herbicide resistant traits. EX1054, ¶¶ 277-329.

1. Claims 11-12

Claims 11-12 relate to a "second herbicide resistance gene." Jepson discloses polynucleotides combining glyphosate resistance genes and the *tfdA* gene; the POSA would have known that applying multiple herbicides would prevent or delay the evolution of herbicide-resistant weeds. EX1030, [0012], [0026]-[0027], [0054], [00135]-[00180], claim 4; EX1054, ¶ 282; *see also* EX1039, 308-09. The POSA

would have been motivated to apply Jepson's disclosure to RdpA with a reasonable expectation of success in view of Schleinitz's and Streber's disclosures and the POSA's information regarding plant transformation. *See* EX1054, ¶¶ 278-283; *supra* Section VII.D.1.

2. Claims 17-19

Claims 17-19 relate to methods of controlling weeds by applying multiple herbicides, sequentially or concurrently. Jepson discloses that herbicides may be applied at different times, including pre- and post-emergence; the POSA would have known that herbicides should be applied under the circumstances they were known to be effective. EX1030 [0005]-[0011], [0026], claims 3, 12; EX1054, ¶ 289; *see also* EX1039, 69, 88-92. The POSA would have been motivated to apply these known practices to transgenic plants and plant cells expressing RdpA with a reasonable expectation of success. EX1054, ¶¶ 284-290.

3. Claims 20-24

Claims 20-24 relate to methods of applying multiple herbicides. Jepson discloses polynucleotides for encoding the *tfdA* gene and a glyphosate resistance gene. EX1030, [0004], [0012], [0024], [0026]-[0027], [0054], [00135]-[00180], claims 4-5, 14-15; EX1054, ¶ 299. The POSA would have would have been motivated to combine the multiple classes of herbicides recited in these claims to ensure that the combination was effective against a broad spectrum of weeds via

multiple mechanisms and, accordingly, to transform at least some plants to be resistant to those herbicides. EX1054, ¶¶ 289, 299; *see also* EX1039, 308-09. Jepson's disclosures regarding herbicide resistance traits would have further motivated the POSA to achieve these transformations with RdpA and with a reasonable expectation of success. EX1054, ¶¶ 295-300.

4. Claims 25-26

Claims 25-26 depend from claim 24 and relate to methods involving a "second herbicide resistance gene." Jepson specifically discloses combining the *tfdA* gene with a modified EPSPS gene; thus, the POSA would have been motivated to practice the additional limitations of these claims in conjunction with the claimed methods with RdpA and with a reasonable expectation of success. EX1030, [0004], [0012], [0024], [0026]-[0027], [0054], [00135]-[00180], claims 4, 5, 14, 15; EX1054, ¶¶ 303-306.

5. Claims 27-29

Claims 27-29 relate to methods of applying three herbicides. As explained in connection with claims 1 and 6-10, the Saari References disclose that RdpA degrades phenoxy herbicides, which include 2,4-D and quizalofop. *See supra* Section VII.D.1, VII.D.5. Jepson specifically discloses combining the *tfdA* gene with glyphosate resistance. EX1030, [0004], [0012], [0024], [0026]-[0027], [0054], [00135]-[00180], claims 4-5, 14-15. The POSA would have been motivated to

combine multiple classes of herbicides and other classes of herbicide-resistance traits to prevent weeds from acquiring resistance, and the Saari References' and Jepson's disclosures would have motivated the POSA to combine the claimed herbicides with RdpA and other classes of resistance genes with a reasonable expectation of success. EX1030, [0004], [0012], [0024], [0026]-[0027], [0054], [00135]-[00180], claims 4-5, 14-15; EX1054, ¶¶ 284-290; *supra* Section VII.E.1; *see also* EX1039, 308-09.

6. Claim 30

Claim 30 recites: "A seed comprising a plurality of the plant cells of claim **1**." This claim is obvious. EX1054, ¶¶ 315-318. For example, Jepson discloses seeds containing cells transformed to impart herbicide resistance. EX1030, [00122]-[00123], [00131]-[00132], [00144], [00168]-[00169], [00180]-[00183], [00187]-[00188], claims 13, 15; EX1054, ¶ 317.

7. Claim 31

Claim 31 depends from claim 30 and addresses the timing of herbicide application. This claim is obvious. EX1054, ¶¶ 319-323. The Saari References suggest that RdpA could be used to selectively degrade aryloxyalkanoate herbicides (which include phenoxy auxin and (*R*)-aryloxyphenoxypropionate herbicides), EX1054, ¶ 321; *supra* Section VII.D.5, and the POSA would have been motivated to apply aryloxyalkanoate herbicides to plants transformed with RdpA, EX1054,

¶ 321. As of April 2004, herbicides were routinely used less than 14 days before planting, to eliminate weeds. EX1051, 906, 909-10 & Tbls. 5-6; EX1054, ¶ 322. Such pre-planting applications were advantageous because "[r]ainfall probabilities are usually greater earlier in the growing season" and pre-planting applications "conserve soil moisture under low moisture conditions." EX1051, 906. Studies reported that applying 2,4-D as little as 14, 7, or 0 days before planting had no effect on crop yield. EX1051, 909-10 & Tbls. 5-6. Accordingly, the POSA would be motivated to practice this claim with a reasonable expectation of success. EX1054, ¶¶ 319-323.

8. Claims 32-33

Claim 32-33 relate to plants grown from the seed of claim 25 and their parts, progeny, and propagates. These claims are obvious. EX1054, ¶¶ 324-329. For example, Jepson discloses transgenic herbicide-resistant plants grown from seeds containing the recombinant polynucleotide that imparts the herbicide resistance and which themselves exhibit resistance. EX1030, [0168]-[0170], [0172]-[0179]; EX1054, ¶ 328.

F. No Secondary Considerations Support Nonobviousness.

Patent Owner cannot provide any evidence of nexus or secondary considerations to support nonobviousness. The Saari References highlighted RdpA and further recommend transforming plants to express α-ketoglutarate-dependent

dioxygenase enzymes with RdpA's reported activity, to impart resistance to phenoxy herbicides. *Supra* Section VII.D; EX1054, ¶¶ 639-640. While during prosecution the applicant argued that the claimed activity against (*R*)-aryloxyphenoxypropionates was an unexpected property, mere recognition of latent properties in the prior art does not render nonobvious an otherwise known invention. *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991). In any event, Patent Owner has not and cannot demonstrate that the claimed proteins have a nexus to or are commensurate with any unexpected properties, particularly given RdpA's known activity and the claims' massive scope. *In re Huai-Hung Kao,* 639 F.3d 1057, 1067-69 (Fed. Cir. 2011); EX1054, ¶¶ 639-640.

VIII. DISCRETIONARY DENIAL IS NOT APPROPRIATE.

The Board should not exercise its discretion under or 35 U.S.C. § 325(d), or 35 U.S.C. § 314(a) and *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (Precedential).

A. Discretionary Denial Under § 325(d) Is Not Appropriate.

Denial under Section 325(d) is not appropriate, as the *Advanced Bionics* factors favor institution. *See* IPR2019-01469, Paper 6, at 8 (PTAB Feb. 13, 2020) (Precedential).

First, the Petition is based on prior art and arguments not presented to the examiner. Saari 1998 (Grounds IIA-B) was not before the examiner at all. Although

the applicant disclosed Saari 1999 (Grounds IIA-B) in an IDS, the examiner never discussed its substance. *See Zip Top, LLC v. Stasher, Inc.*, IPR2018-01216, Paper 14, at 35-36 (PTAB Jan. 17, 2019); *Navistar, Inc. v. Fatigue Fracture Tech., LLC*, IPR2018-00853, Paper 13, at 16-17 (PTAB Sept. 12, 2018); *Praxair Distribution, Inc. v. INO Therapeutics, LLC*, IPR2015-00893, Paper 14, at 8 (Sept. 22, 2015) (granting institution on references cited in IDS). The examiner certainly never considered "a combination of" the Saari References and Schleinitz, Streber, and/or Jepson. *MED-EL Elektromedizinishce Geräte Ges.m.b.H. v. Sonova AG*, IPR2020-00176, Paper 13, at 10-11 (PTAB June 3, 2020).

Second, the Office erred in a manner material to patentability. As shown in Grounds IA-IB, the examiner failed to apply the correct priority date because the '555 patent's predecessors fail to provide adequate written description support. Although claims cover at least 20[44] different sequences, the '555 patent's predecessors disclose at most three sequences within that scope. *Supra* Section VII.A.1. Moreover, the examiner's apparent rationale for allowing the claims was erroneous and relied on "legally irrelevant" information not disclosed in the '555 patent's predecessors. *Supra id.*; *Juno*, 10 F.4th at 1335. The examiner's vacillating descriptions of the post-priority data that he did consider—which prompted the applicant to correct his understanding—reinforce that his analysis was flawed. *See supra* Section V.C.3.

B. *Fintiv* Is Irrelevant

Petitioner has omitted the *Fintiv* discussion that Bayer included in its petition in IPR2023-01036, which Petitioner seeks to join. *Fintiv* considerations are irrelevant because Inari expects the Board will institute Bayer's petition in IPR2023-01036. In any event, the fact that Inari "is not a party to the district court action" involving the '555 patent cuts against discretionary denial under Section 314(a). *Samsung Bioepis Co. Ltd. v. Regeneron Pharms, Inc.*, IPR2023-00739, Paper 9 at 60-61 (PTAB Oct. 20, 2023) (*Fintiv* factor 5 weighs in favor of institution for parties uninvolved in co-pending litigation).

IX. CONCLUSION

Petitioner respectfully requests institution and cancellation of claims 1-34.

November 15, 2023

/Scott A. McKeown/
Scott A. McKeown, Reg. No. 42,866

EXHIBIT LIST

Exhibit No.	Description
EX1001	U.S. Patent No. 10,947,555
EX1002	U.S. Patent No. 11,149,283
EX1003	U.S. Patent No. 11,299,745
EX1004	U.S. Provisional Application No. 60/567052
EX1005	U.S. Application No. 11/587893 and File History
EX1006	U.S. Application No. 12/951813 and File History
EX1007	U.S. Application No. 14/820893 and File History
EX1008	Certified U.S. Application No. 15/288,406 and File History
EX1009	U.S. Application No. 17/143,824 and File History
EX1010	Certified U.S. Application No. 17/175,966 and File History
EX1011	Certified U.S. Application No. 17/403,476, and File History
EX1012	Accession No. AAS49436.1, submitted Feb. 04, 2004
EX1013	Accession No. AF516751, published Aug. 6, 2002
EX1014	Accession No. AF516752, published Aug. 6, 2002
EX1015	Accession No. AJ628856, published March 3, 2004
EX1016	Accession No. Q8KSC8, published Oct. 1, 2002

Exhibit No.	**Description**
EX1017	U.S. Patent Pub. No. 2016/0108422
EX1018	C. Bayley et al., *Engineering 2,4-D Resistance into Cotton*, 83 THEORETICAL & APPLIED GENETICS 645-649 (1992)
EX1019	J.R. Chekan et al., *Molecular Basis for Enantioselective Herbicide Degradation Imparted by Aryloxyalkanoate Dioxygenases in Transgenic Plants*, 27 PROC. NAT'L ACAD. SCI. 13299-13304 (2019)
EX1020	J.R. Chekan et al., *Supplementary Information, Molecular Basis for Enantioselective Herbicide Degradation Imparted by Aryloxyalkanoate Dioxygenases in Transgenic Plants*, 27 PROC. NAT'L ACAD. SCI. 13299-13304 (2019)
EX1021	International Patent Pub. No. WO2005/107437
EX1022	BIOLOGICALLY ACTIVE NATURAL PRODUCTS: AGROCHEMICALS (H.G. Cutler & S.J. Cutler, eds. 1999)
EX1023	J.M. Elkins, R.P. Hausinger et al., *X-ray Crystal Structure of* Escherichia coli *Taurine/α-Ketoglutarate Dioxygenase Complexed to Ferrous Iron and Substrates*, 41 BIOCHEMISTRY 5185-5192 (2002)
EX1024	F. Fukumori & R.P. Hausinger, Alcaligenes Eutrophus JMP134 *"2,4-Dichlorophenoxyacetate Monooxygenase" Is an α-Ketoglutarate-Dependent Dioxygenase*, 175 J. BACTERIOLOGY 2083-2086 (1993)

Exhibit No.	**Description**
EX1025	R. Hausinger, *Fe(II)/α-Ketoglutarate-Dependent Hydroxylases and Related Enzymes*, 39 CRIT. REV. BIOCHEM. MOLECULAR BIO. 21-68 (2004)
EX1026	S.S.Q. Hee & R.G. Sutherland, I PHENOXYALKANOIC HERBICIDES: CHEMISTRY, ANALYSIS, AND ENVIRONMENTAL POLLUTION (1981)
EX1027	D.A. Hogan, R.P. Hausinger et al., *Site-Directed Mutagenesis of 2,4-Dichlorophenoxyacetic Acid/α-Ketoglutarate Dioxygenase. Identification of Residues Involved in Metallocenter Formation and Substrate Binding*, 275 J. BIO. CHEM. 12400-12409 (2000)
EX1028	J.C. Dunning Hotopp & R.P. Hausinger, *Alternative Substrates of 2,4-Dichlorophenoxyacetate/α-Ketoglutarate Dioxygenase*, 15 J. MOLECULAR CATALYSIS B: ENZYMATIC 155-162 (2001)
EX1029	J.C. Dunning Hotopp & R.P. Hausinger, *Probing the 2,4-Dichlorophenoxyacetate/α-Ketoglutarate Dioxygenase Substrate Binding Site by Site-Directed Mutagenesis and Mechanism-Based Inactivation*, 41 BIOCHEMISTRY 9787-9794 (2002)
EX1030	U.S. Patent Pub. No. 2003/0041357
EX1031	H.P.E. Kohler, Sphingomonas herbicodovorans *MH: A Versatile Phenoxyalkanoic Acid Herbicide Degrader*, 23 J. INDUS. MICROBIO. & BIOTECH. 336-340 (1999)
EX1032	B.R. Lyon et al., *Expression of a Bacterial Gene in Transgenic Tobacco Plants Confers Resistance to*

Exhibit No.	Description
	the Herbicide 2,4-Dichlorophenoxyacetic Acid, 13 PLANT MOLECULAR BIO. 533-540 (1989)
EX1033	B.R. Lyon et al., *Cotton Plants Transformed with Bacterial Degradation Gene Are Protected from Accidental Spray Drift Damages by the Herbicide 2,4-Dichlorophenoxyacetic Acid*, 2 TRANSGENIC RES. 162-169 (1993)
EX1034	R.H. Müller et al., *Physiological and Genetic Characteristics of Two Bacterial Strains Utilizing Phenoxypropionate and Phenoxyacetate Herbicides*, 156 MICROBIO. RES. 121-131 (2001)
EX1035	T.A. Müller, R.P. Hausinger et al., *Structural Basis for the Enantiospecificities of* R- *and* S-*Phenoxypropionate/α-Ketoglutarate Dioxygenases*, 15 PROTEIN SCI. 1356-1368 (2006)
EX1036	K. Nickel et al., *Involvement of Two α-Ketoglutarate-Dependent Dioxygenases in Enantioselective Degradation of (*R*)- and (*S*)-Mecoprop by* Sphingomonas herbicidovorans *MH*, 179 J. BACTERIOLOGY 6674-6679 (1997)
EX1037	E. Otoxby & M.A. Hughes, *Engineering Herbicide Tolerance into Crops*, 8 TIBTECH 61-65 (1990)
EX1038	E.J. Perkins et al., *Use of* Alcaligenes eutrophus *as a Source of Genes for 2,4-D Resistance in Plants*, 35 WEED SCI. 12-18 (1987)
EX1039	PRINCIPLES OF WEED SCIENCE (V.S. Rao, ed., 2d ed. 2000)
EX1040	R.E. Saari, Substrate Specificity and Spectroscopic Properties of 2,4-Dichlorophenoxyacetic Acid/α-

Exhibit No.	Description
	Ketoglutarate Dioxygenase, Doctoral Thesis, Mich. State Univ. (July 6, 1998)
EX1041	R.E. Saari, R.P. Hausinger et al., *Stereospecific Degradation of the Phenoxypropionate Herbicide Dichlorprop*, 6 J. MOLECULAR CATALYSIS B: ENZYMATIC 421-428 (1999)
EX1042	K.M. Schleinitz et al., *Localization and Characterization of Two Novel Genes Encoding Stereospecific Dioxygenases Catalyzing 2(2,4-Dichlorophenoxy)Propionate Cleavage in* Delftia acidovorans *MC1*, 70 APPLIED & ENVTL. MICROBIO. 5357-5365 (2004)
EX1043	U.S. Patent No. 6,153,401
EX1044	W.R. Streber et al., *Analysis, Cloning, And High-Level Expression of 2,4-Dichlorophenoxyacetate Monooxygenase Gene* tfdA *of* Alcaligenes eutrophus *JMP134*, 169 J. BACTERIOLOGY 2950-2955 (1987)
EX1045	W.R. Streber & L. Willmitzer, *Transgenic Tobacco Plants Expressing a Bacterial Detoxifying Enzyme Are Resistant to 2,4-D*, 7 BIOTECHNOLOGY 811-816 (1989)
EX1046	E. Vedler et al., *The Completely Sequenced Plasmid pEST4011 Contains a Novel IncP1 Backbone and a Catabolic Transposon Harboring* tfd *Genes for 2,4-Dichlorophenoxyacetic Acid Degradation*, 186 J. BACTERIOLOGY 7161-7174 (2004)
EX1047	A. Westendorf et al., *The Two Enantiospecific Dichlorprop/α-Ketoglutarate Dioxygenases from* Delftia acidovorans *MC1-Protein and Sequence*

Exhibit No.	Description
	Data of RdpA and SdpA, 157 MICROBIO. RES. 317-322 (2002)
EX1048	A. Westendorf et al., *Purification and Characterization of the Enantiospecific Dioxygenases from* Delftia acidovorans *MC1 Initiating the Degradation of Phenoxypropionate and Phenoxyacetate Herbicides*, 23 ACTA BIOTECHNOLOGICA 3-17 (2003)
EX1049	Public Version of Stipulation and Proposed Order for Leave to File First Amended Complaint and to Amend Scheduling Order, *Corteva Agriscience LLC v. Monsanto Co.*, No. 1:22-cv-1046-GBW (D. Del.), D.I. 66
EX1050	Public Version of First Amended Complaint, *Corteva Agriscience LLC v. Monsanto Co.*, No. 1:22-cv-1046-GBW (D. Del.), D.I. 68
EX1051	R.F. Krausz et al., *Soybean* (Glycine max) *Tolerance to 2,4-D Ester Applied Preplant*, 7 WEED TECH. 906-910 (1993)
EX1052	C.T. Larue et al., *Development of Enzymes for Robust Aryloxyphenoxypropionate and Synthetic Auxin Herbicide Tolerance Traits in Maize and Soybean Crop*, 75 PEST MGMT. SCI. 2086-2094 (2019)
EX1053	Admin. Office of the U.S. Courts, United States District Courts—National Judicial Caseload Profile, https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_appprofile0331.2023.pdf (Mar. 31, 2023)
EX1054	Declaration of Dr. Aron Silverstone, Ph.D.

Exhibit No.	**Description**
EX1055	Curriculum Vitae of Aron Silverstone, Ph.D.
EX1056	Joint Claim Construction Chart, *Corteva Agriscience LLC v. Monsanto Co.*, No. 1:22-cv-1046-GBW (D. Del.), D.I. 82
EX1057	OCLC WorldCat Search
EX1058	OCLC WorldCat Entry for R.E. Saari, Substrate Specificity and Spectroscopic Properties of 2,4-Dichlorophenoxyacetic Acid/α-Ketoglutarate Dioxygenase, Doctoral Thesis, Mich. State Univ. (July 6, 1998)
EX1059	OCLC FirstSearch Entry for R.E. Saari, Substrate Specificity and Spectroscopic Properties of 2,4-Dichlorophenoxyacetic Acid/α-Ketoglutarate Dioxygenase, Doctoral Thesis, Mich. State Univ. (July 6, 1998)
EX1060	R.E. Saari, Substrate Specificity and Spectroscopic Properties of 2,4-Dichlorophenoxyacetic Acid/α-Ketoglutarate Dioxygenase, Doctoral Thesis, Mich. State Univ. (July 6, 1998)
EX1061	Declaration of Mikel T. Strom
EX1062	*Finding Dissertations and Theses: Home*, MICH. STATE UNIV., https://libguides.lib.msu.edu/dissertations (accessed October 18, 2023)

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing Petition for *Inter Partes* Review contains 13,229 words excluding; a table of contents, a table of authorities, Mandatory Notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.

Date: November 15, 2023

/MacAulay Rush/
MacAulay Rush
Paralegal
WOLF, GREENFIELD & SACKS, P.C.

CERTIFICATE OF SERVICE UNDER 37 C.F.R. § 42.6 (E)(4)

I certify that on November 15, 2023, I will cause a copy of the foregoing document, including any exhibits or appendices filed therewith, to be served via Overnight FedEx at the following correspondence address of record for the patent:

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