

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BAYER CROPSCIENCE LP AND MONSANTO COMPANY,
Petitioners,

v.

CORTEVA AGRISCIENCE LLC,
Patent Owner.

IPR2023-01038
Patent 11,299,745 B2

Before MICHAEL J. FITZPATRICK, ROBERT A. POLLOCK, and
TIMOTHY G. MAJORS, *Administrative Patent Judges*.

MAJORS, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Bayer CropScience LP and Monsanto Company (collectively “Petitioner”) filed a Petition (Paper 2, “Pet”) requesting *inter partes* review of claims 1–29 of U.S. Patent No. 11,299,745 B2 (Ex. 1003, “the ’745 patent”). Pet. 1, 16. Corteva Agriscience LLC (“Patent Owner” or “Corteva”) filed a Preliminary Response (Paper 8, “Prelim. Resp.”). Petitioner also filed a Preliminary Reply (Paper 9) and Patent Owner filed a Preliminary Sur-reply (Paper 10) addressing 35 U.S.C. § 325(d).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless it is determined that there is a reasonable likelihood that the petitioner will prevail with respect to at least one of the claims challenged in the petition. Considering the parties’ arguments and evidence, for reasons explained below, we conclude that Petitioner shows a reasonable likelihood that it will prevail with respect to at least one of the ’745 patent’s challenged claims. We decline to deny the Petition on the basis of discretion under § 325(d). We institute an *inter partes* review on all challenged claims. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1355 (2018).

Findings and conclusions at this stage are preliminary and based on the current record. Any final decision will be based on a full trial record.

II. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies Bayer CropScience LP and Monsanto Company as real parties-in-interest. Pet. 3. Petitioner also states that counsel for Bayer Intellectual Property GmbH and Bayer U.S. LLC have been involved in this proceeding and that those Bayer entities are wholly-owned subsidiaries of Bayer AG. *Id.* Patent Owner identifies itself as the real party-in-interest. Paper 4, 1.

B. Related Matters

The parties identify the following lawsuit involving assertion of the '745 patent: *Corteva Agriscience LLC v. Monsanto Co.*, 22-cv-01046 (D. Del.); Pet. 4; Paper 4, 1.

The parties also identify related matters before the Board. Pet. 4; Paper 4, 1–2. Those matters include IPR2023-01036 and IPR2023-01037, in which Petitioner challenges, respectively, claims of U.S. Patent Nos. 10,947,555 (“the ’555 patent”) and 11,149,283 (“the ’283 patent”). Pet. 4; Paper 4, 1–2. The ’283 and ’745 patents issued from continuation applications to the application that issued as the ’555 patent. Ex. 1001 (’555 patent), code (63); Ex. 1002 (’283 patent) code (63).

The parties identify *Ex Parte* Reexamination Control No. 90/019,130, brought by a third-party requester (Inari Agriculture, Inc.) and involving the ’555 patent. Pet. 4; Paper 4, 2.

C. The ’745 Patent & Technology Background

The ’745 patent, titled “Herbicide Resistance Genes,” issued April 12, 2022. Ex. 1003, codes (45), (54). The application that matured into the ’745 patent was filed August 16, 2021, and claims the priority benefit of several earlier applications. *Id.* at codes (22), (63). Those applications include U.S. Application No. 15/288,406 (filed October 7, 2016, which issued as the ’555 patent), U.S. Application No. 11/587,893 (filed as PCT/US2005/014737 on May 2, 2005, and published as WO2005/107437¹ on November 17, 2005) and U.S. Provisional Application No. 60/567,052, filed April 30, 2004. *Id.*; Ex. 1021 (Corteva ’437), codes (22), (30), (43).

¹ The parties use different abbreviations for this publication, which is an asserted reference in this case: “Corteva ’437” (Petitioner) or “WO ’437” (Patent Owner). We use “Corteva ’437” in this Decision.

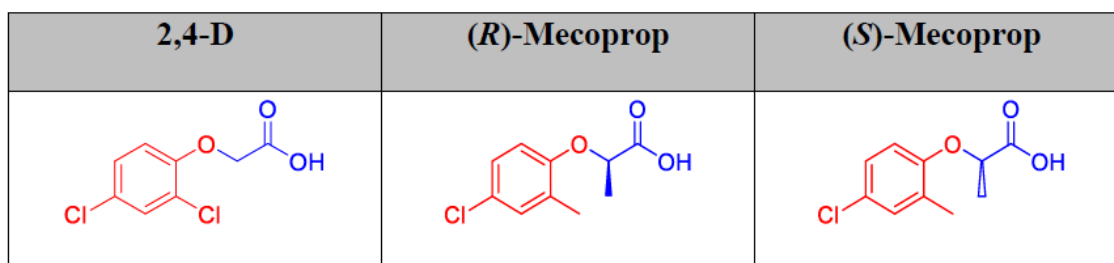
As explained in the '745 patent, “[w]eeds can quickly deplete soil of valuable nutrients needed by crops” and “many different types of herbicides” are “used for the control of weeds.” Ex. 1003, 1:37–40. “One extremely popular herbicide is glyphosate.” *Id.* at 1:40. The patent explains that crops such as corn and soybean have been developed that are resistant to glyphosate, allowing glyphosate-resistant crops to be sprayed for weed control without significantly damaging the crop plants. *Id.* at 1:41–45. With glyphosate’s extensive use over time, however, “glyphosate resistant weeds” have emerged, including weeds of the broadleaf (dicot) and grass (monocot) variety. *Id.* at 1:46–2:35.

According to the '745 patent, in areas with glyphosate resistant weeds, “growers can compensate for glyphosate’s weaknesses by tank mixing or alternating with other herbicides that will control the missed weeds.” *Id.* at 2:36–40. One popular herbicide is 2,4-dichlorophenoxyacetic acid (also known as “2,4-D”). *Id.* at 2:40–57 (noting 2,4-D’s use for “broadleaf weed control for more than 60 years,” but citing the sensitivity of broadleaf crops like soybean to 2,4-D as a “limitation” to its use); *see also id.* at 2:66–67 (“2,4-D has different levels of selectivity on certain plants (e.g., dicots are more sensitive than grasses).”), 2:59–63 (“2,4-D has been used in many monocot crops (such as corn, wheat, and rice) for the selective control of broadleaf weeds without severely damaging the desired crop plants.”).

As disclosed in the '745 patent, “2,4-D is in the phenoxy acid class of herbicides, as are MCPA, mecoprop, and dichlorprop.” *Id.* at 2:58–59. The patent describes these herbicides as part of a class called “phenoxy auxins.” *See, e.g., id.* at 3:65–67. According to the patent, “2,4-D is a synthetic auxin derivative that acts to deregulate normal cell-hormone homeostasis and impede balanced, controlled growth.” *Id.* at 2:62–65; Ex. 1054 ¶ 39

(testimony of Dr. Robert Hausinger) (“2,4-D is a widely used herbicide that acts by mimicking indolacetic acid, a naturally occurring plant growth hormone also known as an ‘auxin.’”).

As representative of the “phenoxy auxins,” the chemical structures of 2,4-D and mecoprop are depicted below.



Ex. 1054 ¶ 41; *see also* Ex. 1003, 8–11 (Table 1 (listing chemical name and structures for several phenoxy auxins)). The image above shows the structures of 2,4-D as well as two stereoisomeric or “enantiomeric” forms of mecoprop—(*R*)-Mecoprop and (*S*)-Mecoprop. Ex. 1054 ¶ 41. The image above, as highlighted by Dr. Hausinger, shows the sub-structures as including phenoxy (red) and carboxylic acid (blue) groups. *Id.* ¶¶ 41–42.

As Dr. Hausinger further explains, some phenoxy auxins exist as enantiomers—“pairs of compounds that are mirror-images of one another, like a right hand and a left hand,” also known as “chiral” compounds. *Id.* ¶ 40. This can be seen in the image above for mecoprop, with (*R*)-Mecoprop having a methyl (CH₃) group depicted as extending in front of the flat plane of the page (solid blue triangle); conversely, (*S*)-Mecoprop has a corresponding methyl group extending behind the plane of the page (hollow blue triangle). *Id.* The “(*R*)-enantiomers of these herbicides are herbicidally active, while the (*S*)-enantiomers are not.” *Id.* ¶ 41; *see also* Ex. 1003, 8:21–23 (describing the “*R*-enantiomers” as the “herbicidally active isomers” of

“the chiral phenoxy auxins”). In contrast to mecoprop and other phenoxy auxins, 2,4-D is not chiral. Ex. 1054 ¶¶ 41–42.

The ’745 patent discloses that various bacteria have developed an efficient pathway for degradation of 2,4-D. Ex. 1003, 3:9–3:15 (noting degradation results in the “complete mineralization of 2,4-D”). “One organism that has been extensively researched for its ability to degrade 2,4-D is *Ralstonia eutropha*” and the “gene that codes for the first enzymatic step in the mineralization pathway is *tfdA*.” *Id.* at 3:19–23. According to the patent, the enzyme encoded by this gene, “TfdA[,] catalyzes the conversion of 2,4-D acid to dichlorophenol (DCP) via an α -ketoglutarate-dependent dioxygenase^[2] reaction.” *Id.* at 3:21–30 (noting “TfdA has been used in transgenic plants to impart 2,4-D resistance in dicot plants (e.g., cotton and tobacco) normally sensitive to 2,4-D”).

Moreover, the ’745 patent discloses, “[a] large number of *tfdA*-type genes that encode proteins capable of degrading 2,4-D have been identified from the environment and deposited into the Genbank database.” *Id.* at 3:31–33. Some of these homologues, the patent explains, are “similar to *tfdA*, (>85 amino acid identity),” with similar properties; other homologues “have a significantly lower identity to *tfdA* (25-50%), yet have the characteristic [amino acid] residues associated with α -ketoglutarate

² Papers and evidence herein describe various enzymes (such as TfdA, RdpA, SdpA, and TauD) as being part of a α -ketoglutarate-dependent dioxygenase family or subfamily. *See, e.g.*, Prelim. Resp. 5–9 (citing evidence). As explained by Patent Owner, to degrade 2,4-D, such enzymes require the presence of iron (Fe(II)), oxygen (O₂) and α -ketoglutarate as a co-substrate. *Id.* at 6–7 (citing Ex. 2001, 24311, Fig. 11 (model of TfdA active site indicating potential roles for histidine residues)). As short-hand, we may refer to these enzymes as “ α KGD” enzymes or “ α KGD” dioxygenases in this Decision.

dioxygenase Fe^{+2} dioxygenases.” *Id.* at 3:36–39. According to the patent, “[i]t is therefore not obvious what the substrate specificities of these divergent dioxygenases are.” *Id.* at 3:39–41.

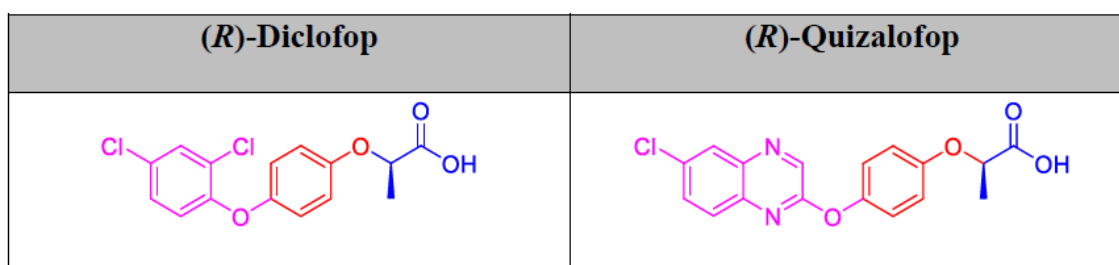
The ’745 patent discloses that one known gene with “low homology to *tfdA* (28% amino acid identity) is *rdpA*” from the bacterium *Sphingobium herbicidovorans*. *Id.* at 3:42–46. The patent explains that “[t]his enzyme has been shown to catalyze the first step in (R)-dichlorprop (and other (R)-phenoxypropionic acids) as well as 2,4-D (a phenoxyacetic acid) mineralization.” *Id.* Yet, the patent discloses, “[h]eterologous expression of *rdpA* in other microbes, or transformation of this gene into plants, has not heretofore been reported” and the “[l]iterature has focused primarily around close homologues of *tfdA* that primarily degrade achiral phenoxyacetic acids (e.g., 2,4-D).” *Id.* at 3:54–58.

The ’745 patent discloses that “[a]ryloxyalkanoate chemical substructures are a common entity of many commercialized herbicides.” Ex. 1003, 3:65–4:5. Those herbicides include phenoxy auxins (e.g., 2,4-D), pyridyloxy auxins (e.g., fluroxypyr), and aryloxyphenoxypropionates (“AOPP”) acetyl-coenzyme A carboxylase inhibitors (e.g., quizalofop), among others. *Id.* “However,” the patent states, “these classes of herbicides are all quite distinct, and no evidence exists in the current literature for common degradation pathways among these chemical classes.” *Id.* at 4:6–4:8. The patent states that “[d]iscovery of a multifunctional enzyme for the degradation of herbicides covering multiple modes would be both unique and valuable as an HTC [(herbicide-tolerant crop)] trait.” *Id.* at 4:8–4:11.

According to the ’745 patent, the invention relates to “novel plants that are not only resistant to 2,4-D, but also to AOPP herbicides.” Ex. 1003, 4:15–17. The patent states that, before the invention, “there was no

expectation or suggestion that a plant with both of these advantageous properties could be produced by the introduction of a single gene.” *Id.* at 4:16–18. More specifically, the patent explains, “the subject invention relates to the use of an enzyme that is capable of degrading both 2,4-D and AOPP herbicides, in an enantiospecific manner. No α -ketoglutarate-dependent dioxygenase enzyme has previously been reported to have the ability to degrade herbicides of different chemical classes and modes of action.” *Id.* at 4:53–58. The patent indicates that “[t]he preferred enzyme and gene for use according to the subject invention are referred to . . . as AAD-1 (AryloxyAlkanoate Dioxygenase).” *Id.* at 4:58–60. And, the patent states, “[t]here was no prior motivation to produce plants comprising the AAD-1 gene . . . and there was no expectation that such plants could effectively produce an AAD-1 enzyme to render the plants resistant to not only phenoxy acid herbicides (such as 2,4-D) but also AOPP herbicides (such as quizalofop, haloxyfop, et al.).” *Id.* at 4:63–5:3.

The chemical structure for illustrative AOPP herbicides, also called “FOP” herbicides, is shown below.



Ex. 1054 ¶ 42; *see also* Ex. 1003, 11–16 (Table 2 (providing names and structures for many AOPP herbicides)). The above image shows the structures for (R)-Diclofop and (R)-Quizalofop. Ex. 1054 ¶ 42. As highlighted by Dr. Hausinger, the two depicted FOPs include phenoxy (red) and carboxylic acid (blue) groups, similar to 2,4-D and mecoprop, discussed

above. *Id.* The FOPs, however, include additional aryloxy structures shown in purple. *Id.* The two depicted FOPs are chiral compounds—the (*R*)-enantiomers are shown above. “Similar to the chiral phenoxy auxins mecoprop and dichlorprop, the (*R*)-enantiomers” of FOP herbicides “are herbicidally active, while the (*S*)-enantiomers are not.” *Id.*

As a preferred version of its AAD-1 enzyme, the ’745 patent identifies AAD-1 (v1), which is SEQ ID NO: 9—the native amino acid sequence expressed by the *rdpA* gene of *S. herbicidovorans*. Ex. 1003, 7:6–8, 139–141 (sequence information). The patent also identifies two AAD-1 variants as SEQ ID NO: 10 (AAD-1 (v2)) and SEQ ID NO: 11 (AAD-1 (v3)). *Id.* at 7:9–13 (describing AAD-1 (v3) as a plant-optimized sequence). The sequences of AAD-1 (v2) and AAD-1 (v3) differ from AAD-1 (v1) by two and one amino acid(s), respectively. *See id.* at 141–145 (sequence listings for SEQ ID NO: 10 and SEQ ID NO: 11, noting differences from v1). The patent gives examples of *in vitro* and *in vivo* testing, including AAD-1 transformation in several plants and testing for expression of active protein and herbicidal tolerance. *See, e.g., id.* at 78:11–93:23 (Examples 7–9, related to transformations in maize/corn).

D. Illustrative Claims

Independent claim 1, reproduced below, is illustrative of the challenged claims. It reads:

1. A transgenic soybean plant cell comprising a recombinant polynucleotide that encodes an AAD-1 protein that exhibits aryloxyalkanoate dioxygenase activity wherein said activity enzymatically degrades a phenoxy auxin herbicide and an (*R*)-aryloxyphenoxypropionate herbicide, which are aryloxyalkanoate herbicides, 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) an AAD-1 motif having the general formula of:

HX₁₁₂D(X)₁₁₄₋₁₃₇T(X)₁₃₉₋₂₆₉H(X)₂₇₁₋₂₈₀R (SEQ ID NO: 34),
wherein

X₁₁₂ represents a single amino acid at position 112, relative to the sequence of SEQ ID NO: 9;
(X)₁₁₄₋₁₃₇ represents a sequence of 24 amino acids;
(X)₁₃₉₋₂₆₉ represents a sequence of 131 amino acids; and
(X)₂₇₁₋₂₈₀ represents a sequence of 10 amino acids,

wherein said AAD-1 protein when expressed in a soybean plant cell renders said soybean plant cell tolerant to a phenoxy auxin herbicide and an (R)-aryloxyphenoxypropionate herbicide as compared to an untransformed soybean plant cell.

Ex. 1003, 167:9–33 (reproduced with minor formatting changes).

Illustrating some of the dependent claims, claim 2 depends from claim 1 and adds “wherein said AAD-1 motif has the general formula of: HX₁₁₂D(X)₁₁₄₋₁₃₇T(X)₁₃₉₋₂₆₉H(X)₂₇₁₋₂₈₀R,(X)₂₈₂₋₂₈₄R (SEQ ID NO: 35), wherein (X)₂₈₂₋₂₈₄ represents a sequence of 3 amino acids.” *Id.* at 167:26–30.

Independent claim 29 is similar to claim 1 and further recites that the AAD-1 motif “has 90% sequence identity with corresponding amino acids of position 111 to 281 of SEQ ID NO: 9.” *Id.* at 168:51–169:9.

Before moving on, a brief discussion about “motif” terminology (as claimed and as discussed in the art) may be helpful.³ With the exception of “X,” the alphabetical letters represent *specific* amino acids. Ex. 1054 ¶¶ 49–

³ Dr. Hausinger provides a more detailed explanation about motif terminology as used with the claimed “AAD-1 motif” and a “consensus motif” for α-KGD dioxygenases discussed in the parties’ papers. Ex. 1054 ¶¶ 49–50, 63–66. The “consensus motif” is discussed in more detail below.

50. For example, “H” corresponds to histidine (His), “D” is aspartate (Asp), and “R” is arginine (Arg); a recitation of, for example, “D/E” would mean that the amino acid could be either aspartate or glutamate (Glu). *Id.* ¶ 49; *see also id.* ¶ 77 (noting the twenty naturally occurring amino acids). The letter “X” can be *any* amino acid. *Id.*

The numerical subscripts in a motif may refer to the *position* of the amino acid(s) within a sequence (or relative to some reference sequence), and this is how the subscripts are used in claim 1.⁴ So, for example, X₁₁₂ corresponds to an unspecified amino acid “X” at position 112 within the protein sequence of SEQ ID NO: 9, which is 295 amino acids long. *See* Ex. 1003, 139–141.

Alternatively, a motif may use subscripts to represent the *number* of amino acids within a segment of the motif. For example, for a motif reciting HX(D/E)X_{138–207}HX_{10–13}R, the terms X_{138–207} and X_{10–13} indicate a segment of the motif with between 138 to 207 unspecified amino acids and a subsequent segment with 10 to 13 unspecified amino acids. In this format, the position of motif amino acids within a broader consecutively-numbered amino acid sequence is not given. Ex. 1054 ¶¶ 49–50, 66 (testifying that this terminology “specifies a pattern of amino acids, but does not provide information about their positions”). And, in this example, it is clear that the

⁴ In related litigation, the parties appear to disagree whether the claimed subscripts require fixed positions for the motif amino acids of the AAD-1 protein or, instead, provide position reference points in SEQ ID NO: 9 for alignment with motif residues of the AAD-1 protein to determine the degree of sequence identity. Ex. 1056 (Jt. Claim Construction Chart). At present, we take no position on this question. The parties do not propose any claim construction here and it is not clear now that the claims must be further construed to resolve the dispute before us. *See infra* Section III(C).

subscripts relate to the number of amino acids rather than their positions because the second subscript range includes lower numbers (i.e., 10–13) compared to the first subscript range (i.e., 138–207).

E. Prosecution History

The parties’ arguments at this stage focus on events that took place during the prosecution of the related ’555 patent, which preceded the prosecution of the ’745 patent. The claims of the two patents are quite similar, except that the ’555 patent’s broadest claims are directed to transgenic “plant cell[s]” or “plants” while corresponding claims of the ’745 patent concern transgenic “soybean plant cell[s]” or “soybean plants.” *Compare* Ex. 1001, 165:2–19, 36–38, *with* Ex. 1003, 167:9–34, 38–41. Our summary of the relevant prosecution history below starts with the ’555 patent’s prosecution then moves to the more abbreviated prosecution of the ’745 patent.

1. Prosecution of the ’555 patent

On October 7, 2016, the applicant filed U.S. Application No. 15/288,406 (“the ’406 Application”), which later issued as the ’555 patent. Ex. 1008 (file history).

The ’406 Application was filed with a preliminary amendment that canceled claims 1–14, and added claims 15–48. Ex. 1008, 3, 5–10, 194–195

(original claims 1–14).⁵ Application claim 15 corresponds to issued claim 1 of the '555 patent, and its language is nearly identical. Ex. 1008, 5.⁶

In an Office Action dated November 13, 2018, the Examiner rejected the claims for, *inter alia*, lack of written description, anticipation based on Wright (the European counterpart of Corteva '437), and obviousness over Jepson (Ex. 1030) and Kohler (Ex. 1016). Ex. 1008, 267–278. The written description rejection (and similar priority date determination) related to the Examiner's finding that the Specification of the pending application (as well as the priority applications) did not adequately describe the newly claimed "AAD-1 motif." *Id.* at 270–271, 274–275. The Examiner found that the "instant specification refers to an α -ketoglutarate-dependent dioxygenase motif on page 17, paragraph 0085, but there is no description of a specific AAD-1 motif." *Id.* ("Applicant does not describe the claimed genus of AAD-1 proteins or the AAD-1 motif (in the specification)."). The Examiner also questioned the sufficiency of the Specification's description of the claimed AAD-1 protein "having at least 85% sequence identity" with SEQ ID NO: 9 because, the Examiner found, the applicant described AAD-1 (v1) (native RdpA/SEQ ID NO: 9) and only two variants "which are 98.8% and 99.7% identical" with SEQ ID NO: 9. *Id.* at 274–275.

An interview was held March 19, 2019, and is summarized in the prosecution record. *Id.* at 452. The Interview Summary states that a

⁵ Exhibit 1008 was submitted in nine parts. The pages of Exhibit 1008 include Bates numbering (e.g., COR-AAD1-00000005). We use a simplified citation format; for example, COR-AAD1-00000005 is cited as "Ex. 1008, 5," COR-AAD1-00000655 would be "Ex. 1008, 655," and so on.

⁶ Some of the subscripts in claim 15 were later amended to correct an apparent error. Ex. 1008, 481 (e.g., changing (X)₁₃₉₋₂₄₃ to read (X)₁₃₉₋₂₆₉, consistent with motif's "general formula" recited earlier in the claim).

correlation between the “general motif” and the “AAD-1 motif” was discussed, that applicant gave evidence in an “Attachment” about how applicant “modified [the] required amino acids in the AAD-1 motif, demonstrating that these amino acids are critical for maintaining the claimed function,” and that “[n]o agreement was reached concerning the ‘at least 85% sequence identity’ limitation.” *Id.*; *see also id.* at 455 (“Attachment” to interview summary; slide titled “AAD-Variants Verifying Motif Validity”).

On April 12, 2019, applicant filed a response to the rejections. With its response, applicant amended paragraph [0086] of the Specification. *Id.* at 480. That amendment is reproduced below with underlining showing text the applicant added, and we also include paragraph [0085] for context:

[0085] The subject invention relates in part to the identification of an enzyme that is not only able to degrade 2,4-D, but also surprisingly possesses novel properties, which distinguish the enzyme of the subject invention from previously known *tfdA* proteins, for example. Even though this enzyme has very low homology to *tfdA*, the genes of the subject invention can still be generally classified in the same overall family of α -ketoglutarate-dependent dioxygenases. This family of proteins is characterized by three conserved histidine residues in a “HX(D/E)X₂₃₋₂₆(T/S)X₁₁₄₋₁₈₃HX₁₀₋₁₃R” motif which comprises the active site. The histidines coordinate Fe⁺² ion in the active site that is essential for catalytic activity (Hogan *et al.*, 2000). The preliminary *in vitro* expression experiments discussed herein were tailored to help select for novel attributes.

[0086] More specifically, the subject invention relates in part to the use of an enzyme that is not only capable of degrading 2,4-D, but also AOPP herbicides. No α -ketoglutarate-dependent dioxygenase enzyme has previously been reported to have the ability to degrade herbicides of different chemical classes and modes of action. Preferred enzymes and genes for use according to the subject invention are referred to herein as AAD-1 (AryloxyAlkanoate Dioxygenase) genes and proteins. As

disclosed herein a peptide of SEQ ID NO: 9 is provided that is capable of degrading 2,4-D, and AOPP herbicides. 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 of HX₁₁₂D(X)₁₁₄₋₁₃₇T(X)₁₃₉₋₂₆₉H(X)₂₇₁₋₂₈₀R, wherein

X₁₁₂ represents a single amino acid at position 112, relative to the sequence of SEQ ID NO: 9;

(X)₁₁₄₋₁₃₇ represents a sequence of 24 amino acids;

(X)₁₃₉₋₂₆₉ represents a sequence of 131 amino acids; and

(X)₂₇₁₋₂₈₀ represents a sequence of 10 amino acids.

Id.

Applicant also responded with argument and evidence in an effort to traverse the written description and obviousness rejections. Ex. 1008, 486–494.⁷ Applicant argued it had “described the complete amino acid sequence of AryloxyAlkanoate Dioxygenase (AAD-1) proteins (SEQ ID Nos: 9, 10, and 11) that have been found to exhibit activity in degrading 2,4-D as well as AOPP herbicides” and had “derived a specific ‘AAD-1 motif.’” *Id.* at 486–487 (arguing the motif was derived by “mapping” SEQ ID NO: 9 to the disclosed α KGD dioxygenase motif). Applicant argued “[o]ne of ordinary skill in the art would know that the motif provided on page 17 in paragraph [0085] provides a roadmap to identify the corresponding positions in the AAD-1 proteins of SEQ ID Nos: 9, 10, and 11 to allow one to generate a ‘AAD-1 motif’” as claimed and “that is specific to the claimed genus of AAD-1 proteins.” *Id.* at 488–489 (arguing the claims were “narrowly tailored . . . by requiring the claimed peptides to comprise the functional element of the AAD-1 motif” (i.e., dual enzymatic degradation of phenoxy

⁷ Applicant also argued that, upon traversing the § 112 rejection, the claims would be entitled to an earlier priority date and, thus, the asserted anticipatory references would not be prior art. Ex. 1008, 493–494.

auxins and (R)-FOPs)). Applicant filed a declaration from named inventor Dr. Terry Wright, which addressed the claimed AAD-1 motif and described an experiment about the “importance and necessity” of the motif’s amino acid residues to the dual herbicide degradation activity. *Id.* at 463, 489; *id.* at 457–463 (“Wright I”), 472–474 (App’x III about testing of nine variants of AAD-1 v1). For obviousness, applicant argued, *inter alia*, that a rationale for selecting the *rdpA* gene (of Kohler) and substituting it for the *tfdA* gene (of Jepson) was missing from the pending rejection. *Id.* at 490–493. Moreover, applicant argued, the invention produces surprising results insofar as the AAD-1 enzymes degraded herbicides in two different classes and modes of action—phenoxy auxins and (R)-FOPs. *Id.*

On July 12, 2019, the Examiner entered a Final Office Action, maintaining, in substantial part, the Examiner’s prior reasoning for rejecting the claims. Ex. 1008, 496–515. The Examiner further determined that the “generic” α KGD dioxygenase motif “does not itself define a specific function” and the Specification “does not describe what structure in the AAD-1 motif provides the specific activity that degrades a phenoxy auxin and an (R)-aryloxyphenoxypionate herbicide.” *Id.* at 505. Moreover, the Examiner explained, applicant failed to describe adequately the variation within the broadly-claimed genus. *Id.* at 505–506.

Applicant filed a Request for Continued Examination, with accompanying argument and evidence. *See, e.g.*, Ex. 1008, 557–579. Applicant submitted a declaration from Dr. Satish Nair. *Id.* at 590–598. Dr. Nair testified that a skilled person “would readily envision a disclosed AAD-1 motif” from a mapping of the generic α KGD dioxygenase motif against SEQ ID NO: 9, and that the AAD-1 motif “is readily apparent” from the Specification and background knowledge. *Id.* at 593–594. Dr. Nair

cited an investigation of crystal structures for AAD-1 and AAD-2⁸ as validating the importance of the AAD-1 motif residues and their spacing for AAD-1's dual-enzymatic activity. *Id.* at 594–595 (citing Chekan, 2019 (Ex. 1019), published results of the investigation by Dr. Nair's laboratory).

On March 10, 2020, the Examiner again rejected the claims for lack of written description and for obviousness, raising similar points as discussed previously. Ex. 1008, 629–642 (withdrawing the § 102 rejections without substantive comment). Ex. 1008, 631. This Office Action prompted another interview and written response from the applicant. *Id.* at 650, 676–686.

In its September 9, 2020, response, applicant again argued that its claims were patentable. *Id.* at 676–686. Applicant argued that precedent did not support the written description rejection. *Id.* at 676–680 (citing, e.g., *Ajinomoto Co., Inc. v. ITC*, 932 F.3d 1342 (Fed. Cir. 2019)). Applicant argued it had disclosed common structural features for the genus claims, including the “AAD-1 motif” and SEQ ID NOs: 9, 10, and 11. *Id.* Moreover, applicant argued, citing a second declaration from Dr. Wright, that testing showed enzymes with the AAD-1 motif and “as low as 82% sequence identity” to SEQ ID NO: 9 exhibited 2,4-D and *R*-FOP degrading activity. *Id.* at 681–682 (citing testing of eight AAD-1 variant enzymes with sequence identities between 82–90%); *see also id.* at 655–670 (“Wright II”).

⁸ AAD-2 is another known protein, which the '555 patent states has 44% amino acid identity with TfdA. Ex. 1001, 111:9–112:41; *see also id.* at 6:66–67 (“SEQ ID NO: 13 is the amino acid sequence for AAD-2 (v1) protein”). Dr. Nair testified that AAD-2 has conserved amino acid residues within the general α KGD dioxygenase motif, but it is an (*S*)-specific enantiomer dioxygenase that does not degrade (*R*)-phenoxy auxins or (*R*)-FOPS. Ex. 1008, 594–595; Ex. 1001, 112:58–61 (citing data “that confirm that AAD-2 (v1) is specific for (*S*)-enantiomer substrates, in contrast to AAD-1 (v1) which is specific for (*R*)-enantiomers.”).

For obviousness, applicant argued there was no reason to combine Jepson and Kohler, and that unexpected results (dual-degradation activity) favored withdrawal of the rejection. *Id.* at 682–687.

On December 8, 2020, Examiner withdrew the written description and obviousness rejections. *Id.* at 3844. For written description, the Examiner cited applicant’s testing evidence that “demonstrated variants of instant SEQ ID NO: 9 produced by truncations of both the N and C termini that retain the claimed function and that would describe the variation within the genus.” *Id.*⁹ In withdrawing the obviousness rejection, Examiner cited “the ability of the AAD-1 gene to produce herbicide tolerance in a transgenic plant cell to two distinct types of herbicides.” *Id.*

2. Prosecution of the ’745 patent

On August 16, 2021, the applicant filed U.S. Application No. 17/403,476 (“the ’476 Application”), which later issued as the ’745 patent. Ex. 1011 (file history).

In an Office Action dated December 17, 2021, the Examiner rejected one of the pending claims for lack of written description. Ex. 1011, 5357–5360 (rejecting application claim 30). The Examiner found that such claim’s recitation of an amino acid sequence with “at least 85%, but less than 95% sequence identity with SEQ ID NO: 9” was not supported. *Id.* (noting also, in a section titled “Priority,” the application’s relatedness to earlier applications but finding it “adds disclosure not presented in the prior

⁹ On December 16, 2020, applicant responded that the “referenced variants contained amino acid modifications throughout their sequences (but outside of the recited AAD-1 motif)—not truncations at the C- and N- termini” as the Examiner had indicated. Ex. 1008, 3897 (citing *id.* at 650 (Interview Summary) and 660 (Wright II ¶ 18)).

applications” and suggesting the application be identified as a continuation-in-part); *see also id.* at 5325 (full text of application claim 30). The Examiner also entered rejections for obviousness (e.g., over Jepson and Kohler) like discussed above for the ’555 patent. *Id.* at 5360–5365.

Applicant filed an amendment and response dated January 12, 2022. *Id.* at 5422–5437. Applicant amended the Specification like it had done with the ’555 patent as explained above (i.e., adding the sentences about an “AAD-1 motif” allegedly revealed from a “mapping” to another motif). *Id.* at 5423–24 (amending paragraph 87). Applicant also amended another paragraph of the Specification, which paragraph had, in general, previously listed sequence identities from 49–99%. *Id.* at 5424 (amending paragraph 143). This further amendment added language reciting: “For example, in one embodiment an amino acid sequence is provided having at least 85%, but less than 95% sequence identity with SEQ ID NO: 9,” and also added the “general formula” for an “AAD-1 motif” like the other amended portion of the Specification. *Id.* Applicant then argued that the rejections should be withdrawn in view of, *inter alia*, the Specification’s disclosures and “surprising advantages” (i.e., degradation of 2,4-D and AOPP herbicides) with the claimed invention. *Id.* at 5430–54434.

In an interview dated January 31, 2022, the Examiner proposed canceling claim 30 “to expedite allowance of the remaining claims.” *Id.* at 5466 (Interview Summary). “Applicant’s attorney approved [that] cancellation.” *Id.*

A Notice of Allowance was entered February 15, 2022. *Id.* at 5439–5445. By an Examiner’s Amendment, claim 30 was canceled and the Examiner included no further substantive comment or specific reasons for allowing the claims. *Id.*

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–29 are unpatentable based on the following grounds:

Claims Challenged	35 U.S.C. § ¹⁰	References/Basis
1–29	102	Corteva ’437 ¹¹
1–29	103	Corteva ’437
1–6, 9–12, 29	103	Saari 1998, ¹² Saari 1999, ¹³ Schleinitz, ¹⁴ Streber ¹⁵
7, 8, 13–28	103	Saari 1998, Saari 1999, Schleinitz, Streber, Jepson ¹⁶

¹⁰ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. §§ 102, 103 effective March 16, 2013. Petitioner’s grounds based on Corteva ’437 assume that the claims have a priority date no earlier than October 7, 2016, in which case post-AIA §§ 102, 103 apply. Pet. 16–17. Petitioner’s other grounds assume a priority date of April 30, 2004, in which case pre-AIA §§ 102, 103 apply. *Id.*

¹¹ Wright et al., WO 2005/107437 A2, publ. Nov. 17, 2005 (Ex. 1021 (“Corteva ’437”)).

¹² R.E. Saari, *Substrate Specificity and Spectroscopic Properties of 2, 4-Dichlorophenoxyacetic Acid/α-Ketoglutarate Dioxygenase*, Doctoral Thesis, Mich. State Univ. (July 6, 1998) (Ex. 1040 (“Saari 1998”)).

¹³ R.E. Saari, et al., *Stereospecific Degradation of the Phenoxypropionate Herbicide Dichlorprop*, 6 J. Molecular Catalysis B: Enzymatic 421–428 (1999) (Ex. 1041 (“Saari 1999”)).

¹⁴ Accession No. AF516751, publ. Aug. 6, 2002 (Ex. 1013 (“Schleinitz”)).

¹⁵ Streber et al., US 6,153,401, issued Nov. 28, 2000 (Ex. 1043 (“Streber”)).

¹⁶ Jepson et al., US 2003/0041357 A1, publ. Feb. 27, 2003 (Ex. 1030 (“Jepson”)).

Petitioner submits testimony from Robert P. Hausinger, Ph.D., in support of its challenge. Ex. 1054 (Hausinger Decl.).

III. ANALYSIS

A. *Legal Standards*

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3)).

Whether claims are entitled to the priority benefit of an earlier effective filing date is based on disclosure of the invention “in the manner provided by section 112(a)” in a related and earlier-filed application. *See* 35 U.S.C. §§ 119(e), 120. “[A] patent’s claims are not entitled to an earlier priority date merely because the patentee claims priority. . . . Rather, for a patent’s claims to be entitled to an earlier priority date, the patentee must demonstrate that the claims meet the requirements of 35 U.S.C. § 120,” which include satisfying the written description requirement of § 112. *In re NTP, Inc.*, 654 F.3d 1268, 1276–77 (Fed. Cir. 2011) (citations omitted).

“The essence of the written description requirement is that a patent applicant, as part of the bargain with the public, must describe his or her invention so that the public will know what it is and that he or she has truly made the claimed invention.” *AbbVie Deutschland GmbH & Co. v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1298 (Fed. Cir. 2014). “[T]he test for sufficiency [of the written description requirement] is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date sought.” *Ariad Pharm., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (explaining that “the description must clearly

allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed”) (internal quotation marks omitted).

This “possession” test “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Id.* (noting that “[t]his inquiry, as we have long held, is a question of fact”). “[I]t is the specification itself that must demonstrate possession” and, although *in ipsius verbis* recitations are not required, “a description that merely renders the invention obvious does not satisfy the requirement.” *Id.* at 1352. Possession shown by evidence “outside of the specification is not enough.” *Id.* Indeed, “[b]ecause written description is determined as of the filing date . . . evidence of what one of ordinary skill in the art knew” after the filing date sought “cannot provide substantial evidence . . . that the [] claims were supported by adequate written description.” *Id.* at 1355; *Biogen Int’l GmbH v. Mylan Pharm., Inc.*, 18 F.4th 1333, 1342 (Fed. Cir. 2021) (“[E]vidence illuminating the state of the art subsequent to the priority date is not relevant to written description.”) (internal quotation marks omitted).

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the relevant art. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations of nonobviousness when presented. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Moreover, “[a]n obviousness determination requires finding both that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *CRFD Rsch., Inc. v. Matal*, 876 F.3d 1330, 1340 (Fed. Cir. 2017) (internal quotation marks and citation omitted).

B. Level of Ordinary Skill in the Art

In determining the level of skill in the art, we consider the problems encountered in the art, the art’s solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner proposes that 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 activity and substrate selectivity, as well as methods of evaluating those properties.” Pet. 18 (citing Ex. 1054 ¶ 29). Petitioner contends, “[t]he POSA would be able to apply these concepts to expression of enzymes in transgenic plant cells and plants and degradation of herbicides” and “[t]he 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.*

Patent Owner describes Petitioner’s proposed POSA level as “vague.” Prelim. Resp. 19. Patent Owner also contends the claims are “more broadly” directed to “transgenic plants and plant cells” and “methods of controlling

weeds,” and Patent Owner states that Dr. Hausinger “appears to have no meaningful background in these technical areas.” *Id.*

Patent Owner’s contentions are, at this stage, unavailing. Petitioner’s proposal could have been more specific, but it is not so lacking that the institution burden is unmet. It is reasonably clear that, in indicating that a POSA would have an advanced degree (like a Ph.D.) and years of experience in a “relevant discipline,” Petitioner is referring to the technical areas it cited previously, such as protein/enzyme biochemistry. Pet. 18. Petitioner’s definition does not ignore subject matter like “transgenic plants” because it states that the POSA would be able to apply key scientific concepts here (e.g., protein biochemistry, enzyme activity, and substrate selectivity) to such plants. Moreover, although Patent Owner complains about Petitioner’s POSA definition, it does not offer its own or explain why Petitioner’s challenge fails under any alternative definition.

At this stage, Patent Owner’s suggestion that Dr. Hausinger lacks relevant expertise or qualifications of at least a POSA is unpersuasive. The ’745 patent relies on Dr. Hausinger’s own prior work. *See, e.g.*, 1003, 18:49–53 (citing Hogan (Ex. 1027)), 50:51–55 (citing Fukumori (Ex. 2001)) (both references co-authored by Dr. Hausinger). Patent Owner also cites Dr. Hausinger’s work as evidencing what “skilled artisans” understood about the claimed and prior art technology, including α KGD dioxygenases, which is a focus of the parties’ arguments. *See, e.g.*, Prelim. Resp. 8 (“Thus, as reflected in Hogan and Hotopp [(co-authored by Dr. Hausinger)], skilled artisans understood the structure-function relationships of Group II α KG-dependent dioxygenases”); Ex. 1029 (Hotopp 2002)). During prosecution, Dr. Wright’s declaration relied on Dr. Hausinger’s research. *See, e.g.*, Ex. 1008, 462 (Wright I ¶ 13 (citing Hotopp)), 658 (Wright II

¶¶ 10–13 (describing the research in Hogan and Hotopp as that of “skilled artisans”)). And, Applicant’s other declarant, Dr. Nair, who testified about the POSA’s perspective at the time of the invention, appears to have academic and prior work history focused on chemistry, biochemistry, and enzymology without significant background in subjects like “controlling weeds” about which Patent Owner questions Dr. Hausinger’s qualifications. *See, e.g.*, Ex. 1008, 590–591.¹⁷

Patent Owner will have the chance to cross-examine Dr. Hausinger in this proceeding. If Patent Owner feels we should discount Dr. Hausinger’s testimony due to lack of qualifications, it may raise such argument in trial.

For now, we apply Petitioner’s proposed POSA level, with the clarifications noted above, which appears consistent with the level of skill shown in the prior art references of record. *See Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

C. Claim Construction

In *inter partes* review, we construe claims using the same claim construction standard used to construe claims in a civil action before the courts under 35 U.S.C. § 282(b), including construing claims in accordance with the ordinary and customary meaning as understood by the POSA and the patent’s prosecution history. 37 C.F.R. § 42.100(b). We need only construe terms that are in controversy and only as needed to resolve the matters in dispute. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019).

¹⁷ The closest work we see from Dr. Nair related to herbicide resistant transgenic plants is his 2019 paper co-written with the applicant’s employees (e.g., Dr. Wright), which paper appears to be a follow-on investigation into the AAD-1 proteins of the patent. Ex. 1008, 594–595; Ex. 1019, Abstr.

Neither party proposes any express claim construction for this proceeding. Pet. 17; Prelim. Resp. 20. It is not apparent at this stage that any terms need further interpretation to resolve the matters in dispute.¹⁸

D. The Corteva '437 Grounds (Grounds IA & IB)

Petitioner argues that, if the priority date of the challenged claims is no earlier than October 7, 2016, Corteva '437 is prior art that anticipates and renders obvious those claims.¹⁹ Pet. 17, 23–41 (priority analysis)²⁰; 41–55 (anticipation and obviousness analysis).

Patent Owner's counterargument to the Corteva '437 grounds is at this time limited to the priority issue (i.e., whether the claims are entitled to an earlier priority date that forbids use of Corteva '437 as prior art). Prelim. Resp. 20–41.

¹⁸ Patent Owner states that the district court has now construed the claims in the parallel litigation. Prelim. Resp. 20 n.4. We have considered the district court's order and supporting memorandum, now added to the record (Exs. 3003 and 3004), which does not change our decision at this stage. *See* PTAB Consolidated Trial Practice Guide at 49 (Nov. 2019) ("The Board also will consider . . . any prior claim construction determinations from the federal courts and ITC that have timely been made of record, before entering a final written decision that sets forth the final claim construction determination.").

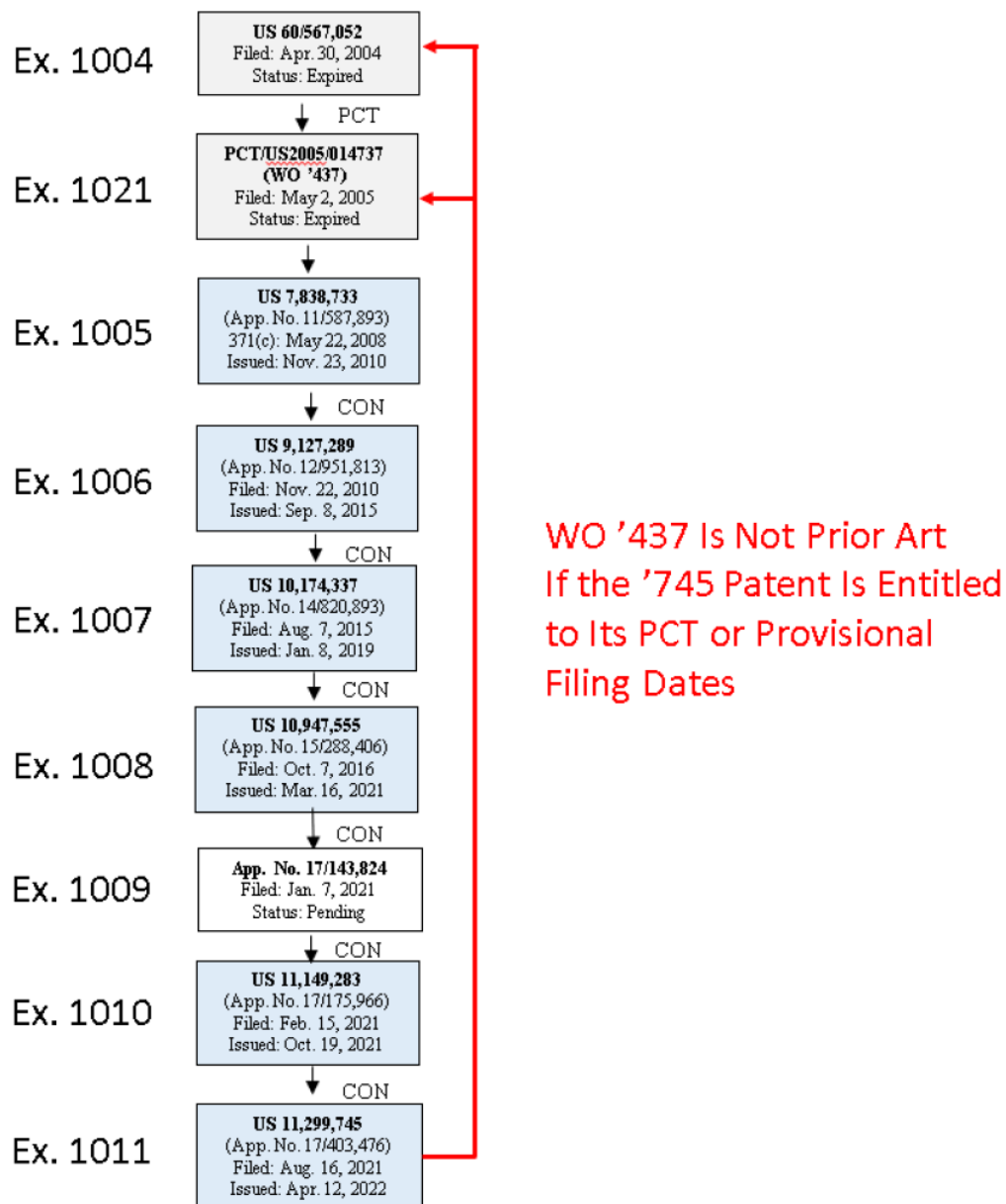
¹⁹ For Grounds IA and IB, asserting Corteva '437, Petitioner's papers refer to both October 7, 2016, and October 17, 2016, as the earliest priority date for the challenged claims. *See, e.g.*, Pet. 17 (Oct. 7), 23 (Oct. 17); *see also* Ex. 1054 ¶ 60 (Oct. 7). The reference to October 17, 2016, appears to be an error, which, in any event, would not change the analysis here.

²⁰ Petitioner's arguments about priority center on whether the claimed genus lacks adequate written description support in the priority applications, and Petitioner raises no argument based on lack of enablement. Prelim. Resp. 22 (noting Petitioner "do[es] not dispute enablement" in its papers). We express no opinion herein on whether the priority applications enable the subject matter of the challenged claims.

1. Priority Date of the Challenged Claims

“In order to gain the benefit of the filing date of the earlier application . . . each application in the chain leading back to the earlier application must comply with the written description requirement.” *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571 (Fed. Cir. 1997).

The image below is a family tree and asserted priority chain for the '745 patent.



Prelim. Resp. 21 (Patent Owner’s annotated family tree for the ’745 patent). The image above shows the ’745 patent at the bottom and the earlier-filed applications to which the ’745 patent claims priority in a sequential chain above it. At the top is U.S. Provisional Application No. 60/567,052 (Ex. 1004 (“’052 Provisional”)), filed April 30, 2004, and below the ’052 Provisional is PCT application, PCT/US2005/014737, filed May 2, 2005, which claims priority to the ’052 Provisional and which published as Corteva ’437 (Ex. 1021). There are six intervening applications shown between the PCT application and the ’745 patent—the national stage entry of the PCT application (Ex. 1005) and five continuation applications (Exs. 1006–1010). Patent Owner contends, and for purposes of this Decision we agree, if the ’745 patent’s challenged claims are entitled to priority to the PCT application (filed in 2005) or the ’052 Provisional (filed in 2004), then Corteva ’437 is not prior art. Prelim. Resp. 20–21. The parties do not identify additional, distinct disclosures (or lack thereof) in the intervening applications that affect the priority analysis. Thus, the question here distills to whether the challenged claims have written description support in the PCT application (i.e., Corteva ’437).²¹

Petitioner argues that the challenged claims are not supported by written description in the priority applications. Pet. 23–41. Some of Petitioner’s arguments address whether there is a literal or otherwise sufficient description of the “AAD-1 motif” and the “at least 85% sequence

²¹ Petitioner’s priority analysis cites paragraphs from the ’052 Provisional (Ex. 1004) and paragraphs in the intervening applications in group citation format (e.g., Exs. 1005–1007). *See, e.g.*, Pet. 25, 30. Exhibit 1005 is the national stage entry of the PCT application and its disclosures are materially identical to the corresponding disclosures in Corteva ’437 (Ex. 1021). We refer to the applications collectively as “the priority applications.”

identity” limitations in the priority applications. *See id.* at 24–29, 38–40. Petitioner also argues that the priority applications provide insufficient written description support for the broad genus that is claimed due to lack of adequate disclosure of representative species or structural features common to the members of the genus. *Id.* at 30–38. Petitioner contends the above failings cannot be cured by the extrinsic, post-priority date evidence that applicant filed during prosecution of the predecessor ’406 Application (i.e., the ’555 patent) because it is the disclosure within the four corners of the priority applications that counts. *Id.* at 31–40.

For organizational convenience, we address Petitioner’s argument and Patent Owner’s rebuttal in more detail in the two subsections below. There is, however, some overlap between the subsections based on the manner in which the parties’ presented the issues.

a) “AAD-1 motif” and “at least 85% sequence identity”

Petitioner argues that the priority applications “do not *disclose* the claimed AAD-1 motifs” as recited in the claims. Pet. 25–26. Instead, Petitioner contends, each of the priority applications refers to “a broader prior-art motif” characteristic of an “overall family” of α KGD dioxygenases, which motif is “HX(D/E)_{X23-26}(T/S)_{X114-183}HX₁₀₋₁₃R.” *Id.* (citing, e.g., Ex. 1005 [0085]); Ex. 1054 ¶¶ 64–70, 489 (testifying, *inter alia*, that the earlier applications disclosed “the same generic consensus motif” for α KGD enzymes “already known and published in the prior art”).

Relative to the “AAD-1 motif” of claim 1, which is HX₁₁₂D(X)₁₁₄₋₁₃₇T(X)₁₃₉₋₂₆₉H(X)₂₇₁₋₂₈₀R, Petitioner points out several differences from the prior-art consensus motif. Pet. 25–26. For example, Petitioner contends the consensus motif permits the series of unspecified (“X”) amino acids to vary in length yet the AAD-1 motif requires specific numbers of the unspecified

amino acids. *Id.* (noting, for example, X₂₃₋₂₆ in the consensus motif allows between 23 to 26 amino acids and X₁₁₄₋₁₃₇ (with subscripts reflecting *position* information) requires exactly 24 amino acids); Ex. 1054 ¶¶ 65–66; *see supra* Section II(D) (discussing differences in “motif” terminology). Moreover, Petitioner notes, the consensus motif permits some amino acid selections (D/E) and (T/S) that are prohibited in the motif of claim 1. Pet. 25–26 (citing Ex. 1054 ¶ 67). Petitioner also contends that many proteins that have the consensus motif amino acids do not have the claimed functional activity against both phenoxy auxins and (*R*)-FOPs—a point applicant emphasized during prosecution of the ’555 patent. *Id.* at 26 (citing Ex. 1054 ¶¶ 64, 100–101, 489, 491); *see, e.g.*, Ex. 1008, 487, 491–492.

Further to its argument about a lack of support in the earlier applications, Petitioner contends applicant only later amended a paragraph of the ’555 patent’s Specification, introducing the “AAD-1 motif” term. Pet. 27–28 (citing Ex. 1008, 480). According to the amended Specification, “[m]apping the α -ketoglutarate-dependent dioxygenase motif . . . to the sequence of SEQ ID NO: 9 reveals the AAD-1 motif of HX₁₁₂D(X)₁₁₄₋₁₃₇T(X)₁₃₉₋₂₆₉H(X)₂₇₁₋₂₈₀R.” Ex. 1008, 480; Ex. 1001, 18:10–28; *see supra* Section II(E) (reproducing full amendment); *see also* Ex. 1003, 18:64–19:5 (similar amended language appearing in the ’745 patent’s Specification). Before that addition, Petitioner contends, the Specification of the patent and its priority applications disclosed the sequences of three AAD-1 proteins (SEQ ID NOs: 9, 10, 11) but “not a genus of proteins characterized by an AAD-1 motif.” Pet. 27–29 (citing, *e.g.*, Ex. 1054 ¶¶ 94–95). That SEQ ID NO: 9 (*i.e.*, RdpA) is a member of the α KGD enzyme family and has amino acid residues within the scope of the α KGD consensus motif was already known in the art, Petitioner contends. *Id.* Thus, Petitioner argues, an

alleged “mapping” to a prior art consensus motif provides essentially no new information that would define a new and allegedly functionally-distinct genus of “AAD-1” proteins, much less a disclosure that “reveal[s] 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.” *Id.*

Patent Owner responds that Petitioner fails to show a lack of description of the AAD-1 motif. Prelim. Resp. 23–27. Patent Owner contends the priority applications disclosed SEQ ID NO: 9 and where to identify active site motif residues. *Id.* (citing Ex. 1005 ¶¶ 50, 85). Patent Owner contends that its prosecution declarant testified that there is only one fit for the α KGD motif in SEQ ID NO: 9 and that Petitioner’s declarant concedes a POSA would have recognized the same. *Id.* (citing Ex. 1008, 594, ¶ 9 (Nair testifying the mapping would have been “readily apparent”), Ex. 1054 ¶ 95 (Hausinger testifying that “prior art already taught[] that RdpA shares the canonical active site residues characteristic of α KG dioxygenases”)). Patent Owner contends that there is no need for *in ipsi* *verbis* description of the AAD-1 motif in the priority applications, and that Petitioner ignores a POSA’s background knowledge. Prelim. Resp. at 25–28. Lastly, Patent Owner contends Petitioner’s argument about the amendment of the Specification is misplaced because the applicant was simply responding to the Examiner’s objection that the claimed “AAD-1 motif” lacked antecedent basis. *Id.* at 27–28 (citing the Examiner’s objection under MPEP § 608.01(o)); Ex. 1008, 271, 480, 488; *see also* Prelim. Resp. 27 (asserting “Patent Owner . . . properly carried the amendment forward in prosecution of the ’745 patent”).

Based on the preliminary record, there appears to be no literal description of the “AAD-1 motif” in the priority applications. *See, e.g.*, Ex. 1005 ¶ 85; Ex. 1021 ¶ 85. The law, however, does not require claim language appear *in ipso verbis* in the specification. *Ariad*, 598 F.3d at 1352. The issue thus turns to the sufficiency of other disclosures in the priority applications and whether the POSA would have reasonably understood the inventors’ possession of the claimed “AAD-1 motif” from those disclosures. For reasons discussed below, we have doubts on the present record.

Patent Owner identifies the priority applications’ disclosure of SEQ ID NO: 9 and, allegedly, “where to identify the active site motif residues” in proteins like RdpA. Prelim. Resp. 23 (citing Ex. 1021 ¶ 85). Patent Owner’s cited disclosure at paragraph 85, however, identifies the known α KGD enzyme family’s consensus motif. Ex. 1054 ¶¶ 64–70. It does not identify a new active site “motif” for a newly-coined subgenus of Aryloxy Alkanolate Dioxygenase “AAD-1” enzymes with a newly claimed ability to degrade herbicides in different chemical classes, including (*R*)-FOPs. *Id.* ¶¶ 73–75, 92–95 (“Nothing in the specification identifies the residues that correspond to the claimed activity.”).

Even accepting the “mapping” premise—that a POSA could map the prior art motif to SEQ ID NO: 9—it is unclear how this “reveals the AAD-1 motif.” Ex. 1003, 18:61–19:5 (using the “mapping” language added to the ’555 and ’745 patents’ shared Specification, which is absent in the priority applications).²² Instead, we find persuasive at this stage Dr. Hausinger’s

²² Contrary to Patent Owner’s contention that argument on the amended Specification is misplaced, the amendment does highlight language about a supposed revelatory connection between the α KDG motif and the AAD-1 motif that is altogether missing in the priority applications. Prelim. Resp.

testimony that such a mapping would only confirm what was already taught in the art; that is, the known RdpA (SEQ ID NO: 9) enzyme shares canonical active site residues characteristic of α KGD dioxygenases. Ex. 1054 ¶¶ 95 (testifying that the “mapping” premise “incorrectly conflate[s] the ‘active site’ residues that are identified by the generic consensus of α KG motif with residues responsible for the [claimed] stereoselective activity . . . (R)-enantioselective activity against chiral phenoxy auxins and aryloxyphenoxypropionate herbicides”). We also question whether a “mapping” that purports to describe something new and unique about a structure-function relationship defined by an AAD-1 motif raises potential obviousness issues that fall short of what is needed. *Lockwood*, 107 F.3d at 1571–72 (“Entitlement to a filing date [for priority] does not extend to subject matter which is not disclosed, but would be obvious over what is expressly disclosed.”); *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1310 (Fed. Cir. 2008) (“Obviousness simply is not enough; the subject matter must be disclosed to establish possession.”).

The written description support for challenged claim 2 is also questionable for the reasons above, and more. Claim 2 modifies claim 1’s “AAD-1 motif” by adding an “(X)₂₈₂₋₂₈₄R” suffix. Ex. 1003, 167:34–37. The consensus α KGD motif recited in the priority applications omits any information corresponding to those added residues. Ex. 1054 ¶¶ 68, 96. Thus, even had the aforementioned “mapping” been known, suggested, or

27–28. Patent Owner’s effort to downplay the amendment as only relating to an examiner’s objection is unavailing because that objection, like the rejection for lack of written description and priority determination were all rooted in a finding that there was no descriptive support in the shared specification for the “AAD-1 motif.” Ex. 1008, 270–271, 274–275.

appeared in the priority applications, there is no “mapping” of that α KGD motif that could reveal three additional un-specified amino acids ($X_{282-284}$) followed by another arginine residue (“R”) as part of the AAD-1 motif.

Patent Owner raises two counterpoints. First, Patent Owner contends that SEQ ID NO: 9 includes the additional arginine residue, which appears in the claim 2 motif. Prelim. Resp. 26. That is true but unavailing. Ex. 1003, 141 (sequence showing residue 285 is “Arg”). SEQ ID NO: 9 includes 295 amino acid residues and the arginine at position 285 is not identified as part of the consensus α KGD motif, or any motif for that matter, in the priority applications. Ex. 1054 ¶ 96. Indeed, it is not identified as significant in the priority applications in any way—it is simply one of hundreds of others that appear in SEQ ID NO: 9 to which the disclosure calls no special attention. *Id.* We see no basis on this record to find that the priority applications reasonably convey to the POSA that the subject arginine in an $(X)_{282-284}R$ subsequence is part of the claimed “AAD-1 motif.” *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000) (“[O]ne skilled in the art, reading the original disclosure, must immediately discern the limitation at issue in the claims.”).

Second, Patent Owner argues that background knowledge is, by law, relevant to the written description inquiry. Prelim. Resp. 26–27. And, Patent Owner contends the skilled artisan would have recognized the importance of the subject arginine residue in claim 2’s motif. *Id.* (citing Hotopp 2002 (Ex. 1029)); *see also id.* at 8 (asserting Hotopp identified additional amino acids in TfdA, including R_{274} , believed to bind the α -KG co-substrate).

We do not disagree with Patent Owner’s contention on the law, only its application on the existing factual record. The POSA’s perspective is key

to the written description inquiry and many factors may inform the adequacy of a specification's disclosure, including existing knowledge in the field and the content of the prior art. *See Ariad*, 598 F.3d at 1351. Where gap-filling of the disclosure with the prior art's teachings is involved, however, the Federal Circuit has been careful to limit such gap-filling to information that is *well-known in the art*. *See, e.g., Boston Scientific Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1366 (Fed. Cir. 2011) (“[I]n some circumstances, a patentee may rely on information that is ‘well-known in the art’ for purposes of meeting the written description requirement.”) (quoting *Falko-Gunter Falkner v. Inglis*, 448 F.3d 1357, 1366–68 (Fed. Cir. 2006)).

There is no evidence that an AAD-1 motif with an (X)₂₈₂₋₂₈₄R sub-segment was well-known in the art. It seems Patent Owner was the first to use the “AAD-1” and “AAD-1 motif” terms so we doubt that evidence exists. We also cannot say on this record that Hotopp's research into possible roles of other amino acids including an arginine at position 274 in the α KGD enzyme TfdA—not RdpA (SEQ ID NO: 9)—qualifies as “well-known” as of the priority date sought by Patent Owner. The Hotopp paper is mentioned nowhere in the disclosure of the priority applications despite a listing of references spanning seven pages. Ex. 1021, 152–158. At best, applicant cited Hotopp in 2019 during the '555 patent's prosecution after the X₂₈₂₋₂₈₄R motif sub-segment was first added to a claim by amendment; and Patent Owner cites it now. Prelim. Resp. 26 (citing Ex. 1029); Ex. 1008, 462 ¶ 13 (Dr. Wright, citing Hotopp's paper and an asserted “analogous arginine,” and testifying that an R285 residue (i.e., in the AAD-1 motif of claim 2) “was considered [by the inventors] to be potentially involved in a

similar role in aryloxyalkanoate herbicide binding in AAD-1”).²³ Insofar as Hotopp indicates R274 may be important, Patent Owner points to no evidence showing that skilled artisans had, by 2004 or 2005, changed the definition of the consensus motif for the α KGD family of enzymes to account for it. To the contrary, the patent’s priority applications, filed after Hotopp, omitted any reference to an α KGD motif that included such additional arginine residue. *See, e.g.*, Ex. 1004 ¶ 59 (identifying only the consensus α KGD motif from above); Ex. 1021 ¶ 85 (same); Exs. 1005–1007 ¶ 85 (same). This record might suggest it would have been *obvious* to redefine the motif to include an (X)₂₈₂₋₂₈₄R portion. Obviousness is not enough. *PowerOasis*, 522 F.3d at 1310.

The questions above are best resolved on a full evidentiary record developed through trial. At present, however, we find Petitioner has met its threshold burden and we determine that Petitioner is reasonably likely to succeed on the issue of whether the priority applications provide sufficient written description for the “AAD-1 motif” as claimed.

Next, we turn to the requirement that the claimed AAD-1 protein comprises “an amino acid sequence having at least 85% sequence identity with SEQ ID NO: 9.” *See, e.g.*, Ex. 1003, 167:16–17 (claim 1).

Petitioner argues that the priority applications fail to support AAD-1 proteins “having at least 85% sequence identity with SEQ ID NO: 9.” Pet. 38–39. According to Petitioner, there are only three examples of

²³ As we discuss below, it is only in testing that applicant submitted during the ’555 patent’s prosecution that applicant purports to have shown that an arginine at position 285 is “critical” to degradation of (R)-FOPs. Ex. 1008, 452, 455. Yet this evidence came roughly fourteen years after the priority date to which Patent Owner contends the claims are entitled.

AAD-1 proteins described: AAD-1 v1 (SEQ ID NO: 9), and two minor variants (AAD-1 v2 and v3) that differ by two and one amino acid(s), respectively. *Id.* (citing Ex. 1008, 487). Thus, Petitioner argues, the AAD-1 proteins described are no less than 99.3% identical, “lack[ing] the diversity needed to support the claims.” *Id.* (citing Ex. 1054 ¶¶ 76–86). Petitioner, acknowledging other disclosure listing sequence identity values ranging from 49% to 99%, argues that such “laundry list” recitations are generic and insufficient. *Id.* at 39 (citing Ex. 1005 ¶ 142). Petitioner contends that data filed during the ’555 patent’s prosecution is outside the priority applications’ disclosures and cannot establish possession of the full scope of the invention at the 2004/2005 priority date sought by Patent Owner. *Id.* at 39–40 (citing Dr. Wright’s examples purporting to show protein variants having ~ 82–95% identity to SEQ ID NO: 9 retained the claimed activity); Ex. 1008, 462–463, 472–473, 660–661, 661. Moreover, Petitioner contends, applicant did not submit the actual sequence information for the variants it tested during prosecution and, even had applicant done so, the limited examples would not support the claim breadth—encompassing at least 20⁴⁴ different proteins. Pet. 40; Ex. 1054 ¶¶ 79, 110, 491.²⁴

Patent Owner responds that the priority applications disclose that preferred proteins of the invention may have 85% sequence identity (or higher) and have the same or similar activity. Prelim. Resp. 28 (citing, e.g., Ex. 1005 ¶ 142). According to Patent Owner, the priority applications

²⁴ Dr. Hausinger explains that 20⁴⁴ variant proteins is a lower-bound numerical estimate, reflecting a protein that is 295 amino acids long where an 85% sequence identity limitation would permit up to 44 substitutions with any of the twenty naturally occurring amino acids at unspecified positions within the longer amino acid chain. Ex. 1054 ¶¶ 78–79.

disclose that 85% sequence identity among α KGD dioxygenases is considered “highly identical,” and that sequences having “high homology would be expected to retain similar properties.” *Id.* at 28–29 (citing, e.g., Ex. 1005 ¶ 171). Patent Owner contends that, given the express disclosures in the priority applications, the Board should reject Petitioner’s “laundry-list” theory, like other panels and courts have done under analogous circumstances. *Id.* at 29 (citing, e.g., *Lifescan Glob. Corp. v. Ikeda Food Rsch., Ltd.*, PGR2019-00032, Paper 11, 25 (PTAB Aug. 15, 2019)). For similar reasons, Patent Owner argues that we should reject Petitioner’s challenge as improperly focused on “numerosity” of the proteins that are encompassed by the claims. *Id.* at 36–41.

There is at least some literal descriptive support in the priority applications for AAD-1 proteins having at least 85% sequence identity. There is no dispute that AAD-1 v1 (SEQ ID NO: 9) and its variants (AAD-1 v2 and v3) would be understood as the “exemplary” AAD-1 proteins. *See, e.g.*, Ex. 1041 ¶¶ 50–52, 207–217 (Example 4, testing with AAD-1 v1). The priority applications also disclose that, although certain “exemplary” proteins are shown, “it should be readily apparent that the subject invention comprises variant or equivalent proteins” that “will have amino acid similarity (and/or homology) with exemplified proteins.” Ex. 1021 ¶ 142. This disclosure continues: “The amino acid identity [with the exemplified proteins] will typically be at least 60%, . . . more preferably at least 80%, even more preferably at least 90%, and can be at least 95%.” *Id.* Continuing further, the applications disclose, “the identity and/or similarity can be 49, 50, 51, . . . **85**, 86, 87, . . . 97, 98, or 99% as compared to a sequence exemplified or suggested herein.” *Id.* (emphasis added). Although this listing is broad, a disclosure of an AAD-1 protein with at least 85%

sequence identity can be reasonably pieced together without further blaze marks. That does not end the inquiry, however, because, just as literal language is not necessary to satisfy the written description requirement, literal language is not necessarily sufficient to meet the requirement. *Enzo Biochem., Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 968 (Fed. Cir. 2002) (rejecting “argument that the written description requirement . . . is necessarily met as a matter of law because the claim language appears *in ipsius verbis* in the specification”).

We agree with Petitioner that the genus of AAD-1 proteins encompassed by the “at least 85% sequence identity limitation” is vast. It is uncontested that it includes at least 20⁴⁴ permutations. Ex. 1054 ¶ 79. The claim scope is, therefore, massive while the disclosure alleged to objectively demonstrate possession of that full scope appears, on this record, to be comparatively narrow. The priority applications expressly describe only three nearly-identical AAD-1 variants (with $\geq 99\%$ similarity) within that “massive” scope that have the claimed enzymatic activity against both phenoxy auxins and (*R*)-FOPs. *Id.* ¶¶ 76, 81–86 (“The POSA would recognize that changing two amino acid residues, as in v2, cannot begin to represent the degree of amino acid sequence variation allowed in the claimed genera of AAD-1 proteins.”). It is, of course, not necessary for applicant’s disclosure to have actually shown that every variant protein works, but the disclosure must adequately support the breadth of the claimed genus. *Capon v. Eshhar*, 418 F.3d 1349, 1359 (Fed. Cir. 2005) (“It is not necessary that every permutation within a generally operable invention be effective in order for an inventor to obtain a generic claim, provided that the effect is sufficiently demonstrated to characterize a generic invention.”).

Patent Owner points to the priority applications' disclosure about proteins with $\geq 85\%$ sequence identity being characterized as "highly identical" and having similar properties. Prelim. Resp. 3, 10, 28 (citing 1021 ¶ 171); *see also* Ex. 1021 ¶ 12 ("Many homologues are similar to *tfdA* (>85% amino acid identity) and have similar enzymatic properties to *tfdA*."). The cited disclosure further states that "[t]raditionally only sequences with high homology would be expected to retain similar properties to the input sequence." Ex. 1021 ¶ 171. Some context is, however, appropriate. These disclosures are not specifically about RdpA (SEQ ID NO: 9) or sequences with at least 85% sequence identity to that protein retaining the dual herbicide degradation property that is claimed; the disclosure appears to be about TfdA. *Id.* The disclosure, in fact, describes how, in identifying the *rdpA* gene from a database, the inventors did not look for high homology genes for their further investigation and plant transformations, and instead chose sequences with less than 50% homology relative to *tfdA*. *Id.* ¶¶ 171–172 (disclosing that RdpA has only 28% amino acid homology with TfdA).

Inasmuch as Patent Owner is suggesting that the disclosure announces a more universal principle for all the proteins including not just TfdA, but RdpA too—that is, if at least 85% amino acid identity, the POSA would expect the same properties—this would benefit from further evidentiary development at trial. In this vein, the parties should consider addressing evidence here about TfdA homologues sharing higher levels of identity that appear to have *different* properties. *See* Ex. 1041, 421, 427 (describing a TfdA-like protein from *A. denitrificans* with 86% and 95% amino acid identity to two other TfdA proteins but exhibiting opposite stereoselective degradation activities). *Capon*, 418 F.3d at 1360 ("The predictability or unpredictability of the science is relevant to deciding how much

experimental support is required to adequately describe the scope of an invention.”); Ex. 1054 ¶¶ 89–91 (testifying about unpredictability in the art and how POSAs believed, for example, that even a few changes to the amino acid sequence could correspond to opposite stereoselectivities).

The test results submitted by applicant during prosecution of the ’555 patent concerning the “at least 85% sequence identity” limitation do not weigh in Patent Owner’s favor on the priority issue. *See, e.g.*, Ex. 1008, 660–661, 670. Petitioner argues that these post-priority results are nowhere within the priority applications’ disclosures and, thus, are irrelevant. Pet. 31, 39–40. Patent Owner provides no argument otherwise. At this stage, we agree with Petitioner. The results were filed in 2020 and it is unclear how these seemingly later-generated results could establish the inventors’ possession of the claimed subject matter in 2004 or 2005. *See Biogen*, 18 F.4th at 1343 (affirming invalidity, explaining, “[t]hat *Biogen later* established the therapeutic efficacy of DMF480^[25] is of no import to the written-description analysis”) (emphasis added).²⁶

²⁵ As the *Biogen* court explained, “[t]he DMF480 dose [was] listed only once in the entire specification . . . [as] part of a wide DMF dosage range,” and without independent disclosure that it was therapeutically effective. *Biogen*, 18 F.4th at 1343–44 (“What matters for purposes of the inquiry . . . is whether, at the time of filing the disclosure—well before the Phase III study even commenced—a skilled artisan could deduce simply from reading the specification that DMF 480 would be a therapeutically effective treatment for [multiple sclerosis].”).

²⁶ Patent Owner concedes that the sequences for the tested variants were not submitted during prosecution, but states that the sequences have been filed now in this proceeding. Prelim. Resp. 17 n.3 (citing Ex. 2002, 941–42). The cited pages are portions of a lab notebook marked confidential and include privilege redactions, which we have not considered further as there is no argument about what is shown on those pages.

Lastly, Patent Owner argues we should reject Petitioner’s challenge for its emphasis on the size of the claimed genus resulting from the claims’ use of percent-identity language. Prelim. Resp. 29–30, 37–41. As an initial matter, Petitioner is not focusing only on the “at least 85% sequence identity” language or the breadth of the claims based on that language. We discussed above the arguments about the adequacy of support for the claimed “AAD-1 motif.” And below we discuss additional arguments about whether sufficient representative species or common structural features are disclosed to support a claimed genus defined at least partly by a dual-herbicide degrading function. The breadth of the claims is, in any event, a relevant consideration throughout, and none of the decisions cited by Patent Owner is to the contrary. Indeed, it stands to reason that, as part of the *quid pro quo* for the patent grant, the broader the claims, the more fulsome the disclosure needed. *Cf. Ariad*, 598 F.3d at 1350 (“[M]erely drawing a fence around the outer limits of a purported genus is not an adequate substitute for describing a variety of materials constituting the genus and showing that one has invented a genus and not just a species.”).

Patent Owner cites decisions where, Patent Owner contends, sequence identity language resulting in broad claims did not undermine a disclosure’s sufficiency under § 112. Prelim. Resp. 38–39. For example, Patent Owner cites the institution decision in *Lifescan*, where the Board was skeptical of a challenge that focused on the number of claimed sequences encompassed by a “90% Limitation” without the petitioner in that matter addressing other key disclosures. *Lifescan*, Paper 11 at 28–30 (discounting testimony about the genus of proteins having 5.0×10^{76} members). Other cases, however, have emphasized percent identity language that rendered the claims broad in route to finding them unpatentable for lack of written description. For example, in

a case involving claims to recombinant viral proteins having “at least 90% sequence homology” with a reference sequence, the Board gave significant weight to evidence that the permissible sequence variance resulted in over 10^{56} permutations. *Boehringer Ingelheim Animal Health USA Inc. v. Kansas State Univ. Research Foundation*, PGR2020-00076, Paper 42 at 30–38 (PTAB Jan. 31, 2022) (“Thus, as Petitioner asserts, based on a 10% variance, there are over 10^{56} —*100 septendecillion*—combinations for ORF2.”) (internal quotation marks omitted). Of course, in each of these cases there was additional evidence that either favored or detracted from petitioners’ challenges. But these cases only confirm that the written-description inquiry is highly fact intensive, and that different outcomes may be justified even where some facts between cases might appear facially analogous. *Biogen*, 18 F.4th at 1342 (“[T]he written-description analysis is highly dependent on the facts of each case”).

Altogether, we preliminarily find that there is some literal description support for AAD-1 proteins with at least 85% sequence identity to SEQ ID NO: 9 but, as explained, the sequence identity limitation means the genus of proteins putatively encompassed by that language is very large. We discuss further below in our analysis of whether representative species or common structural features are disclosed sufficient to support the claimed genus.

b) Representative Species / Common Structural Features

“[T]he level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Ariad*, 598 F.3d at 1351. “For generic claims,” the Federal Circuit has “set forth a number of factors for evaluating the adequacy of the disclosure, including the existing knowledge in the particular field, the extent and content of the

prior art, the maturity of the science or technology, [and] the predictability of the aspect at issue.” *Id.* (internal quotation marks omitted).

Claims to a broad genus, especially claims with functional language, raise further considerations. *Id.* at 1349–1350. As explained in *Ariad*, where a genus is claimed, the written description requirement may be met by “disclosure of either a representative number of species falling within the scope of the genus or structural features common to members of the genus so that one of skill in the art can ‘visualize or recognize’ the members of the genus.” *Id.* at 1350. “[F]unctional claim language can meet the written description requirement when the art has established a correlation between structure and function.” *Id.*; *see also id.* at 1349 (“But the specification must demonstrate that the applicant has made a generic invention that achieves the claimed result and do so by showing that the applicant has invented species sufficient to support a claim to the functionally-defined genus”), 1352–1353 (remarking that claiming a genus by its function can be especially problematic in the “biological arts” absent a specification that “recites sufficient materials to accomplish that function”).

Petitioner argues that the claims cover a broad genus of functionally-active AAD-1 proteins without sufficient disclosure in the priority applications of structures providing that function. Pet. 30–31. According to Petitioner, the claims require that the proteins degrade herbicides in two different classes—phenoxy auxins and (*R*)-FOPs. *Id.* Petitioner argues the claims, however, specify only 5 (or 6, for claim 2) amino acids in an “AAD-1 motif,” and, even with the sequence-identity limitation, the claims encompass an “enormous” number of protein variants (at least 20⁴⁴) that may or may not possess the claimed function. *Id.* (citing Ex. 1054 ¶¶ 67, 74, 76–80, 334). Petitioner contends the priority applications disclosed only

SEQ ID NO: 9 and two other, nearly-identical species (AAD-1 v2, v3), which cannot represent the claimed genus of AAD-1 proteins “especially given the lack of three-dimensional structural data” at the time. *Id.* (citing, e.g., Ex. 1054 ¶¶ 81–91; Ex. 1035, 1358–1366). Petitioner contends there is no disclosure in the priority applications to define the “AAD-1 motif” or establish a sufficient structure-function relationship for the claimed function, including selectivity of the enzymes for (*R*)-enantiomers. *Id.* at 28–29 (*see supra*, arguing that presence of canonical α KGD residues in SEQ ID NO: 9 does not describe the structural basis for the enzyme’s specificity for (*R*)-FOPs), 34–38; *see, e.g.*, Ex. 1054 ¶¶ 87–91, 95. To the contrary, Petitioner contends, applicant’s attempts to derive the AAD-1 motif and explain potential structure-activity relationships over a decade later suggests that applicant did not understand such relationships in 2004/2005, and further highlights the inadequacy of the priority disclosures. *Id.* at 32–37 (citing, e.g., experiments where motif amino acids were mutated and the structural analyses of AAD-1 proteins from 2019); Ex. 1054 ¶¶ 96–109.

Patent Owner raises multiple counterarguments. Patent Owner contends that Petitioner’s common-structure arguments fail to address the 85% sequence identity limitation. Prelim. Resp. 28–29, 34. Patent Owner contends Petitioner fails to establish that the common structures disclosed lack correlation to the claimed function. *Id.* at 31–36. More specifically, Patent Owner argues that Petitioner has conceded that the five conserved residues in the AAD-1 motif are “important to enzymatic function.” *Id.* at 31–33 (citing Ex. 1054 ¶¶ 53, 95). Patent Owner contends skilled artisans have likewise recognized that the active site motif is important and present in RdpA. *Id.* (citing Ex. 1042, Abstr.). And, Patent Owner contends that Petitioner’s complaints about the sufficiency of the priority applications’

structure-function disclosures are premised on an overly strict standard. *Id.* at 23, 31–35. According to Patent Owner, adequate written description does not require perfect correspondence between the members of the genus and a common structure; all that is needed is a *correlation* between structure and function, which Patent Owner contends is described in the priority applications. *Id.* (citing *Ajinomoto*, 932 F.3d at 1359–60).

We agree with Petitioner that the priority applications do not disclose sufficient representative species compared to the breadth of the claims. As Petitioner contends, SEQ ID NO: 9 and the two AAD-1 variants that differ from SEQ ID NO: 9 by just one or two amino acids do not fairly represent the diversity of proteins within genus of at least 20⁴⁴ variants. Pet. 30–31; Ex. 1054 ¶¶ 81–83 (showing the minimal sequence differences in AAD-1 v2 (alanine substituted for histidine at position 2, and cysteine substituted for arginine at position 212), and v3 (alanine insertion at position 2)); Ex. 1003, 6:55–67 (describing the substitution in v2 position 212 as “inadvertent”). Dr. Hausinger testifies persuasively that the > 99% identity shared by these three AAD-1 variants “are simply not representative of proteins having as little as 85% sequence identity to AAD-1 v1 (SEQ ID NO: 9).” Ex. 1054 ¶¶ 83–86 (testifying, e.g., that the Specification “does not provide any structural information that might have allowed the POSA to make inferences about the effect of a given change” and that nothing in the disclosure “would have suggested to the POSA that changes at [the positions in which v2 and v3 differ] would be particularly informative.”). Patent Owner provides no

persuasive argument or evidence to the contrary on the question whether sufficient representative species are disclosed.²⁷

Moving to the question whether sufficient common structural features are disclosed, here too we agree with Petitioner at this stage. Petitioner does not ignore the 85% sequence identity limitation as argued by Patent Owner. As explained above, that limitation is factored into Petitioner's analysis, including the calculation that the genus encompasses some 20⁴⁴ or more different protein variants that may or may not provide the dual-herbicide degradation functionality that is claimed. And, for example, Dr. Hausinger testifies that, given the limited disclosure, the "POSA would not have thought it possible to extrapolate from these [three] examples to other proteins within the genus, including proteins with combinations of 20, 30, 40 or more changes [(such as encompassed by the $\geq 85\%$ limitation)] at amino acid positions that the applicant never discussed or modified." *See, e.g.*, Ex. 1054 ¶¶ 86, 88–91 ("The POSA could not have known, and would not have been able to predict, based on the limited information in the patent, whether any given amino acid sequence possessing the required motif and percent identity would have had the claimed activity."). It is not clear how common structure-function correlated features across this broad scope could be discerned from three, in effect, identical example sequences—in that sense, the representative species and common-structure inquiries collapse together. On the characterization of protein with $\geq 85\%$ sequence alignment

²⁷ Patent Owner does assert that the disclosure includes more than three examples. Prelim. Resp. 11–13, 36–37 (citing examples testing in corn, tobacco, soybeans, cotton, and other plants). Patent Owner's assertion, even if true, sidesteps the issue raised here because the testing in different plant types does not, at least on this record, demonstrate broader diversity in the amino acid sequences for the enzymes in question.

as being “highly identical,” as discussed above, we will revisit the import of such disclosure on a full trial record. Ex. 1021 ¶ 171.

Neither is it evident at this stage that the “AAD-1 motif” provides the necessary disclosure of common structural features supporting the broad genus. Patent Owner contends that Petitioner has conceded the AAD-1 motif residues are important to enzyme function. Prelim. Resp. 32–33. What Patent Owner cites as a concession is Petitioner and Dr. Hausinger’s acknowledgment that SEQ ID NO: 9 shares canonical residues with the α KGD dioxygenase consensus motif, much like other enzymes such as TfdA. Ex. 1054 ¶¶ 53, 95. That, however, does not describe a structure-function relationship for degradation of, not just phenoxy auxin herbicides, but also (*R*)-FOPs—the allegedly new and unexpected functionality of the genus of AAD-1 proteins claimed. Ex. 1003, 4:48–52, 4:63–5:5. We see no prior art evidence disclosing that TfdA or other α KGD family enzymes were known to degrade (*R*)-FOPs and describing the structural basis by which such enzymes do so. Indeed, as background, the ’745 patent states that, even for enzymes sharing the α KGD motif residues, it is “not obvious what the substrate specificities” will be, and further states that “no evidence exists in the current literature for common degradation pathways” among the phenoxy auxin and AOPP/FOP herbicide classes. Ex. 1003, 3:36–41, 3:65–4:8. At present, it is not clear where, if at all, the priority applications include sufficient disclosures from which the POSA would understand a structure-function correlation between the AAD-1 motif and (*R*)-FOP degradation.

Patent Owner cites a paper by Schleinitz in 2004 showing, Patent Owner contends, that skilled artisans recognized the active site motif “is present in . . . RdpA” and “functionally important.” Prelim. Resp. 32 (citing

Ex. 1042, Abstr, 5357, 5362). This citation suffers from a similar shortcoming to that discussed immediately above because, like the alleged concession by Petitioner, the Schleinitz paper is discussing the α KGD consensus motif and degradation of phenoxy auxins (2,4-D and dichlorprop), not stereospecific degradation of (*R*)-FOPs. Ex. 1042, Abstr. (describing *rdpA* and *sdpA* genes of *D. acidovorans* producing an enzyme that degrades (*R*)- and (*S*)- dichlorprop, respectively). And, even in that context, Schleinitz reported that “[t]he basis of the enantiospecificity of the dichlorprop-cleaving enzymes is not known.” *Id.* at 5362–63 (disclosing it “likely . . . that substrate specificity is determined by only a few amino acids” and “[s]ite-specific mutagenesis studies are needed to reveal the molecular basis of the substrate specificity and stereospecificity of RdpA and SdpA”). If anything, this highlights a lack of understanding and the unpredictability about (*R*)- and (*S*)- enantiomer substrate specificity among the family of α KGD enzymes in the 2004/2005 timeframe. *Ariad*, 598 F.3d at 1351 (explaining that “the predictability of the aspect at issue” is a relevant factor in the written description inquiry).

We also agree with Petitioner at this stage that evidence submitted during the ’555 patent’s prosecution (in 2016, and later) does not show a sufficient disclosure in the priority applications that would justify a priority date in 2004 or 2005. Pet. 32–37. For example, in 2019, applicant submitted experimental data from Dr. Wright that purports to show the criticality of the AAD-1 motif residues. *See, e.g.*, Ex. 1008, 452, 455. None of this data or Dr. Wright’s analysis of the data is in the priority applications. Even assuming the data were relevant, as Petitioner notes, it raises questions that undercut Patent Owner’s positions. Pet. 32–34. For example, in one experiment, an alanine residue was substituted for arginine at position 285

(R285A) and this single substitution rendered the enzyme inactive against both phenoxy auxins and FOPs. Ex. 1008, 455, 462–63. Yet, as discussed above, the priority applications do not describe an arginine at position 285 as significant or part of any “AAD-1 motif.” Also, the claim 1 motif does not require an arginine at that position even considering the amended Specification of the ’555 and ’745 patents. It was only in 2016, with the addition of the “AAD-1 motif” of claim 2 of the ’555 patent and in Dr. Wright’s 2019 experiments that this residue is identified as “critical” to the claimed function. *Id.* at 452.²⁸

Petitioner also points to an analysis undertaken by applicant’s declarants during the ’555 patent’s prosecution comparing the structures of AAD-1 and AAD-2. Pet. 34–36. That analysis proceeds by aligning the amino acid sequences of AAD-1 and AAD-2 (i.e., another protein in the ’555 and ’745 patents derived from a different bacterium²⁹), determining that AAD-1 has the AAD-1 motif while AAD-2 does not, and an evaluation of the enzymes’ different substrate specificities—AAD-1 (v1, v2, v3) degraded (*R*)-FOPs while AAD-2 degraded (*S*)-enantiomers. *Id.* (citing Ex. 1008, 461–62, 593–94). From this, applicant’s declarants then testified that a POSA would have recognized the AAD-1 motif’s importance to the claimed function and understood its specificity to (*R*)-enantiomers was due to a spacer sequence that is ten residues longer in a certain region of the

²⁸ Petitioner also points to another experiment that showed a variant *without* the motif was more active than a variant with the motif, which Dr. Wright sought to explain away as due to “protein insolubility.” Pet. 33 (comparing sequence 6 with sequence 2); Ex. 1008, 455, 472–474.

²⁹ The ’745 patent describes an experiment where AAD-2, a gene obtained from *B. japonicum* and having 44% amino acid identity to TfdA, was cloned and tested for substrate specificity. Ex. 1003, 108:61–110:67.

motif (the region between threonine at position 138 and histidine at position 270). *Id.*

There is, however, no apparent structural comparison of AAD-1 and AAD-2 of this sort described in the priority applications. Pet. 35–36 (noting the disclosures “do not attribute the differences in [the enzymes’] 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.”); Ex. 1054 ¶¶ 98–99. Moreover, Dr. Hausinger testifies, had a comparison of the amino acid sequences of AAD-1 and AAD-2 been undertaken, a POSA could reach any number of conclusions different from what applicant argued. Ex. 1054 ¶¶ 100–109 (testifying, *e.g.*, that less than 85 of the 317 positions (~ 27%) of AAD-1 and AAD-2 are identical and many regions differ in length). According to Dr. Hausinger, “[g]iven the hundreds of differences between AAD-1 and AAD-2, none of which are discussed in the patent, the POSA would not have assumed that the enzymes’ opposite enantioselectivities were attributable to any particular distinction.” *Id.* ¶ 100. As with Dr. Wright’s 2019 experiment discussed above, the analysis comparing the structures of AAD-1 and AAD-2 is untethered from the priority applications’ disclosures and appears to reflect issues explored or understood by the inventors only years later.

The 2019 publication co-authored by Drs. Nair and Wright, which applicant also relied on during the ’555 patent’s prosecution, follows a similar trend and suggests a POSA would not have understood the pertinent structure-function relationships in 2004/2005 from disclosures within the four corners of the priority applications. Ex. 1019; Ex. 1008, 594–596 (Dr. Nair testifying that his lab’s investigation into crystal structures of AAD-1 and AAD-2 “validates the importance of the spacing between the

critical active site amino acids as defined in the AAD-1 motif of the claimed invention”). As Petitioner points out, even in 2019, those authors admitted: “To 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)/ α KG dioxygenase class.” Pet. 37 (quoting Ex. 1019, 13300) (emphasis omitted); Ex. 1054 ¶¶ 105–106; *see also* Ex. 1019, 13303 (stating that “insights into the structure-function relationships within the aryloxyalkanoate dioxygenase family have been lacking” and, through the 2019 publication’s study, “[h]igh-resolution cocrystal structures of AAD-1 and AAD-2, along with kinetic and spectroscopic analyses, provide insights into both the reaction mechanism and the basis of enantiospecificity”). Also, the 2019 publication echoes a long-standing recognition that, as with other enzymes in the α KGD family, the structural basis for stereoselectivity of the AAD enzymes was not well understood. Ex. 1019, 13300 (“[L]ittle is known about protein-substrate interactions or how these [AAD] enzymes catalyze enantioselective oxidation of herbicides.”); *see also* Ex. 1035, 1358 (Müller paper from 2006 reporting that, notwithstanding some conserved residues, “essentially nothing is known about the phenoxypropanoic acid-binding sites of these proteins, especially with regard to the structural basis of enantiospecificity”), Ex. 1042, 5362–63 (Schleinitz, in 2004, reporting that “[t]he basis of enantiospecificity . . . is not known”).

Lastly, we turn to Patent Owner’s reliance on the *Ajinomoto* decision and the argument that Petitioner is imposing too high a written-description standard. *See, e.g.*, Prelim. Resp. 3 (“Petitioners advance the type of perfect-correspondence argument . . . that *Ajinomoto* squarely rejected.”), 31–35. We agree with Patent Owner that *Ajinomoto* rejected a standard that would

have required “perfect correspondence” and, instead, confirmed that “a ‘*correlation* between structure and function’” is what is needed. *Ajinomoto*, 932 F.3d at 1360 (quoting *Ariad*, 598 F.3d at 1350).

On this preliminary record, however, we find the evidence undermines the establishment of a disclosed (or otherwise well-known) structure-function correlation sufficient to support the genus claimed. We do not see that Petitioner is urging too high a standard but instead is pointing to what it argues is manifestly lacking in the priority disclosures, especially given the unpredictability involved concerning, for example, selectivity of the enzymes for the herbicidally-active (*R*)-enantiomers. As discussed above, the three mostly-identical AAD-1 variants (v1, v2, v3) have a structure, and that structure must be correlated to the function of degrading phenoxy auxins and (*R*)-FOPs. But the claims are much broader as we have explained, and what is missing, at this stage, is persuasive evidence showing that the POSA would understand, from the priority applications’ disclosures, what common structures possessed by the genus of AAD-1 proteins correlate to the claimed function of degrading the two different classes of herbicides.

There are also material factual distinctions between this case and *Ajinomoto*. The structure-function relationship at issue in *Ajinomoto* was shown to be well-understood. *See, e.g., Ajinomoto*, 932 F.3d at 1351 (noting “because *E. coli* promoters were well understood in the art”), 1359 (citing a “well-known link between consensus sequence and promoter strength”). Further, the Federal Circuit pointed out, the invention in *Ajinomoto* related to a discovery that a specific gene conferred microbial resistance to phenylalanine when that gene’s expression was enhanced, *not* to the means of expression enhancement (i.e., replacement of a native promoter sequence

with a more potent promoter sequence) on which the written description dispute turned. *Id.* at 1359 (finding the invention was “not the well-known techniques for performing the amplification or expression enhancement”). Indeed, on the disputed issue, the Federal Circuit explained, “the genus of more potent promoters was already well explored in the relevant art by the time of the . . . invention.” *Id.*³⁰

This case presents a very different factual backdrop—the alleged invention is the discovery that a genus of AAD-1 proteins degrades herbicides in two different classes, including (*R*)-FOPs. *See, e.g.*, Ex. 1003, 4:15–19, 48–55. According to the ’745 patent, “[n]o α -ketoglutarate-dependent dioxygenase enzyme has previously been reported to have the ability to degrade herbicides of different chemical classes and modes of action.” *Id.* at 4:55–58. If Patent Owner was first to discover a broad genus of proteins with this function, there likely would be no well-known correlation between the common structures and function for this newly-defined AAD-1 genus. And, indeed, there is no persuasive evidence supporting such a well-known correlation at this stage. It was, therefore, incumbent on applicant to supply the necessary disclosures—by describing sufficient representative species or the common structural features among the newly-claimed genus that correlate to this newly-claimed function. For the reasons explained above, we agree with Petitioner at this stage that the priority applications do not provide those disclosures.

³⁰ Aside from the promoters being well understood, the court also noted that the patent expressly included four examples of more potent promoters and cited another article with data on fourteen promoters and instructions for evaluating promoter strength, such that the POSA could make predictable changes to the native promoter to arrive at more potent promoters. *Ajinomoto*, 932 F.3d at 1359, 1361.

c) Conclusion

Based on the preliminary record, we determine that Petitioner is reasonably likely to prevail in establishing that the challenged claims are not entitled to a priority date that is earlier than October 7, 2016. Accordingly, Corteva '437, which was filed May 2, 2005, and published November 17, 2005, is prior art under 32 U.S.C. § 102. Ex. 1021, codes (22), (43).

2. Anticipation and Obviousness

We have considered Petitioner's argument and evidence supporting the assertion that Corteva '437 anticipates and/or renders obvious the claims. Pet. 41–54; Ex. 1054 ¶¶ 493–563 (Dr. Hausinger's testimony explaining how Corteva '437 discloses and renders obvious subject matter encompassed by the challenged claims) (and cross-referencing similar analyses for the challenged claims of the '555 patent). Based on Petitioner's analysis and cited evidence, which is presently uncontested, we determine that Petitioner is reasonably likely to prevail in showing that at least one of claims 1–29 is anticipated by, or obvious over, Corteva '437. *Chesterv. Miller*, 906 F.2d 1574, 1577 (Fed. Cir. 1990) (holding “no impermissible anomaly or logical inconsistency” in a parent application serving as invalidating prior art against “broader claims” that application did not adequately describe).

E. Obviousness over Saari 1998, Saari 1999, Schleinitz, and Streber (Ground IIB)

Petitioner contends that claims 1–6, 9–12, and 29 would have been obvious over Saari 1998 or Saari 1999, in combination with Schleinitz and Streber. Pet. 55–60. For purposes of this challenge (as well as the challenge discussed below (Section III(F))), Petitioner assumes the claims are entitled to priority to April 30, 2004—the filing date of the provisional application in the '745 patent's ancestral chain. Pet. 16–17; Ex. 1003, code (60).

Petitioner contends that each of Saari 1998, Saari 1999, Schleinitz, and Streber are prior art to the '745 patent and Patent Owner provides no argument otherwise. Pet. 21–23. On this record, we agree that the asserted references qualify as prior art.

We summarize the asserted prior art below before turning to the parties' arguments and our analysis.

1. Saari 1998 (Ex. 1040)

Saari 1998 is a doctoral thesis that published in 1998, and was authored by Ruth Saari. Ex. 1040, title page, vii; Ex. 1054 ¶ 212. Saari 1998 relates to substrate specificity of certain enzymes, especially the proteins encoded by the *tfd* genes and their specificity for herbicides including 2,4-D and dichlorprop. *See, e.g.*, Ex. 1040, 2 (disclosing that the “main focus of this thesis” is “TfdA”). Saari 1998 “examine[s] the biochemical and genetic relationships between TfdA and other α -ketoglutarate (α KG)-dependent dioxygenases.” *Id.*

Saari 1998 discloses that the bacterium *A. denitrificans* contains a DNA sequence related to *tfdA*. *Id.* at 86 (disclosing the *tfdA*-like gene from *A. denitrificans* has ~ 60% DNA sequence identity with *tfdA*_{JMP134} and > 90% DNA sequence identity to *tfdA*_{RASC}); *see also id.* at 92 (discussing similarities in the genes). According to Saari 1998, “[s]tereospecificity is a common phenomenon among α -KG-dependent dioxygenases.” *Id.* at 90. Saari 1998 reports that “TfdA of JMP134 (or RASC) acts only on the S-enantiomer of dichlorprop, while the activity of *A. denitrificans* is specific for the R-enantiomer.” *Id.* (teaching that “R-specificity of *A. denitrificans* for mecoprop has been reported previously”). Saari 1998 also teaches that *Sphingomonas herbicidovorans* has two α -KG-dependent dioxygenases that have been reported for degradation of (*S*)- and (*R*)-dichlorprop. *Id.* at 92;

see also id. at 127 (same). Saari 1998 teaches that “[t]he sequence relationship between the two *S. herbicidovorans* proteins is unknown” but results suggest those proteins “may be derived from the same ancestral sequence.” *Id.* at 92.

Saari 1998 discloses that “only the R-enantiomers of dichlorprop and the other phenoxy herbicides are active towards plants.” *Id.* Saari 1998 also discloses, “[a] potential application for *A. denitrificans* or the *tfdA*-like gene it contains would be protection of crops from mecoprop and dichlorprop.” *Id.* at 93 (noting transforms of cotton with another gene confer 2,4-D resistance). Saari 1998 teaches that “the gene from *A. denitrificans* could be used since its gene product degrades the R-enantiomer.” *Id.*

2. Saari 1999 (*Ex. 1041*)

Saari 1999 is a paper authored by Ruth Saari, Deborah Hogan, and Dr. Hausinger, and is related to stereospecific degradation of herbicides, especially dichlorprop. *Ex. 1041*, 421.

Saari 1999 teaches that TfdA proteins from *Ralstonia eutropha* JMP134 and from *Burkholdia cepacia* RASC degrade the *S*-enantiomer of dichlorprop while a similar protein in *A. denitrificans* exhibited the opposite stereoselectivity and degraded only *R*-dichlorprop. *Id.*; *see also id.* at 422 (disclosing that the *tfdA*-like gene in *A. denitrificans* degrades both *R*-mecoprop and *R*-dichlorprop in a α -KG-dependent process), 426 (Fig. 5 sequence comparisons). Saari 1999 teaches that “[t]he present work extends the conclusions derived from the studies with a strain of *Sphingomonas herbicidovorans* that is capable of degrading both enantiomers of mecoprop.” *Id.* at 427. “In that [*S. herbicidovorans*] strain, two α -KG-dependent dioxygenases appear to be present, each specific for a separate

enantiomer of the substrate” and “it is probable that the two *S. herbicidovorans* enzymes are closely related in sequence.” *Id.*

Saari 1999 discloses that “only the R enantiomers are active toward plants.” *Id.* at 421. Saari 1999 reports a “current trend in agriculture is increasing use of only the active enantiomer of chiral herbicides in order to reduce environmental loads of organopesticides.” *Id.* Saari 1999 discloses that “[g]enetic engineering has already been used for crop protection from (achiral) phenoxyacetate herbicides: cotton has shown enhanced tolerance to 2,4-D when *tfdA* was transformed directly into the plant.” *Id.* at 422. Saari 1999 teaches that “the 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” and “a gene encoding an R isomer selective enzyme, such as that in *A. denitrificans*, may be useful for development of herbicide-resistant plants.” *Id.* at 422, 427.

3. *Schleinitz (Ex. 1013)*

Schleinitz is an entry in the NCBI database, published August 6, 2002. Ex. 1013. Schleinitz includes the nucleotide sequence for the *rdpA* gene and the amino acid sequence for the protein it encodes. *Id.*; *see also* Ex. 1054 ¶ 229 (testifying the amino acid sequence of RdpA listed in Schleinitz is the same as SEQ ID NO: 9 of the ’555 and ’745 patents).

4. *Streber (Ex. 1043)*

Streber is a US patent that issued November 28, 2000. Ex. 1043, code (45). Streber relates to “the production and use, by genetic engineering, of plasmids and bacterial strains containing . . . the gene *tfdA* or a gene almost identical to *tfdA*” that produce a 2,4-D degrading enzyme. *Id.* at Abstr. According to Streber, plasmids are suitable “for the transfer, by genetic engineering of the 2,4-D-degrading property of this enzyme to

various organisms.” *Id.* Transgenic organisms identified by Streber include “plants,” which can become “resistant to the growth inhibiting effects of certain substituted or unsubstituted phenoxy-acetic acids.” *Id.* at 3:7–10.

5. *Jepson (Ex. 1030)*³¹

Jepson is a US patent application that published February 27, 2003. Ex. 1030, code (43). Jepson relates to the production of herbicide-resistant transgenic plants. *Id.* ¶ 1. Jepson discloses a polynucleotide with regions encoding first and second proteins that confer to the plants expressing such proteins resistance to first and second herbicides. *Id.* at Abstr. Jepson teaches that the proteins encoded by the polynucleotide may include the product of the *tfdA* gene, which produces a protein capable of oxidizing 2,4-D. *Id.* ¶ 12. Jepson further teaches crossing plants to confer resistance to multiple herbicides, and Jepson discloses methods of selectively controlling weeds with transgenic plants. *Id.* ¶¶ 26–27.

6. *Analysis*

We focus on the parties’ arguments for claim 1 as illustrative.

Petitioner contends claim 1 would have been obvious over Saari 1998 or Saari 1999, in combination with Schleinitz and Streber. Pet. 55–58. According to Petitioner, the Saari references “single[] out” the RdpA protein as having the ability to degrade achiral phenoxy herbicides, including (*R*)-mecoprop and (*R*)-dichlorprop, and recommend transforming plants to express proteins with RdpA’s activity to impart resistance to phenoxy herbicides. *Id.* at 56–57 (citing Ex. 1040, 92–93, 127; Ex. 1041, 422, 427;

³¹ Although Jepson is not asserted as part of this combination and, instead, is cited in a further combination with Saari 1998, Saari 1999, Schleinitz, and Streber (*see infra* Section III(F)), we summarize it here.

Ex. 1054 ¶¶ 226–227, 571). Petitioner contends Schleinitz discloses the nucleotide and amino acid sequence for RdpA. Ex. 1013, 2.

Petitioner contends a POSA would have been motivated to and had a reasonable expectation of success in transforming plants, including soybean, to express RdpA. According to Petitioner, the Saari references disclosed that researchers had successfully transformed plants to express a related enzyme (TfdA), and Streber discloses methods for transforming plants to express TfdA. Pet. 57 (citing Ex. 1040, 93; Ex. 1041, 422; Ex. 1043, 7:58–9:23; Ex. 1054 ¶¶ 228–231). Petitioner argues a POSA would have known that transformation methods could be applied with RdpA and in plants because the '745 patent admits that methods for introducing a gene encoding a desired protein were well known in the art. *Id.* at 57 (citing, e.g., Ex. 1003, 39:32–37; Ex. 1054 ¶ 231).

Petitioner argues claim 1's remaining limitations concerning AAD-1 activities are inherent in its proposed combination of the art. *Id.* at 57–58. Petitioner contends RdpA/SEQ ID NO: 9 includes the AAD-1 motif and is identical to itself. *Id.* (citing Ex. 1054 ¶ 234). Petitioner argues the AAD-1 enzyme activities “are inherent properties of RdpA.” *Id.* (citing Ex. 1054 ¶¶ 120, 227, 232). Moreover, Petitioner contends that Patent Owner admits that AAD-1 v1 (RdpA) expressed in soybean renders the soybean plant or plant cell tolerant to an (*R*)-FOP herbicide compared to untransformed soybean. *Id.* (citing Ex. 1054 ¶ 497).³²

³² For the AAD-1 activity recited in dependent claims, Petitioner further argued that a POSA would expect that RdpA would degrade phenoxy auxins as well as (*R*)-FOP herbicides, “via the same mechanism.” *Id.* at 58–59 (analysis for claims 3–6, citing Ex. 1042, 422–423, 427; Ex. 1040, 71–72, Scheme 13, 93, Fig. 72; Ex. 1054 ¶¶ 210–215, 219–222, 226–227, 232, 252–262, 575–583). Petitioner's citation here includes errors: it appears that

Petitioner argues there are no secondary considerations of nonobviousness. Pet. 64–65. According to Petitioner, mere recognition of a latent property in the prior art does not evidence nonobviousness, and Patent Owner has not shown that the claimed proteins have a nexus to any unexpected properties given RdpA’s known activity and the broad scope of the claims. *Id.* (citing Ex. 1054 ¶¶ 639–640).

We have concerns about whether Petitioner is likely to prevail on this ground, which we discuss below in addressing Patent Owner’s rebuttal arguments. Nevertheless, because Petitioner has met its institution burden on the Corteva ’437 grounds, as discussed above, we are proceeding to trial and, therefore, we institute as to all asserted grounds and challenged claims. *SAS*, 138 S. Ct. at 1355.

Patent Owner contends that Petitioner’s challenge fails for lack of an adequate *Graham* analysis. Prelim. Resp. 41–45. According to Patent Owner, Petitioner’s “cursory” analysis does not address differences between the claims and prior art and, instead, invokes hindsight. *Id.* Patent Owner contends: neither the Saari references nor Schleinitz discloses RdpA-transformed soybean cells, or disclose RdpA’s activity against (*R*)-FOPs; and Streber (and Jepson) do not disclose transforming plants with RdpA. *Id.* Patent Owner similarly argues that Petitioner’s motivation analysis is brief and tainted with hindsight. *Id.* at 51–53 (arguing hindsight is shown because the Saari references do not mention “RdpA . . . by name” and the Saari references do not identify the Schleinitz or Streber references).

Petitioner meant to cite Exhibit 1041, not Exhibit 1042, which does not include pages 422–433; also, we see no Figure 72 in Exhibit 1040.

Patent Owner's argument is unpersuasive. Petitioner's theory is based on the art's *combined* teachings. *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019) (obviousness cannot be overcome by attacking the references' teachings separately) (internal quotation marks omitted). Saari 1999, for example, teaches that RdpA is active against phenoxy auxins like (*R*)-mecoprop and that transforming plants to express proteins specific to the (*R*)-enantiomers may be useful for creating herbicide-resistant transgenic plants. Ex. 1041, 422, 427 (describing an (*R*)-specific α KGD enzyme from *S. herbicidovorans*). Thus, a suggestion to transform crop plants such as cotton to express proteins like RdpA is evidenced by Saari 1999. Ex. 1054 ¶¶ 226–227. Saari 1999 need not have explicitly described transforming plants to express RdpA—the challenge is obviousness not anticipation. Petitioner has asserted without dispute that Streber teaches or suggests engineering plant cells to produce herbicide-degrading enzymes. That Streber suggests transformed plants producing TfdA not RdpA is of no moment when Streber's disclosure is considered in *combination* with Saari 1999. Moreover, Dr. Hausinger testifies, a POSA would have known that soybean was a commonly grown agricultural crop and researchers had already developed herbicide-resistant soybean plants, which testimony is supported by background knowledge described in the '745 patent. Ex. 1054 ¶ 569 (citing Ex. 1003, 1:37–45, 2:12–35); *see also id.* (testifying that a POSA would have been motivated to use alternative herbicides such as phenoxy herbicides (due to emergence of glyphosate-resistant weeds) and

transformed soybean plants accordingly for alternative herbicide resistance).³³

Also, contrary to Patent Owner’s position, there is no requirement that Saari 1999 use the “RdpA” name when describing the (*R*)-enantiomer-degrading enzyme from *S. herbicidovorans*, or that the asserted references cross-cite each other as a precondition to combining their teachings.³⁴ The obviousness inquiry presumes that all prior art references in the field are available to the skilled artisan. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). As for the claimed activity of the AAD-1 protein, Petitioner does not ignore that subject matter. Petitioner argues the activity is inherent and would have been expected with RdpA. Pet. 56.

Patent Owner argues that Petitioner’s inherency theory is conclusory and deficient. Prelim. Resp. 46–49. Patent Owner contends that Petitioner identified no prior art disclosure of RdpA having the dual-degradation activity claimed and instead improperly relies on Patent Owner’s own disclosures, and further contends that obviousness cannot be predicated on what was unknown. *Id.* (arguing, e.g., that inherent properties of a claim

³³ Patent Owner contends it is hindsight to use the disclosures of the ’745 patent in this way. Prelim. Resp. 52–53. Such contention is unavailing, however, because the patent supplies these disclosures as *background* knowledge about which the POSA is presumptively aware.

³⁴ We do agree that Petitioner’s assertion that the Saari references “single[] out” RdpA is overstated. Prelim. Resp. 42, 51. It is, however, undisputed that the Saari references describe a *tfdA*-like gene in *A. denitrificans* and a comparable gene and protein in *S. herbicidovorans* (i.e., RdpA), and that both degrade herbicidally active (*R*)-enantiomers of phenoxy auxins. *See, e.g.*, Ex. 1041, 427; Ex. 1040, 90–93. It is also undisputed that sequence information for RdpA was otherwise known. Ex. 1013; *see also* Ex. 1003, 3:42–48.

cannot be dismissed as inherent without also considering whether such properties are unexpected). We agree in part.

Petitioner's inherency argument about the claimed activity is little more than a single sentence: "The recited aryloxyalkanoate dioxygenase activities are inherent properties of RdpA." Pet. 57 (citing Ex. 1054 ¶¶ 120, 227, 232). Looking to Dr. Hausinger's testimony cited in support, however, Petitioner's argument seemingly rests on the position that, because the same protein is produced (AAD-1 v1 or RdpA), whether in the '745 patent or the combination of the art asserted here, that protein will have the same activity. Ex. 1054 ¶ 120 (testifying the claimed AAD-1 activity "is a necessary and natural result of the disclosed AAD-1 v1 and v2 enzymes"); *see also* Pet. 58–59 (arguing that Patent Owner admits expressing RdpA in soybean confers the *R*-FOP tolerance claimed, citing Ex. 1054 ¶ 497; arguing, for claims 3–6, that the '745 patent admits that RdpA degrades these herbicides, citing Fig. 4, Tbls. 3–4). And, on that, Petitioner relies in substantial part on the patent itself. Ex. 1054 ¶ 120 (citing the shared specification in Corteva '437). Maybe a distinction exists for this ground (e.g., might using Streber's transformation method with the *rdpA* gene be ineffective in a soybean cell, or yield inactive protein) but there is no evidence of that now. Patent Owner cites one of Petitioner's patent applications as showing "RdpA may not have activity under certain conditions." Prelim. Resp. 48–49 (citing Ex. 1017 ¶ 87). This citation relates to a temperature assay where the wild-type RdpA becomes completely inactive at temperatures $\geq 46^{\circ}\text{C}$. Ex. 1017 ¶ 87. The relevance of this assay to the Saari (1998 or 1999), Schleinitz, and Streber combination is, at this stage, unclear. Nor is there any indication that an AAD-1 protein as claimed would behave any differently at such

temperatures. Threadbare as Petitioner’s inherency theory is, we will revisit the issue on a full record.

Patent Owner contends that Petitioner is resorting to hindsight in using Corteva’s own specification to argue inherency. Prelim. Resp. 49–50 (arguing that Corteva ’437 is not prior art based on Petitioner’s priority date assumptions for Grounds 3 and 4).³⁵ There is, however, no prohibition on using the inventors’ own disclosure to show inherency. *Hospira, Inc. v. Fresenius Kabi USA, LLC*, 946 F.3d 1322, 1329–30 (Fed. Cir. 2020) (holding “the work of the inventor or the patentee can be used as the evidence of inherency”); *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1369 (Fed. Cir. 2012) (analyzing inherency based on disclosures of the “patent itself”). Inherency and obviousness raise different questions. And, we generally agree with Patent Owner that its own patent disclosure should not be used to establish a reason to modify the art’s teachings or as evidence of the skilled artisan’s expectations that do not exist separate from that disclosure. We keep such limits in mind below in addressing whether the POSA would have expected the AAD-1 enzyme’s activity as claimed.

“Expectation” issues arise in different contexts here. If Petitioner prevails in establishing that the claimed activity is inherent, Petitioner need not also show a reasonable expectation of success for that activity. *Hospira*, 946 F.3d at 1331–32 (“If a property of a composition is in fact inherent, there is no question of a reasonable expectation of success in achieving it.”).

³⁵ We see Patent Owner’s point inasmuch as Dr. Hausinger’s cited testimony purports to explain what a POSA “would have understood” from the disclosure of Corteva ’437, which could ambiguously be read as suggesting that the POSA would also have *expected* the claimed AAD-1 activity for purposes of obviousness. Prelim. Resp. 49 (citing Ex. 1054 ¶ 120).

That does not mean that Petitioner automatically wins on the ultimate question of obviousness, however, because, Patent Owner may still succeed in demonstrating, for example, that the claimed dual-degradation activity provides an unexpected benefit that evidences nonobviousness. *Honeywell Int’l Inc. v. Mexichem Amanco Holding S.A. de C.V.*, 865 F.3d 1348, 1355 (Fed. Cir. 2017) (“What is important regarding properties that may be inherent, but unknown, is whether they are unexpected”); *In re Spormann*, 363 F.2d 444, 448 (CCPA 1966) (holding that “[t]he inherency of an advantage and its obviousness are entirely different questions”). A showing of unexpected results, like other objective indicia of nonobviousness, requires a sufficient nexus be established between the claims and those results—a burden that falls to Patent Owner. *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999) (“The patentee bears the burden of showing that a nexus exists.”).

Aside from inherency (and potential objective indicia), Petitioner also alleged here that the POSA would expect that RdpA would degrade phenoxy auxins and (*R*)-FOPs “via the same mechanism.” Pet. 58–59 (arguing for claims 3–6, and similarly arguing for claims 9–12, that a “POSA would have expected that RdpA would degrade these [phenoxy auxin and *R*-FOP] herbicides”).³⁶ We first address Petitioner’s “expectation” theory and then briefly turn to objective indicia.

³⁶ Petitioner expressly raised this “expectation” theory against claim 1 of the ’555 and ’283 patents in the related proceedings. *See, e.g.*, IPR2023-01036, Paper 2 at 56–57. In this case, the briefing for claim 1 mentions only inherency, yet Petitioner raises essentially the same “expectation” issue as raised in the other cases against the dependent claims here. *See, e.g.*, Pet. 57–59. For completeness, we address the issue in this Decision, and our analysis at this stage parallels that in the related proceedings.

Petitioner's argument that the POSA would have expected RdpA to degrade phenoxy auxins and (*R*)-FOPs "via the same mechanism" lacks a sufficient explanation and is wanting for persuasive evidentiary support. Pet. 58–59. Petitioner's analysis is deficient and includes only a single conclusory sentence regarding the required activity against FOP herbicides. Patent Owner is also correct that "Petitioners fail to identify *any* prior-art enzyme that was known to degrade FOP herbicides, let alone any evidence that RdpA was known to have this enzymatic activity." Prelim. Resp. 54–55. What Petitioner does cite in support of its single-sentence "expectation" theory is twelve-plus pages of Dr. Hausinger's testimony, which testimony itself cross-cites other sections from his declaration (~ fourteen more pages). This is an improper incorporation-by-reference of analysis and/or evidence that should have been presented in the Petition itself. 37 C.F.R. § 42.6(a)(3).³⁷

Even attempting to decipher the basis for Petitioner's expectation theory from this broad citation, we agree with Patent Owner that evidentiary support is lacking. Prelim. Resp. 54–56. For example, Dr. Hausinger testifies that a POSA would have understood that degradation of (*R*)-FOPs would involve "hydroxylation of the C2 carbon atom to release the phenol and pyruvate." Ex. 1054 ¶ 219. The only cited support for this testimony, however, is a hypothesis suggested by applicant during patent prosecution.

³⁷ Patent Owner flagged the incorporation-by-reference issue for the inherency argument as well. Prelim. Resp. 49 n.11. There is a material difference between citing three or four paragraphs for inherency (only one or two seemingly on point), and the thirteen paragraphs cited in support of the expectation issue (even ignoring the inter-sectional cross-referencing). Whether a citation is an improper incorporation-by-reference must be judged by what is reasonable under the circumstances.

Id. (citing Ex. 1008, 493³⁸). Using an applicant's discovery as evidence of the POSA's expectations looks like hindsight. What the '745 patent does state, as background, is that "no evidence exists in the current literature for common degradation pathways among" the phenoxy auxin and FOP herbicides. Ex. 1003, 3:65–4:8. Petitioner provides no persuasive evidence to the contrary. Dr. Hausinger further opines that "[b]ased on prior structural and functional studies of α KG dioxygenases, the POSA would have expected that RdpA would have less interaction with the second aryl group of the [FOP] herbicide, and that the second aryl group would not be critical to substrate specificity." Ex. 1054 ¶ 220. This opinion comes with no independent factual support and, thus, we give it little weight. 37 C.F.R. § 42.65 (a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.").

Based on the dearth of explanation in the Petition, we find that Petitioner is not reasonably likely to prevail in establishing that the POSA would have expected the recited AAD-1 activity against both phenoxy auxins and (*R*)-FOPs. That leaves Petitioner with its inherency theory, as discussed above, as possibly satisfying the AAD-1 activity limitation.

Finally, on objective indicia of nonobviousness, Patent Owner cites alleged unexpected results. Prelim. Resp. 57–59. Patent Owner argues that

³⁸ The prosecution history cited here concerned applicant's disclosure that FOP herbicides were discovered as excellent substrates for AAD-1 v1, which applicant then argued: "These data are significant in that this is the first reported observation for any members of this class of enzyme to be active on herbicides outside the phenoxy auxins. The implications are that this enzyme is promiscuous enough to utilize chemicals with similar phenoxyalkanoate substructures even though they have completely different modes of action as herbicides." Ex. 1008, 493 (bold font omitted).

the “dual activity of degrading two different classes of herbicides (FOPs and phenoxy auxins) . . . was unprecedented in the agricultural biotechnology field.” *Id.* Patent Owner cites disclosures in the patent itself and evidence from the prosecution history. *Id.* (citing, e.g., Ex. 1003, 4:15–19, 8:19–33, 108:61–116:6 (Example 17); Ex. 1008, 492–493, 576–577, 685–687).

Objective indicia, such as unexpected results, are “only relevant to the obviousness inquiry” if a sufficient nexus is shown. *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017). The burden is on Patent Owner to make that showing, as noted above. *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019) (“To determine whether the patentee has met that burden, we consider the correspondence between the objective evidence and claim scope.”). Patent Owner only briefly mentions a “presumption of nexus” and, conversely, Petitioner argues Patent Owner has not established a nexus commensurate with the “claims’ massive scope.” Prelim. Resp. 58; Pet. 64–65. The weight to be given to any unexpected results is best determined on a full record, especially because we are already instituting trial based on other grounds and the arguments about objective indicia also concern the breadth of the claims (e.g., as discussed at length in the priority analysis, *supra* Section III(D)(1)).

F. Obviousness over Saari 1998, Saari 1999, Schleinitz, Streber, and Jepson (Ground IIB)

Petitioner contends that claims 7, 8, and 13–28 would have been obvious over Saari 1998 or Saari 1999, in combination with Schleinitz, Streber, and Jepson. Pet. 60–64. Petitioner’s challenge to these remaining claims relies on its reasoning above (Section III(E)), adding Jepson for disclosure about transforming plants with multiple herbicide resistant traits. *Id.* Patent Owner’s arguments are the same as discussed above. Prelim.

Resp. 41 (arguing Ground IIA and IIB together). Our discussion from above applies here. *See* Section III(E). This ground is included in trial and will be decided on a fully-developed record.

IV. DISCRETION ISSUES

The Board has discretion under 35 U.S.C. § 325(d) to reject a petition when the same or substantially the same prior art or arguments were presented previously in another proceeding before the Office.³⁹ The relevant portion of that statute reads:

In determining whether to institute or order a proceeding . . . , the Director may take into account whether, and reject the petition or request because, the same or substantially the same prior art or arguments previously were presented to the Office.

35 U.S.C. § 325(d). In evaluating whether to deny institution under 325(d), the Board has considered several non-exclusive factors: (a) the similarities and material differences between the asserted art and the prior art involved during examination; (b) the cumulative nature of the asserted art and the prior art evaluated during examination; (c) the extent to which the asserted art was evaluated during examination; (d) the extent of the overlap between the arguments made during examination and the manner in which a petitioner relies on the prior art or a patent owner distinguishes the prior art; (e) whether a petitioner has pointed out sufficiently how the Office erred in evaluating the asserted prior art; and (f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments. *See Becton, Dickinson & Co. v. B. Braun Melsungen*

³⁹ Patent Owner urges discretionary denial on the basis of § 325(d) alone. Prelim. Resp. 59–64. On this record, we do not further address Petitioner’s arguments about discretionary denial due to parallel litigation. Pet. 67–69.

AG, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first para.).

Factors (a), (b), and (d) relate to whether the art or arguments in the Petition are the same or substantially the same as those previously presented to the Office. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 10 (PTAB Feb. 13, 2020) (precedential) (“*Advanced Bionics*”). Factors (c), (e), and (f) “relate to whether the petitioner has demonstrated a material error by the Office” in the Office’s prior consideration of that art or arguments. *Id.*

Under *Advanced Bionics*’s two-part framework, we first determine whether the same or substantially the same art or arguments previously were presented to the Office. *Id.* at 8, 10. If “either condition of [the] first part of the framework is satisfied,” we then determine whether material error by the Office has been shown. *Id.* at 8, 10.

Patent Owner argues that the Petition should be discretionarily denied under § 325(d). Prelim. Resp. 59–64; Pet. 65–67 (opposition to § 325(d) denial); *see also* Papers 9 and 10 (respectively, Petitioner’s Preliminary Reply and Patent Owner’s Preliminary Sur-reply).

Patent Owner argues that the Office considered the same (or cumulative) prior art and obviousness arguments during prosecution of the parent ’406 Application (i.e., the ’555 patent). Prelim. Resp. 59–61 (arguing, *inter alia*, that Saari 1999, Streber, and Jepson were submitted and considered, but that Saari 1998 and Schleinitz are, respectively, cumulative to Saari 1999 and Kohler). Moreover, Patent Owner contends, the Office considered substantially the same priority and written description issues during prosecution of the ’555 patent as raised by Petitioner now. *Id.* at 61–62; Paper 10 at 1–2. Patent Owner argues no Office error is shown on the

priority/written description issues and Petitioner simply disagrees with the Examiner's allowance of the claims. Prelim. Resp. 62–64 (pointing to Patent Owner's similar merits arguments as discussed above in Section III(D)(1)). And, related to obviousness, Patent Owner contends that Petitioner presents no arguments for material error by the Office. *Id.*

Petitioner argues that its Petition is based on prior art and arguments not presented to the Examiner. Pet. 66. According to Petitioner, Saari 1998 was not before the Office and the Office never considered a combination of the Saari references with Schleinitz, Streber, and/or Jepson. *Id.* Petitioner argues the Office erred in failing to apply the correct priority date, including by the Examiner's reliance on legally irrelevant information not disclosed in the '555 or '745 patents' priority applications. *Id.* at 66–67. Petitioner also alleges that the Examiner never considered the argument emphasized by Patent Owner now about sequences with ≥ 85 sequence similarity being “highly identical” (*see supra* Section III(D)(1)). Paper 9 at 1–2.

Looking at the priority and related written description issue, and considering the argument and evidence raised by Petitioner here, we find that the Office materially erred in its apparent determination that the claims of the '555 patent were entitled to priority earlier than October 7, 2016. We agree with Patent Owner that many similar arguments were raised during the '555 patent's prosecution (e.g., about the insufficiency of support for the “AAD-1 motif,” the “at least 85% sequence identity” limitation, and for the broad genus generally). *See supra* Section II(E). In allowing the '555 patent's claims, however, it is clear that the Examiner relied on the applicant's post-priority data rather than holding applicant to the applicable legal standard based on the sufficiency of the disclosure within the four corners of the Specification. *See, e.g.,* Ex. 1008, 3844 (withdrawing

rejection “in view of evidence” attached to the August 31, 2020 Interview Summary, *i.e.*, applicant’s testing of some variants with ~82% to 90% identity); *see id.* at 650–652 (“Applicant presented the attached exhibit demonstrating that the ADD1 [sic] enzyme could be modified down to 82% identical to instant SEQ ID NO: 9 and retain dioxygenase activity in the presence of both 2,4-D and R-quizalofop.”).⁴⁰ Petitioner contends, and we agree, that Patent Owner “ignores Petitioner’s contention that the examiner erred . . . because he relied on [such] legally irrelevant information.” Paper 9, 2. Patent Owner instead devotes most of its additional authorized briefing to repeating its priority arguments, which we addressed above. Paper 10, 1–4; Section III(D)(1).

The Office’s error in the ’555 patent’s prosecution was carried forward into the later prosecution of the ’745 patent, involving similar claims and presenting substantially the same priority issues where only a single claim (later canceled) was rejected for lacking a sufficient written description. *Supra* Section II(E)(2).

In addition, Petitioner offers new evidence, such as the testimony of Dr. Hausinger, which was not available to the Examiner during prosecution. Such evidence provides additional context on important priority questions raised here, including the lack of an adequate structure-function disclosure correlated to (*R*)-FOP degradation, the limited understanding in 2004/2005 about stereoselectivity for α KGD-type enzymes, and how, for example,

⁴⁰ Even in relying on this data, the Examiner appears to have been mistaken or at least confused about what the data show. At one point, the Examiner characterized the data as illustrating modifications “throughout the polypeptide sequence” but, in allowing the claims, the Examiner asserted that the sequence variants were produced by truncations at the respective ends (N and C termini) of the protein. Ex. 1008, 650, 3844.

applicant's post-priority data (even if considered) highlights what was missing in the disclosures of the priority applications. *See, e.g.*, Paper 9 at 2 (citing evidence). Because the only issue in dispute at this time for Petitioner's grounds based on Corteva '437 is the applicable priority date for the challenged claims, the Office's error is plainly material to Petitioner's challenge under Grounds IA & IB, covering all claims.

We do not further address the parties' arguments about § 325(d) as applied to the obviousness challenge under Grounds IIA and IIB. Even if we agreed with Patent Owner's arguments for discretionary denial of those grounds, we would not find that § 325(d) is sufficiently implicated based on our determination of error concerning the priority issue as explained above.

For the foregoing reasons, we do not deny the Petition on the basis of discretion under 35 U.S.C. § 325(d).

V. CONCLUSION

We determine that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the claims challenged in the Petition. We further decline to deny the Petition on a discretionary basis. We, therefore, institute *inter partes* review.

Any argument not raised in a Patent Owner Response to the Petition, or as permitted in another manner during trial, shall be deemed waived even if asserted in the Preliminary Response. In addition, nothing in this Decision authorizes Petitioner to supplement information advanced in the Petition in a manner not permitted by the Board's Rules.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review of all challenged claims of the '745 patent is instituted on all grounds of unpatentability set forth in the Petition.

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, notice is given of institution of trial commencing on the entry date of this Decision.

IPR2023-01038
Patent 11,299,745 B2

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