

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOTIF FOODWORKS, INC.,
Petitioner,

v.

IMPOSSIBLE FOODS, INC.,
Patent Owner.

Case IPR2023-00208
Patent No. 11,013,250

**PATENT OWNER'S PRELIMINARY RESPONSE
PURSUANT TO 37 C.F.R. § 42.107**

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I. INTRODUCTION

The Board should not institute *inter partes* review of claims 1, 3-13, and 15-23 of U.S. Patent No. 11,013,250 (EX1001, “’250 patent”) because Petitioner Motif FoodWorks, Inc. fails to show that it has a reasonable likelihood of prevailing. Petitioner’s grounds are an exercise in ignoring the very aspect in which the claimed invention is directed, a “meat replica matrix,” and then impermissible mixing-and-matching designed to reach a contorted version of it through hindsight, mischaracterizations of the references’ teachings, and illogical combinations.

Petitioner’s grounds for challenging claims of the ’250 patent are based on various combinations of references, all of which include Conrad. Pet., 10. For Grounds 1 and 2, Petitioner relies on Conrad to provide the claimed meat replica matrix, but Conrad’s meat replacement products fail to meet the claimed “replica” requirement because it contains at least 50% real meat in all of its meat products. Conrad, moreover, teaches adding actual animal blood/hemoglobin fraction to a wheat filler, far from the claimed meat replica matrix with a “non-animal heme-containing protein.” Moreover, Petitioner then relies on a third reference, Crane or Proulx, to teach that it was possible to produce recombinant functional heme-binding proteins. However, Crane never discusses food products (and instead, *e.g.*, blood transfusions), and Petitioner fails to show Crane is analogous art or that a

POSA looking to Conrad's teachings to add animal blood to meat/wheat mixtures would look instead to recombinant technology relevant to blood transfusions.

With respect to Proulx, this reference has nothing to do with food flavoring, and has already been vetted in this and related patents and patent applications.

Petitioner's third and fourth grounds relies on Rovaart to provide a meat-replica matrix including a non-animal heme-containing protein, then relies on Conrad's teaching to add actual animal blood to a wheat-filler to address the discoloration impact of the wheat-filler on the meat to which Conrad teaches it should be added. Petitioner again adds Crane to teach that it was possible to produce recombinant functional heme-binding proteins, relying on the same deficient reasons. Each set of Petitioner's grounds also rely on unsupported inherency arguments to reach the volatile compounds/aroma requirements of the claims, ignore the form requirements of the claims, and fail to demonstrate that the final combination would satisfy the "non-animal heme-containing protein" limitation of the claims.

Petitioner uses hindsight and fails to provide a supportable motivation or rationale to combine the cited references. Petitioner also ignores the extensive unexpected results and teachings that support no reasonable expectation of success with the combinations. The '250 patent reflects the work of Patent Owner Impossible Foods, Inc. ("Patent Owner"), which is widely recognized as being the

first to incorporate heme-containing proteins into plant-based meat products.

EX2002, (“A new kind of meatless meat”). Impossible Foods’ innovations did not come overnight—“five years of research and hundreds of iterations” brought a final version of a plant-based meat product able to recreate the aromas, taste, and texture of animal meat such that “[m]ore than 1,500 consumers couldn’t tell the difference between a meat burger and the Impossible burger....” *Id.*

Accordingly, institution of *inter partes* review should be *denied*.

II. OVERVIEW OF THE ’250 PATENT

The ’250 patent discusses the negative impact brought about by animal farming, including “account[ing] for more than 18% of net greenhouse gas emissions,” as well as “be[ing] the largest human source of water pollution...[and] the world’s largest threat to biodiversity.” EX1001, 1:36-43. The ’250 patent also discusses the impact of a meat-based diet is on human health, contemplating that “[i]f the human population would shift to a more vegetarian diet, there would be a decrease in health care costs.” *Id.*, 1:51-53.

The ’250 patent recognized, however, that prior solutions of “[p]lant based meat substitutes have largely failed to cause a shift to a vegetarian diet,” owing to the “fail[ure] to *replicate* the experience of cooking and eating meat.” *Id.*, 1:59-63 (emphasis added). Prior substitute products contrasted with meat products by providing “a texture and mouthfeel that are more homogenous than that of

equivalent meat products.” *Id.*, 1:63-66. Also absent was the ability of these plant-based substitutes to “replicate aromas, flavors, and other key features associated with cooking meat.” *Id.*, 1:66-2:2. While prior substitute products appeal to an established vegetarian/vegan base, these products “have failed to appeal to the larger consumer segment accustomed to eating meat.” *Id.*, 2:2-6.

The ’250 patent distinguishes from prior substitute products and provides meat replica matrices that *replicate* aromas associated with beef. *See Id.*, 121:61-122:64 (upon cooking, generate “at least two volatile compounds ... that are associated with a beef-like aroma”; Example 33. The ’250 patent replicates this meat-like aroma by incorporating a heme-containing protein with flavor precursors, where “[t]he concentration of heme containing protein is an important determinant of meat flavor and aroma.” *Id.*, 46:34-36; *see also* EX2002 (“The Impossible Burger bleeds, sizzles and tastes just like meat, but its production uses 96% less land, 87% less water and emits 89% less carbon into the atmosphere than a beef hamburger.”).

The ’250 patent thus delivered not only a delicious and realistic meat replica product that accurately mimicked the aromas when cooking animal meat, it also addressed the real and serious environmental and human health issues associated with animal meat consumption at unsustainable rates.

III. CLAIM CONSTRUCTION

A claim term subject to *inter partes* review receives its plain and ordinary meaning, interpreted in light of the specification of the patent in which it appears. *See* 37 C.F.R. § 42.100(b). The terms identified in the petition do not require construction in order to reach a decision denying institution. Nevertheless, Petitioner’s attempts to ignore express limitations of the claims warrant discussion. *See* Pet., 8-9.

Independent claims 1 and 13 recite a “meat replica matrix . . . wherein, upon cooking of the meat replica matrix, at least two volatile compounds are generated.” EX1001, 121:61-122:65, 124:40-126:5. Claim 1 recites that the at least two volatile compounds “are associated with a beef-like aroma,” and claim 13 recites that the at least two volatile compounds are selected from specifically recited compounds. *Id.* The independent claims further recite various ingredients of the meat replica matrix, including “one or more plant proteins; a sugar selected from glucose, ribose, sucrose, fructose, xylose, maltodextrin, and combinations thereof; [and] at least one sulfur compound selected from methionine, cysteine, and thiamine,” to combine with specific amounts of a non-animal heme-containing protein (0.01%-5%, by weight of the meat replica matrix). *Id.*

A. The preamble “meat replica matrix” is a limitation in the claims

Independent claims 1 and 13 of the '250 patent recite a “meat replica matrix” comprising a heme-containing protein (0.01%-5% by weight of the meat replica matrix) and various ingredients such that “upon cooking of the meat replica matrix, at least two volatile compounds are generated.” *Id.* Petitioner asserts that the preamble reciting a “meat replica matrix” is not limiting. *See* Pet., 8-9. Patent Owner disagrees.

“In general, a preamble limits the [claimed] invention if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2022). “When limitations in the body of the claim rely upon and derive antecedent basis from the preamble, then the preamble may act as a necessary component of the claimed invention.” *Eaton Corp. v. Rockwell Int’l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003) (citations omitted). In *Eaton*, the preamble of a method claim was found to be limiting because the preamble identified and described structures that are manipulated in the steps of the body of the claim. *Id.*, 1340 (“Consideration of the preamble gives meaning and purpose to the manipulative steps in this case.”) (citing *Griffin v. Bertina*, 285 F.3d 1029, 1033 (Fed. Cir. 2002). Similarly, in *Bio-Rad Laboratories, Inc. v. 10X Genomics Inc.*, 967 F.3d 1353 (Fed. Cir. 2020), the court found that “[t]he fact that the terms

‘reaction’ and ‘microfluidic systems’ provide antecedent basis for these terms in the body of the claim is a strong indication that the preamble acts ‘as a necessary component of the claimed invention.” *Id.*, 967 F.3d at 1371 (citing *Eaton*, 323 F.3d at 1339).

The preamble in the independent claims of the ’250 patent is also limiting because the preamble “meat replica matrix” provides antecedent basis to the same claim terms in the body of the claim. In particular, it provides antecedent basis for the claim limitations reciting “0.01%-5% (by weight of the meat replica matrix) of a non-animal heme-containing protein,” and “wherein, upon cooking of the meat replica matrix, at least two volatile compounds are generated,” recited in claims 1 and 13. The preamble also defines the structure and relationship between the “meat replica matrix” in the body of the claims, and the generation of “at least two volatile compounds” as claimed in claims 1 and 13. For at least this reason, the preamble is limiting.

IV. GROUNDS 1-6 FAIL TO ESTABLISH THE OBVIOUSNESS OF THE CHALLENGED CLAIMS

Petitioner asserts six separate grounds: Grounds 1-4 are based on combinations of Conrad (EX1013), Mottram (EX1017), and Crane (EX1014) (Ground 1) or Proulx (EX1019) (Ground 2); or Rovaart (EX1125), Conrad, and Crane (Ground 3) or Proulx (Ground 4). Each of Grounds 1-4 challenge the

following claims: 1, 3-8, 10-13, 15-20, and 22-23. Ground 5-6 challenge claims 8-9 and 20-21 based on the addition of Boye (EX1016).

As detailed below, Petitioner fails to show a reasonable likelihood of prevailing on the asserted grounds.

A. Ground 1 Fails

Petitioner's Ground 1 challenges claims 1, 3-8, 10-13, 15-20, and 22-23 as obvious over the combination of Conrad (EX1013), Mottram (EX1017), and Crane (EX1014). Petitioner's Ground 1 fails for several reasons. First and foremost, Petitioner's proposed combination based on Conrad, Mottram, and Crane is premised not only on the teachings of a reference that fails to be analogous art, it also employs hindsight to piece together misrepresented readings of the references. Moreover, Petitioner fails to establish that its proposed combination discloses each and every limitation of the claims. For these reasons, Petitioner's Ground 1 fails.

1. Petitioner fails to show Crane is analogous art

Petitioner's Ground 1 relies on replacing Conrad's animal blood with Crane's recombinant heme proteins in order to arrive at a meat replica matrix recited in the claims. *See* Pet., 24-27. As a threshold matter, Petitioner's Ground 1 fails because Petitioner does not establish (indeed, does not even attempt to establish) that Crane is analogous art under the proper legal framework.

“A reference qualifies as prior art for an obviousness determination only when it is analogous to the claimed invention.” *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1379 (Fed. Cir. 2019). A reference is analogous art when the reference is either (1) “from the same field of endeavor, regardless of the problem addressed” by the reference, or (2) “if the reference is not within the field of the inventor’s endeavor,” the reference “still is reasonably pertinent to the particular problem with which the inventor is involved.” *Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1359 (Fed. Cir. 2020). Petitioner concludes that Conrad, Mottram and Crane are analogous art because each “relates to the desirability of making ‘improved’ meat replica products” (Pet., 13), but as detailed below, Crane makes no implicit or explicit statement to this effect.

First, Petitioner fails to establish that Crane is “from the same field of endeavor” as the ’250 patent. As Petitioner acknowledges, the ’250 patent relates to “meat replica products.” Pet., 13; *see also* EX1001, 1:28-30 (stating the field of invention “relates to consumable products and more particularly, to non-animal based replicas of animal-based food products”). Yet, nowhere does Crane even mention meat, a meat replica, or even food products in general. Instead, Crane is expressly directed to “methods of producing recombinant functional heme-binding proteins...and methods of identifying agents that modulate the activity of heme-binding proteins.” EX1014, Abstract. Thus, Petitioner fails to show Crane is

analogous art under the first part of the test. *See Airbus*, 941 F.3d at 1381 (affirming non-analogous art finding when a reasonable factfinder could not conclude that “a reference that is expressly directed to exercise equipment and fails to mention the word ‘fire’ even a single time” would “fall[] within the field of fire prevention and suppression”).

Second, Petitioner fails to show Crane is “reasonably pertinent to the particular problem with which the inventor is involved.” As noted by the Federal Circuit, this test “ultimately rests on the extent to which the reference of interest and the claimed invention relate to a similar problem or purpose.” *Donner Tech.*, 979 F.3d at 1359. As described in the ’250 patent, the problem solved by the inventors was to provide a meat substitute that overcame the limitations of prior-art meat substitutes, “which largely fail to replicate the experience of cooking and eating meat,” “fail[] to cause a shift to a vegetarian diet,” and lack “appeal to the larger consumer segment accustomed to eating meat.” EX1001, 1:36-2:6. The ’250 patent explains that “[t]he release of odorants upon cooking is an important aspect of meat consumption” and that its meat replica can “generate[] an aroma recognizable by humans as typical of cooking beef.” *Id.*, 50:38-43.

In contrast, Crane is directed to the problem of producing recombinant heme-binding proteins with complete heme incorporation. *See* EX1014, [0003]-[0005]. Entirely absent from Crane is any mention that the recombinant heme-

binding proteins with complete heme incorporation produced by its methods are relevant to improving meat-associated flavors or aromas in a meat replica matrix, or even food products in general. Indeed, the uses that Crane does identify for the recombinant heme-binding proteins produced by its methods stand in stark contrast to the production of food products. *See, e.g., id.*, [0062] (“Recombinant hemoglobin preparations are used as effective and safe oxygen carriers as an alternative to blood transfusion.”), [0063] (“preclinical screening assays that are designed to predict drug metabolism and toxicity”), [0066] (production of “bio-ethanol and chemical feedstocks for commercial use”). Petitioner fails to demonstrate Crane’s facially distinct problem would have been viewed by a POSA as “reasonably pertinent” to the problem faced by the inventors of the ’250 patent, which was not directed to how to generate recombinant proteins, but instead how to generate meat substitutes that accurately replicate meat.

Rather than applying the proper test in its argument that Crane is analogous art, Petitioner asserts that because the recombinant proteins in Crane can be used for “commercial applications” (applications of which are entirely unrelated to food products, *see* EX1014, Abstract, [0021], [0024], [0040], [0060]-[0062], [0085]), a POSA “would recognize recombinant technology usefulness for generating proteins for use in consumables.” *Pet.*, 15-16. Because the problem of the ’250 patent is not how to generate recombinant proteins, but how to generate meat

substitutes that actually replicate meat, Petitioner’s argument is irrelevant to the analysis required for establishing a reference as analogous art under both the “from the same field of endeavor” and “reasonably pertinent to the particular problem” tests.

Accordingly, for the reasons above, Petitioner fails to show that Crane is analogous art to the ’250 patent. Because Petitioner’s Ground 1 relies on Crane to replace the animal-sourced blood of Conrad in its combination, this ground necessarily fails because Crane is not within the scope and content of prior art in an obviousness determination. At a minimum, Crane’s status as non-analogous art undermines Petitioner’s rationale for obviousness because Petitioner fails to establish why a POSA would be motivated to look to Crane—a reference entirely unrelated to food products—for guidance on how to supplement a meat replica matrix. *See In re Klein*, 647 F.3d 1343, 1350-1351 (Fed. Cir. 2011) (“If [a reference] is directed to a different purpose, the inventor would accordingly have had less motivation or occasion to consider it.”) (citing *In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992))

2. Petitioner’s motivation to combine Conrad, Mottram, and Crane is driven by hindsight

Notwithstanding Petitioner’s failure to establish Crane as analogous art, Petitioner’s purported reasons as to why a POSA would have been motivated to

combine Conrad, Mottram, and Crane with reasonable expectation of success are premised on an illogical and unsubstantiated rationale.

a) Petitioner fails to establish that a POSA would have been motivated to combine Conrad and Mottram

Petitioner's motivation to combine Conrad and Mottram is based on both references "relat[ing] to the desirability of making 'improved' meat replica products that, due to 'improved' meat-like properties, would appeal to a broader consumer base and motivate a shift away from the consumption of conventionally-sourced meat." Pet., 13. Petitioner, however, mischaracterizes Conrad as driven to make "improved" meat replica products. Conrad seeks to add "wheat meat" into meat itself, which Conrad states is beneficial from "a nutritional point of view and from a cost benefit point of view," to make a meat-replacement product. EX1013, 1:25-40. Conrad explains that the "nutritional" benefit of adding "wheat meat" to a meat product is to add fiber, while the "cost benefit" aspect is so that "costs can be lowered compared with a pure meat product" through its extension with the "wheat meat." *Id.*, 1:28-49. Conrad provides no suggestion to avoid meat or meat-based products due to "environmental consequences, expenses, and other ramifications," (Pet., 26) as Petitioner suggests.

Not only does Conrad include real meat in its product, it doubles-down on animal products by adding **animal blood/hemoglobin** to its wheat-meat mixture in order to improve the color of the "brown-yellow" wheat meat product and "further

give[] a desired taste improvement as it improves the meat flavour of the final product,” as well as cheese fines and animal fat. EX1013, 4:14-16. There is nothing in Conrad that suggests a desirability to make “meat replica products” as claimed for the purpose of “motivat[ing] a shift away from the consumption of conventionally-sourced meat.” That motivation, instead, comes from the ’250 patent. *See, e.g.*, EX1001, 1:36-2:6.

Petitioner argues that Mottram would be combined with Conrad because it “teaches meat flavor science,” and in particular teaches that the “sugar **ribose** and the sulfur compound **cysteine** ... are naturally present in meat.” Pet., 15, 19. But nothing in Mottram would have motivated a POSA to include a sugar compound, such as ribose, and a sulfur compound, such as cysteine, where meat is already present as in Conrad, much less a wheat meat product where an animal blood/hemoglobin fraction is added to the product. EX1013, 1:56-61. Petitioner’s recognition that the claimed compounds “are naturally present in meat” make the combination of Mottram with Conrad illogical where meat and animal products, including animal blood, cheese fines and animal fat, are already present. *See id.*

b) Petitioner’s illogical combination of Conrad, Mottram and Crane is transparent hindsight

Petitioner’s tortured analysis of the prior art to reach the claimed invention is further highlighted by its reliance on Crane. In particular, Petitioner’s Ground 1 relies on an additional step—not only would a POSA seek to add isolated

compounds from the real meat of Mottram to blood to further the flavor and taste benefits of Conrad's products, the POSA would further be motivated to substitute that blood with an entirely different composition, namely, heme-containing proteins produced recombinantly using the methods disclosed in Crane. *See* Pet., 24-27. Petitioner provides three purported reasons for why a POSA would have further combined Crane with Conrad and Mottram. *Id.*, 26-27. In addition to failing to establish Crane was analogous art (*supra*, Section IV.A.1), each of Petitioner's alleged reasons for the combination is premised on mischaracterizations and strained readings of the applied references that fail to provide an objective-based rationale supporting a finding of obviousness.

Petitioner first asserts that a POSA "would be motivated to replace Conrad's blood-sourced hemoglobin with Crane's recombinantly-produced heme-proteins" (Pet., 26), citing to "environmental consequences, expenses, and other ramifications as cultivating animals for meat." *Id.* Yet, aside from its expert say-so, the references themselves do not support this viewpoint.

For example, Petitioner argues that "Conrad teaches or suggests this motivation, as Conrad teaches utilizing meat replacement products in place of 'animal meat'" (Pet., 26 (emphasis omitted) (citing EX1013, 1:25-40)), but Petitioner mischaracterizes Conrad. As noted above, Conrad seeks to **add** "wheat meat" **into** meat itself, which Conrad states is beneficial from "a nutritional point

of view and from a cost benefit point of view.” EX1013, 1:25-40. Conrad explains that the “nutritional” benefit of adding “wheat meat” to a meat product is to add fiber, while the “cost benefit” aspect is so that “costs can be lowered compared with a pure meat product” through its extension with the “wheat meat.” *Id.*, 1:28-49. Conrad provides no suggestion to avoid meat or meat-based products due to “environmental consequences, expenses, and other ramifications,” as Petitioner suggests. Instead, Conrad explicitly teaches the animal products (actual meat, blood, lard, cheese), which would contribute to the environmental concerns posed by Petitioner. *See, id.*, 1:56-61, Example 2. The same can be said for Petitioner’s use of Mottram, which expressly teaches inclusion of real meat. EX1125, 1:8-13.

Petitioner’s reliance on Crane as also teaching or suggesting this motivation is likewise a hindsight-driven leap that is not supported by the reference. Pet., 26 (“Crane also teaches or suggests this motivation, as Crane teaches using its recombinant heme-proteins in place of conventionally-sourced proteins.”) (citing EX1014, [0062]). The passage in Crane that Petitioner relies upon to support its assertion merely references the use of its recombinant hemoglobin preparations “as effective and safe oxygen carriers as an alternative to blood transfusion.” EX1014, [0062]. However, Crane’s suggestion to use its recombinant hemoglobin preparations as an alternative to conventional **blood transfusions** provides no basis

for suggesting that those same preparations would be suitable as replacements for animal-sourced components (*e.g.*, blood) in **food products** in order to avoid the “environmental consequences, expenses, and other ramifications” associated with “cultivating animals for meat.” Petitioner’s attempt to link a suggestion to use recombinant hemoglobin as an oxygen carrier for blood transfusions to an untaught reason to use the same in food products is unsound and unsubstantiated.

For its second reason, Petitioner argues that a POSA would have been motivated to turn to Crane because “Conrad teaches avoiding conventionally-sourced meat due to its relative expense, and it teaches preparing its products with the aim of lowering costs of manufacture” and “Crane teaches that heme-proteins can be produced via a ‘**simple and inexpensive method**’” Pet., 26-28. Again, Petitioner mischaracterizes the references and makes an apples-to-oranges comparison.

In particular, Conrad’s discussion of “lowering costs” is in reference to the cost savings achieved by extending a meat product with a wheat-based product compared to the same product made from “pure meat.” EX1013, 1:28-49. Notably, this cost savings is achieved even **with** the inclusion of animal blood in the wheat meat. *Id.*, 4:3-16. Thus, any implication by Petitioner that Conrad’s mention of “lowering costs” somehow suggests avoiding meat entirely, or even animal-sourced ingredients generally, is misleading.

Moreover, Crane’s reference to its “simple and inexpensive method” to achieve “high fidelity incorporation of heme into recombinantly overexpressed heme proteins” is in comparison to ***other methods of that type***. While Petitioner cites to certain paragraphs of Crane to support its generic reliance on “cost savings,” none of these passages actually make such a connection. Pet., 27 (citing EX1014, [0014], [0043], [0085]). For example, Crane compares its methods to other prior-art methods that address “heme incorporation into recombinant proteins” and explains that “[t]he present invention is directed to overcoming these and other deficiencies in the art.” EX1014, [0004]-[0008]. In this sense, Crane explains “[t]he present invention is a straightforward and inexpensive method for high fidelity incorporation of heme into recombinantly overexpressed heme proteins.” *Id.*, [0014]. Crane also describes that, in the context of its invention, “[f]ungal protein expression systems” are “more efficient and economical” compared to “mammalian expression systems” for recombinantly producing its proteins and, in the particular “simple and inexpensive method of co-expressing ferrochelatase,” fully incorporated heme proteins in *E. coli* may be effectively produced. *Id.*, [0043], [0085]. All of these passages are in relation to the specific field in which Crane is focused: the production of recombinant heme-binding proteins. Apart from its unfounded reading of Crane, Petitioner provides no evidence that a POSA would have understood the recombinantly-produced heme-

proteins of Crane would somehow “lower[] costs” relative to the naturally-occurring, animal-obtained blood used in Conrad. Furthermore, the animal-obtained blood used in Conrad was readily obtained when preparing the meat portion of Conrad’s wheat meat product, where real meat makes up at least half of the product by dry weight. *See* EX1013, 2:9-13. Thus, a POSA concerned with costs when producing the wheat meat product of Conrad would have no reason to set up a recombinant purification system when blood or the hemoglobin part of blood is already procured when obtaining the real meat in Conrad’s wheat meat products.

As its third reason, Petitioner argues that “Crane’s heme-proteins can be purified,” which Petitioner asserts could be use in foodstuffs. Pet., 27 (emphasis omitted). But Crane makes no mention of incorporating its heme-proteins into food products. Petitioner’s leap from recombinant hemoglobin for use as an oxygen transport in blood transfusions, and assays for characterizing protein activity and structure to foodstuffs is wholly unsupported. *See* EX1014 ¶¶4, 7, 62; Section IV.A.1, *supra*, describing how Crane is not analogous art. Further, simply because Crane’s heme-proteins “can be” purified (*e.g.*, for blood transfusion) provides no rationale for combining Crane with Conrad and Mottram. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (obviousness requires showing whether a POSA “not only could have made but would have been

motivated to make the combinations or modifications of prior art to arrive at the claimed invention”).

Petitioner further argues that purified proteins would be “generally desirable for a commercial application” such as Conrad’s “‘grain meat,’ to achieve standardized ingredients.” Pet., 27. However, there is no indication in Conrad and Crane that purified and standardized ingredients in a food product is desirable. The opposite is seen in Conrad’s meat and wheat meat products, which use heterogeneous and non-standardized ingredients. For instance, the grain/wheat meat replacement product can include blood, milk, and cheese fines, and the wheat meat products can include various meats (e.g., beef, swine), and lard. *See, e.g., id.*, 1:43-49 (“a grain product, preferably a wheat product, which alone or in combination with blood products and/or milk protein products can form a grain or preferably a wheat meat”); 1:62-68 (“cheese fines”); 4:55-63 (“Lard 32% by weight, Swine meat 39% by weight, Beef meat 11% by weight, . . . dry milk 3% by weight”); 5:29-34 (“minced swine meat”).

Accordingly, the arguments set forth by Petitioner are not supported by the asserted references, and instead rely on impermissible hindsight based on patent owner’s invention.

3. Petitioner fails to establish that a POSA would have had a reasonable expectation of success in combining Conrad, Mottram, and Crane

Petitioner contends a POSA “would be motivated to utilize hemoglobin, myoglobin, or leghemoglobin obtained using Crane’s methods in Conrad’s ‘grain/wheat meat,’” because a POSA “would expect doing so to contribute (1) desirable meat-like coloration, (2) desirable aroma/flavor, and (3) desirable meat-like nutrition.” Pet., 24 (emphasis omitted). Petitioner bases this assertion on the notion that “Crane’s recombinant hemoglobin and myoglobin are the same as those heme-proteins found in animal muscle.” *Id.* However, aside from conclusory expert testimony, neither Conrad nor Crane makes this connection. As Petitioner admits, Conrad utilizes “the ‘hemoglobin part of whole blood,’” which a POSA “would understand to refer to red blood cells that comprise hemoglobin protein.” Pet., 21. Petitioner provides no objective evidence supporting the contention that the recombinantly-produced, isolated hemoglobin proteins of Crane would have been viewed as equivalent to the more complex blood or “red blood cells that comprise hemoglobin protein” of Conrad, such that a POSA would have expected the same properties of the latter to occur in the former and that the latter would impart the same effects when added to different products. *See Motif Foodworks, Inc. v. Impossible Foods Inc.*, IPR2022-00887, Paper 7 at 20 (rejecting Petitioner’s substitution of colorants because “Petitioner does not establish sufficiently that a

[POSA] would have had reason to make that substitution or that using different types of colorants for such different products are interchangeable”).

The evidence in the prosecution record of the related US 10,039,306 (“’306”)¹, which was relied on by the Examiner of the ’250 patent as relevant in the Notice of Allowance (EX1149, 753), also supports the unpredictable effect of heme proteins on flavor and aroma. Citing to the Proulx Thesis (*see* EX1148, 2715, citing to EX2003²), Patent Owner emphasized that food products with heme could be adversely affected by off-flavors and rancidity, quoting Proulx’s work as recognizing that “[f]ortification [with] iron has *a potential negative effect on organoleptic quality* of maize products, in that soluble forms of iron can cause *oxidative rancidity*.” EX1148, 2715. Patent Owner submitted numerous declarations, including by Dr. Keith R. Cadwallader, who stated:

This is a significant discovery since a person having ordinary skill in the art would not have anticipated that the inclusion of a heme protein would have any beneficial effect on flavor. In fact, iron, and specifically heme iron, has been most often associated with *causing*

¹ Portions of the prosecution record for the ’306 patent have been cited as EX1148 by Petitioner.

² Excerpted from the ’306 patent prosecution file history, and provided as EX2003.

deleterious off-odor consequences in foods and especially meat products.

Id., 2715-2716 (emphasis added). Petitioner's own evidence in the record supports this. *See, e.g.*, EX1028, 70 ("In general, total iron was not a good indicator of beef flavor attributes"); *see also id.* ("[H]eme iron been thought to be a pro-oxidant that may influence meat flavor due to its reaction to produce radicals that can promote lipid oxidation in biological systems."); EX1048, Abstract ("WOF (Warmed-Over Flavor) is catalyzed by the non-heme iron released from meat pigments during cooking.").

Rather than acknowledge the teachings of the references as a whole, including those cited during prosecution of the '250 and '306 patents, and those that have published in the 25 years since Mottram's publication, Petitioner attempts to discount the well-known issues of off-flavoring by citing to a selectively excised passage from Mottram. Specifically, Petitioner asserts that rather than producing off-flavors, lipid oxidation products "contribute to desirable aromas." Pet., 68 (citing EX1017, 420). Petitioner's citation is out of context. The sentence prior to the cited quote acknowledges that lipid oxidation is "associated with the off-flavour, known as 'warmed-over flavour', which develops in re-heated cooked meats." EX1017, 420. Later published references, such as EX2013 (Chapter 7 of EX1033 and EX1034 submitted by petitioner) clearly teach

that off-flavoring from lipid oxidation is an objectionable flavor in the food industry: “[t]race metals, particularly copper, cobalt, and iron, **greatly increase the rate of LO** [lipid oxidation]” and heat treatment of enzymes such as hemoglobin, “results in denaturation of the enzymes, [] free[ing] the iron to greatly enhance its catalytic properties” which is “particularly relevant in the formation of **warmed-over off-flavor** in cooked meats. EX2013 (emphasis added).

A POSA, thus, would not have had a reasonable expectation of success of combining a heme iron-containing protein into a meat product without deleterious effects, including off-flavors and off-odors, *see id.*, 2716, further emphasizing Petitioner’s hindsight exercise of mapping the prior art onto the ’250 patent claims.

Accordingly, for these reasons, Petitioner fails to establish that a POSA would have been motivated to combine Conrad and Crane with a reasonable expectation of success.

4. Petitioner fails to establish that the combination of Conrad, Mottram, and Crane discloses each element of claim 1

In addition to its hindsight-based combination of the references, Petitioner also fails to sufficiently establish that the combination discloses each and every limitation of the challenged claims.

a) **Petitioner fails to establish that the combination of Conrad, Mottram, and Crane discloses “a meat replica matrix”**

Petitioner asserts that “Conrad teaches a meat replica matrix”, citing portions of Conrad related to “grain meat” or “wheat meat” (referred to herein as “wheat meat”) replacement product. Pet., 14, 16. Petitioner’s assertion is unsubstantiated and based on a clear misunderstanding of Conrad’s “wheat meat” product.

Petitioner’s ground ignores that the 250 claims require the term “meat *replica*,” which is not satisfied by the “wheat meat” products of Conrad. Conrad’s stated purpose is not to replicate meat, but instead to **replace** a portion of a **real meat** product with a wheat or grain cereal filler, in order to reduce costs and change the nutritional content of **real meat**, *e.g.*, by increasing fiber. EX1013, 1:28-49; *see also id.*, 1:15-18 (“The object of the present invention is to replace *some* of the contents of mixed meat products with meat replacement products obtained from cereals, and particularly from whole wheat.” (emphasis added)).

Petitioner fails to cite any evidence from Conrad (or Mottram or Crane) showing that the “wheat meat” product replicates meat, and ignores that Conrad refers to its end products as “meat products.” *See id.*, 1:13-14. Petitioner’s argument instead relies on portions of Conrad indicating that certain “embodiments (e.g., sausage, meatballs)” comprise real meat mixed with meat replacement product, and thus appears to argue that it is Conrad’s final consumed product, not

Conrad’s “wheat meat” product, that includes meat. Pet., 14. To reach this tortured understanding of Conrad, a POSA must ignore the express objective of Conrad’s invention of replacing “some of the contents of mixed meat products with meat replacement products,” (EX1013, 1:15-18), specifically “replac[ing] up to 50% of the meat.” *Id.*, Abstract. Moreover, the inclusion of the animal blood/hemoglobin in the meat replacement portion (“wheat meat”) is performed in Conrad for the purpose of “improv[ing] the meat flavour of the *final* product,” (*id.*, 4:14-16) (emphasis added), supporting that Conrad’s final wheat mixed-meat product is the comparator product.

Petitioner provides an alternative claim construction in its argument, stating that while it believes that Conrad’s equivalent “meat replica matrix” (*i.e.*, “wheat meat”) is meat free, the “’250 patent claims do not exclude meat.” Pet., 15. Petitioner ignores the plain and ordinary meaning of the claim term “meat replica,” which is to “replicate meat.” The plain meaning of “meat replica” cannot logically characterize a product containing real meat as a “meat replica”. *See Motif Foodworks, Inc. v. Impossible Foods Inc.*, IPR2022-00887, Paper 7 at 9 (“As such, a ‘replica’ does not encompass the actual material that it replicates or approximates.”).

Petitioner thus fails to show that Conrad, alone or combined with Mottram and Crane, disclose a “meat replica matrix.” For at least this reason, Ground 1 fails.

b) Petitioner fails to establish the combination of Conrad, Mottram, and Crane discloses “0.01%-5% (by weight of the meat replica matrix) of a non-animal heme-containing protein”

Petitioner asserts that Conrad teaches “adding up to 5% heme-protein.” Pet., 21; EX1003 ¶¶ 142-143. Petitioner’s assertion is unsubstantiated and based on a mischaracterization of Conrad’s grain/wheat meat product as a meat replica matrix. section IV.A.4.a, *supra*.

Conrad does not teach the addition of heme-protein per se, much less 0.01%-5% by weight heme-protein, to its grain/wheat meat. Rather, Conrad teaches adding **blood or the “hemoglobin part** of whole blood from slaughtered animals” (emphasis added) to its grain/wheat meat replacement product. See EX1013, 1: 56-61; 4: 3-17. Petitioner recognizes that the “hemoglobin part” of whole blood recited in Conrad is **not hemoglobin** itself, asserting that the “hemoglobin part” instead refers to red blood cells that comprise hemoglobin protein. Pet., 21. Petitioner then sets forth a series of calculations to identify how much heme-protein may be present in the blood, or the “hemoglobin part” of blood in Conrad, based on unsubstantiated calculations a “POSITA would understand,” rather than explicit teachings of an amount of heme-containing protein in Conrad. See Pet.,

21-23. Thus, Petitioner fails to show that the blood or “hemoglobin part” of the blood of Conrad necessarily satisfies the “0.01%-5% (by weight of the meat replica matrix)” limitation. This oversight undermines Petitioner’s assertions that Conrad discloses this limitation. *Par Pharm. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir. 2014) (inherency cannot be established “by probabilities or possibilities”).

For at least these reasons, Petitioner fails to establish that Conrad, Mottram, and Crane disclose “0.01%-5% (by weight of the meat replica matrix)” of a heme-containing protein.

c) Petitioner fails to establish the combination of Conrad, Mottram, and Crane discloses “upon cooking of the meat replica matrix, at least two volatile compounds are generated that are associated with a beef-like aroma”

Claim 1 also recites that, “upon cooking of the meat replica matrix, at least two volatile compounds are generated that are associated with a beef-like aroma.” Petitioner argues that, because “Conrad teaches that its meat replicas should be cooked,” a POSA “would reasonably expect success in producing at least two volatile compounds associated with beef-like aroma when frying Conrad’s products (containing Mottram’s sugar and sulfur compound precursors.” Pet., 28. Petitioner bases this assertion on the contention that “the art long taught that when

sugars and sulfur compounds are heated together, they produce many volatiles associated with meaty aromas,” citing to references not applied in the ground. *Id.*

To be clear, nowhere does Mottram (nor Conrad or Crane) disclose the generation of “at least two volatile compounds” from a meat **replica** matrix as claimed, much less volatiles “associated with a beef-like aroma” generated from a meat replica matrix. Indeed, Petitioner relies on passages in Mottram related to volatile compounds produced from cooking **real meat**. Pet., 28. Petitioner provides no explanation as to how a discussion of volatile compounds released from actual meat teaches or suggests that “at least two volatile compounds” are generated upon cooking of a meat **replica** matrix that “are associated with a beef-like aroma.” Instead, Petitioner assumes, without support, that the claimed volatile compounds will be produced, without showing that the compounds would be **necessarily present** in a meat replica matrix. See *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (inherency requires showing that a characteristic would necessarily be present in disclosure); *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1369 (Fed. Cir. 2012) (requirement that the claimed property be “necessarily present” in the prior art); *In re Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981) (Inherency “may not be established by probabilities or possibilities,” and “[t]he mere fact that a certain thing *may* result from a given set of circumstances is not sufficient.”); *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir.

2014) (Inherency is a “high standard,” that is “carefully circumscribed in the context of obviousness.”).

Accordingly, for these reasons, Petitioner fails to establish that a POSA would have been motivated to combine Conrad and Crane with a reasonable expectation of success.

5. Petitioner fails to establish that the combination of Conrad, Mottram, and Crane disclose all elements of claim 13

Petitioner relies on the same arguments raised for claim 1 in asserting the obviousness of claim 13 over Conrad, Mottram, and Crane. Pet., 39-40.

Accordingly, for the same reasons provided above, Petitioner’s Ground 3 also fails with respect to claim 13.

6. Petitioner fails to establish that the combination of Conrad, Mottram, and Crane discloses all elements of dependent claims 3-8, 10-12, 15-20, and 22-23

Petitioner asserts that Conrad, Mottram, and Crane render obvious dependent claims 3-8, 10-12, 15-20, and 22-23. These dependent claims depend from claim 1 or claim 13, and thus, are not shown to be unpatentable for the same reasons described above with respect to claim 1 and 13.

B. Ground 2 Fails

Petitioner relies on the same arguments in Ground 2 for claims 1, 3-8, 10-13, 15-20, and 22-23 as for Ground 1, substituting Crane for Proulx. Pet., 41.

Petitioner states that a POSA would be “motivated to combine Proulx’s

leghemoglobin with Conrad and Mottram for the same reasons set forth in Ground 1, with a reasonable expectation of success.” *Id.* Proulx discusses iron fortification with soybean leghemoglobin in flour tortillas, a reference that was vetted in this and related patents and patent applications.³

Given the above, Petitioner fails to establish the obviousness of the challenged claims under Ground 2 for the same reasons given above with respect to Ground 1. That is, the combination with Proulx continues to suffer from 1) Petitioner’s illogical combination and lack of motivation to combine Conrad and Mottram (section IV.A.2.a, *supra*); 2) Petitioner’s lack of motivation to combine

³ The Examiner stated in the Notice of Allowance for the ’250 patent that “[w]hile Proulx et al. provides motivation to include leghemoglobin, a non-animal heme-containing protein, in a foodstuff, the reference is silent with respect to the influence of heme-containing protein on beef associated flavor.” EX1149, 753-754; *see also* EX1148 (’306 patent), 3267; EX1150 (’241 patent), 1270-1271; EX1002 (’096 patent), 1180 (“Note, while Proulx et al. [disclose] that hemoglobin from soy root nodules (i.e. non-animal heme-containing protein) is a good source of bioavailable iron and can be used as a food forticant, there is no motivation to include the forticant, in combination with the claimed sugars and amino acids to produce meat associated flavors.”).

Conrad, Mottram and now Proulx (section IV.A.2.b); 3) Petitioner’s lack of a reasonable expectation of success in combining Conrad, Mottram and now Proulx (section IV.A.3, *supra*) and 4) Petitioner’s failure to establish that the combination of Conrad, Mottram and now Proulx, discloses each element of the claims (sections IV.A.4.a-c, *supra*). Indeed, Petitioner’s attempt to equate Conrad’s “red blood cells that comprise hemoglobin protein” to Proulx’s “plant-sourced leghemoglobin” is even further afield, and Petitioner points to no basis in the references that a POSA would have expected Proulx’s “plant-sourced leghemoglobin” to provide the same benefits identified by Conrad with its addition of “red blood cells that comprise hemoglobin protein.” Petitioner’s additional reliance on Proulx to “fortify foodstuffs with heme iron” (Pet., 40) is also inapt as Conrad already includes a heme-containing protein to its wheat meat, which is then added to a meat product.

For these reasons, Petitioner’s combination continues to be a litigation-driven claim mapping exercise that merely fashions the claimed invention through hindsight. Such a rationale is insufficient to establish obviousness and thus Petitioner’s Ground 2 also fails for this reason.

C. Ground 3 Fails

For Ground 3, Petitioner substitutes Mottram for Rovaart, and maintains the same combination with Conrad and Crane. Rovaart, however, fails to cure the

many deficiencies of the combination of references in Grounds 1 and 2. First Petitioner’s proposed combination depends on Crane, which is not analogous art. Second, Ground 3 is premised on tortured readings of the applied references in an attempt to fashion together the claimed invention. Moreover, Petitioner fails to establish that its proposed combination discloses each and every limitation of the claims. For these reasons, Petitioner’s Ground 3 fails.

1. Petitioner fails to show Crane is analogous art

Petitioner’s Ground 3 relies on replacing Conrad’s animal blood with Crane’s recombinant heme proteins in order to arrive at a meat replica matrix recited in the claims. *See* Pet., 50-53. Like Grounds 1 and 2, Petitioner’s Ground 3 fails because Petitioner does not establish that Crane is analogous art under the proper legal framework. *See supra*, IV.A.1.

Accordingly, because Petitioner fails to show that Crane is analogous art to the ’306 patent, Petitioner’s obviousness ground necessarily fails. *See In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011) (“A reference qualifies as prior art for an obviousness determination under § 103 only when it is analogous to the claimed invention.”) (citations omitted). At a minimum, Crane’s status as non-analogous art undermines Petitioner’s rationale for obviousness because the petition fails to establish why a POSA would be motivated to look to Crane—a reference entirely unrelated to food products—for guidance on how to supplement a meat-like-food

product. *Klein*, 647 F.3d at 1350-1351, citing to *In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992) (“If [a reference] is directed to a different purpose, the inventor would accordingly have had less motivation or occasion to consider it.”).

2. Petitioner’s illogical combination of Rovaart, Conrad, and Crane is transparent hindsight

Notwithstanding Petitioner’s failure to establish Crane as analogous art, Petitioner’s purported reasons as to why a POSA would have been motivated to combine Rovaart, Conrad, and Crane to arrive at the claimed invention are premised on an illogical and unsubstantiated rationale. Petitioner’s analysis starts with a porous, soy-based food product of Rovaart that, by Petitioner’s own assertions, already imitates the flavor and texture of meat. *See Pet.*, 45-46. Petitioner then turns to Conrad’s “wheat meat,” a product designed to add bulk to actual meat, and its incorporation of blood to add color and flavor to the wheat-based extender. *Id.*, 47-50. Petitioner proposes incorporating that same blood to Rovaart’s soy-based porous product for the same purported reasons mentioned in Conrad, but Petitioner provides no explanation as to why a POSA would have sought to use a blood colorant meant for a wheat-filler for mixed meat like Conrad’s in a soy-based porous product like Rovaart’s. A further confounding feature underlying its combination is Petitioner’s subsequent abandonment of Conrad’s blood in favor of an entirely different substitute—the recombinant heme proteins disclosed in Crane, a molecular biology reference that says nothing about

food products. *See id.*, Pet., 50-53. As detailed below, the petition never grapples with any of these issues.

Simply put, rather than being based on an articulated rationale rooted logically in the prior art's teachings, Petitioner's combination is a litigation-driven claim mapping exercise that merely reconstructs the claimed invention through hindsight. Such a rationale is insufficient to establish obviousness and thus Petitioner's Ground 3 fails for this additional reason.

a) Petitioner's motivation to combine Rovaart and Conrad is deficient

Petitioner's combination first relies on the modification of Rovaart in view of Conrad. *See Pet.*, 47-50. While Petitioner contends that Rovaart discloses a soy-based porous product having a "fibrous structure analogous to the texture of meat and a meat flavour" (Pet., 46), Petitioner nevertheless asserts that a POSA would have turned to Conrad and sought to add heme-protein—*i.e.*, blood—to "achieve desirable meat-like properties." *See Pet.*, 49-50. Petitioner's reasoning, however, is unavailing because it fails to address and account for the distinct products and purposes of Rovaart and Conrad—a soy-based porous product on the one hand, and a wheat-based meat extender on the other—and fails to explain why a POSA would have sought a solution disclosed by one (the addition of blood) and applied it to the other.

First, Petitioner ignores the differences between the products disclosed in Rovaart and Conrad. For instance, Conrad is directed to a mixed meat product where, due to the general expense of meat itself, “some” of it is replaced with a meat replacement product made from wheat (*i.e.*, “wheat meat”). EX1013, 1:25-40. Because the wheat meat “has a brown-yellow color deriving partly from the brown bran and partly from the yellow gluten,” Conrad discloses that its “colour can advantageously be transferred into meat colour by adding thereto up to 15% by weight of blood” *Id.*, 4:3-8. Conrad also states that “[t]he addition of blood/hemoglobin further gives a desired taste improvement as it improves the meat flavour of the final product.” *Id.*, 4:13-16. Thus, Conrad is directed to the production of a wheat-based product designed to replace some portion of meat itself, thereby extending the meat and making the meat product cheaper. However, because Conrad is effectively diluting actual meat with a product that is decidedly not meat in terms of both color and taste, Conrad discloses adding in animal blood to the extender (*i.e.*, the “wheat meat”) to recover color and taste lost by the addition of the wheat to mixed meat.

Rovaart, on the other hand, is concerned with the production of expanded porous food products that already have a meat-like flavor, with Petitioner specifically pointing to its use of soybean flour as the protein element of its product. *See* EX1125, Abstract, 2:58-61 (“products obtained by the process in

accordance with the invention have a flavour of meat that is clearly more pronounced and fuller”); Pet., 46. Further, Rovaart expresses no desire to change or improve on the color of its products. Petitioner fails to explain why a POSA would have been motivated to modify Rovaart to “enhance” its meat flavor or color, when the reference itself already achieves a “more pronounced and fuller” meat flavor (EX101125, 2:58-61) and is unconcerned with color, in view of a reference that seeks to add blood to a meat-based product to recoup flavor and color lost by its extension with a non-meat-based product.

In other words, the references concern two different products directed to two different problems. *Personal Web Tech., LLC v. Apple, Inc.*, 848 F.3d 987 (Fed. Cir. 2017) (Board reversed where no adequate explanation of “how the combination of the [obviousness] references was supposed to work”) (original emphasis). Petitioner’s purported reasons for combining the two references fail to account for these differences and Petitioner fails to explain how a POSA would have understood Rovaart’s soy-based porous products as having the same problems in relation to flavor and color as Conrad’s wheat-based extender that Conrad seeks to solve with blood. Moreover, Petitioner ignores the component differences in the products themselves—one based on soy, the other based on wheat—and fails to explain how a POSA would have understood that any

improvement to flavor and color caused by the addition of blood to one type of product (wheat) would necessarily occur in the other (soy).

Petitioner's attempted explanation for how a POSA would have understood Rovaart's soy-based porous products as having the same problems in relation to flavor and color as Conrad's wheat-based extender further fail because it is based on a mischaracterization of Rovaart. In particular, Petitioner argues that "Rovaart also teaches methods of enhancing—not merely producing—meaty flavor, which a POSITA would recognize as advantageous." Pet., 48 (emphasis omitted).

However, Petitioner's argument relies on a selective reading of the background of Rovaart. See EX1125, 1:24-37. Rovaart only mentions flavoring agents in the background to *describe the deficiencies of the prior art* that utilizes flavoring agents. *Id.* In particular, previous methods required preparation of food products and then subsequent flavoring treatment. *Id.* In contrast to these previous methods, Rovaart specifically indicates that its method is distinguishable because it can impart meat-like flavor in a single operation *without the flavoring treatment step*. Therefore, upon a reading of Rovaart as a whole, a person of skill in the art would have no reason to complicate the simple production steps of Rovaart with the addition of a flavoring treatment, when the Rovaart product already has a "meat flavour."

Accordingly, for this reason, Petitioner’s rationale for combining Rovaart and Conrad fails to satisfy its burden in establishing a reasonable likelihood of success on the merits.

b) Petitioner’s motivation to further combine Rovaart and Conrad with Crane is deficient

Petitioner’s tortured analysis of the prior art to reach the claimed invention is further highlighted by its reliance on Crane. In particular, Petitioner’s Ground 3 relies on an additional step—not only would a POSA seek to add blood for purposed flavor and taste benefits to Rovaart’s products, the POSA would further be motivated to substitute that blood with an entirely different composition, namely, heme-containing proteins produced recombinantly using the methods disclosed in Crane. *See* Pet., 50-53. Petitioner provides three purported reasons for why a POSA would have further combined Crane with Rovaart and Conrad. *Id.* In addition to failing to establish Crane was analogous art (*see supra*, section IV.A.), each of Petitioner’s alleged reasons for combination is premised on mischaracterizations and strained readings of the applied references that fail to provide an objective-based rationale supporting a finding of obviousness.

Petitioner first asserts that a POSA “would be motivated to substitute Conrad’s conventionally-obtained hemoglobin with heme-proteins from alternative sources” because “obtaining blood from slaughtered animals incurs the same environmental consequences, expenses, and other ramifications as cultivating

animals for meat.” Pet., 50 (emphasis omitted). Yet, aside from its expert say-so, the references themselves do not support this viewpoint.

For example, Petitioner argues that “Conrad teaches or suggests this motivation, as Conrad teaches utilizing meat replicas in place of ‘animal meat’” (Pet., 50 (citing EX1013, 1:25-40)), but Petitioner mischaracterizes Conrad. As noted above, Conrad seeks to **add** “wheat meat” **into** meat itself, which Conrad states is beneficial from “a nutritional point of view and from a cost benefit point of view.” EX1013, 1:25-40. Conrad explains that the “nutritional” benefit of adding “wheat meat” to a meat product is to add fiber, while the “cost benefit” aspect is so that “costs can be lowered compared with a pure meat product” through its extension with the “wheat meat.” *Id.*, 1:28-49. Conrad provides no suggestion to avoid meat or meat-based products due to “reduce consumption of conventionally-sourced meat and animal products” as Petitioner suggests. Pet., 50. The same can be said for Petitioner’s primary reference, Rovaart, which expressly teaches inclusion of proteins that are of “animal” origin. EX1125, 1:8-13.

Petitioner’s reliance on Crane as also teaching or suggesting this motivation is likewise a hindsight-driven leap that is not supported by the reference. Pet., 50 (“Crane teaches using its recombinant heme-proteins in place of conventionally-sourced proteins.”) (citing EX1014, [0062]). The passage in Crane that Petitioner relies upon to support its assertion merely references the use of its recombinant

hemoglobin preparations “as effective and safe oxygen carriers as an alternative to blood transfusion.” EX1014, [0062]. However, Crane’s suggestion to use its recombinant hemoglobin preparations as an alternative to conventional **blood transfusions** provides no basis for suggesting that those same preparations would be suitable as replacements for animal-sourced components (*e.g.*, blood) in **food products** in order to avoid the consequences associated with “cultivating animals for meat.” Pet., 50. Petitioner’s attempt to link a suggestion to use recombinant hemoglobin as an oxygen carrier for blood transfusions to an untaught reason to use the same in food products is unsound and unsubstantiated.

For its second reason, Petitioner argues that a POSA would have been motivated to turn to Crane because “Conrad teaches avoiding conventionally-sourced meat due to its relative expense, and it teaches preparing its products with the aim of lowering costs of manufacture” and Crane “teaches that heme-proteins can be produced via a ‘simple and inexpensive method’....” Pet., 51 (emphasis in original omitted). Again, Petitioner mischaracterizes the references and makes an apples-to-oranges comparison.

In particular, Conrad’s discussion of “lowering costs” is in reference to the cost savings achieved by extending a meat product with a wheat-based product compared to the same product made from “pure meat.” EX1013, 1:28-49. Notably, this cost savings is achieved even **with** the inclusion of animal blood in

the wheat meat. *Id.*, 4:3-16. Thus, any implication by Petitioner that Conrad's mention of "lowering costs" somehow suggests avoiding meat entirely, or even animal-sourced ingredients generally, is misleading.

Moreover, Crane's reference to its "simple and inexpensive method" to achieve "high fidelity incorporation of heme into recombinantly overexpressed heme proteins" is in comparison to ***other methods of that type***. While Petitioner cites to certain paragraphs of Crane to support its generic reliance on "financial considerations," none of these passages actually make such a connection. Pet., 51 (citing EX1014, [0014], [0043], [0085]). For example, Crane compares its methods to other prior-art methods that address "heme incorporation into recombinant proteins" and explains that "[t]he present invention is directed to overcoming these and other deficiencies in the art." EX1014, [0004]-[0008]. In this sense, Crane explains "[t]he present invention is a straightforward and inexpensive method for high fidelity incorporation of heme into recombinantly overexpressed heme proteins." *Id.*, [0014]. Crane also describes that, in the context of its invention, "[f]ungal protein expression systems" are "more efficient and economical" compared to "mammalian expression systems" for recombinantly producing its proteins and, in particular "simple and inexpensive method of co-expressing ferrochelatase," fully incorporated heme proteins in *E. coli* may be effectively produced. *Id.*, [0043], [0085]. All of these passages are in relation to

the specific field in which Crane is focused: the production of recombinant heme-binding proteins in various cell culture systems. Apart from its unfounded reading of Crane, Petitioner provides no evidence that a POSA would have understood the recombinantly-produced heme-proteins of Crane would somehow “lower[] costs” relative to the naturally-occurring, animal-obtained blood used in Conrad.

As its third reason, Petitioner argues that “Crane’s heme-proteins can be purified, which is desirable for a commercial application such as Rovaart’s food product...” Pet., 51. But Crane makes no mention of incorporating its heme-proteins into food products. Simply because Crane’s heme-proteins “can be” purified (e.g., for blood transfusions) provides no rationale for combining Crane with Rovaart and Conrad. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (obviousness requires showing whether a POSA “not only could have made but would have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention”).

Finally, Petitioner contends a POSA “would be motivated to utilize Crane’s hemoglobin, myoglobin, or leghemoglobin in Rovaart’s products,” because a POSA “would expect doing so to contribute (1) desirable meat-like coloration, (2) desirable aroma/flavor, and (3) desirable meat-like nutrition.” Pet., 52 (emphasis omitted). Petitioner bases this assertion on the notion that “Crane’s recombinant hemoglobin is the same as Conrad’s hemoglobin. . .” *Id.* (emphasis omitted).

However, aside from conclusory expert testimony, neither Conrad nor Crane makes this connection. As Petitioner admits, Conrad utilizes “the ‘hemoglobin part’ of slaughtered-animal blood,” which a POSA “would understand to refer to red blood cells that comprise hemoglobin protein.” Pet., 11, citing to EX1013, 4:3-17. Petitioner provides no evidence supporting the contention that the recombinantly-produced, isolated heme proteins of Crane would have been viewed as equivalent to red blood cells that comprise hemoglobin protein of Conrad, such that a POSA would have expected the same properties of the latter to occur in the former and that the latter would impart the same effects when added to different products. *See Motif Foodworks, Inc. v. Impossible Foods Inc.*, IPR2022-00887, Paper 7 at 20 (rejecting Petitioner’s substitution of colorants because “Petitioner does not establish sufficiently that a [POSA] would have had reason to make that substitution or that using different types of colorants for such different products are interchangeable”).

Accordingly, for these reasons, Petitioner fails to establish that a POSA would have been motivated to combine Rovaart, Conrad, and Crane.

3. Petitioner fails to establish that a POSA would have had a reasonable expectation of success in combining Rovaart, Conrad and Crane

Petitioner contends a POSA “would be motivated to substitute Conrad’s blood-sourced hemoglobin with Crane’s recombinantly-produced heme-proteins, and reasonably expect success in doing so.” Pet., 50. As above for the combination of Conrad, Mottram and Crane, and aside from conclusory expert testimony, neither Conrad nor Crane makes this connection. Petitioner provides no evidence supporting the contention that the recombinantly-produced, isolated hemoglobin proteins of Crane would have been viewed as equivalent to the more complex blood or “red blood cells that comprise hemoglobin protein” of Conrad, such that a POSA would have expected the same properties of the latter to occur in the former. *See Motif Foodworks, Inc. v. Impossible Foods Inc.*, IPR2022-00887, Paper 7 at 20 (rejecting Petitioner’s substitution of colorants because “Petitioner does not establish sufficiently that a [POSA] would have had reason to make that substitution or that using different types of colorants for such different products are interchangeable”).

The evidence in the prosecution record of the ’306 patent supports the unpredictable effect of heme proteins on flavor and aroma. Citing to the Proulx Thesis (*see* EX1148, 2715, citing to EX2003), Patent Owner emphasized that food products with heme could be adversely affected by off-flavors and rancidity,

quoting Proulx’s work as recognizing that “[f]ortification [with] iron has a *potential negative effect on organoleptic quality* of maize products, in that soluble forms of iron can cause *oxidative rancidity*.” EX1148, 2715. Patent Owner submitted numerous declarations, including by Dr. Keith R. Cadwallader, who stated:

This is a significant discovery since a person having ordinary skill in the art would not have anticipated that the inclusion of a heme protein would have any beneficial effect on flavor. In fact, iron, and specifically heme iron, has been most often associated with *causing deleterious off-odor consequences in foods and especially meat products*.

Id., 2715-2716 (emphasis added). Petitioner’s own evidence in the record supports this. *See, e.g.*, EX1028, 70 (“In general, total iron was not a good indicator of beef flavor attributes”); *see also id.* (“[H]eme iron been thought to be a pro-oxidant that may influence meat flavor due to its reaction to produce radicals that can promote lipid oxidation in biological systems.”); EX1048, Abstract (“WOF (Warmed-Over Flavor) is catalyzed by the non-heme iron released from meat pigments during cooking.”).

A POSA, thus, would not have had a reasonable expectation of success of combining a heme iron-containing protein into a meat product without deleterious

effects, including off-flavors and off-odors, *see id.*, 2716, further emphasizing Petitioner’s hindsight exercise of mapping the prior art onto the ’250 patent claims.

Accordingly, for these reasons, Petitioner fails to establish that a POSA would have been motivated to combine Conrad and Crane with a reasonable expectation of success.

4. Petitioner fails to establish that the combination of Rovaart, Conrad, and Crane discloses each element of claim 1

In addition to its hindsight-based combination of the references, Petitioner also fails to sufficiently establish that the combination discloses each and every limitation of the challenged claims.

a) Petitioner fails to establish the combination of Rovaart, Conrad, and Crane discloses a meat replica matrix comprising “0.01%-5% (by weight of the meat replica matrix) of a non-animal heme-containing protein”

Claim 1 requires that the “meat replica matrix” comprises “a non-animal heme-containing protein.” Petitioner generally states that a “POSA would be motivated to substitute Conrad’s blood-sourced hemoglobin protein in Rovaart’s products with Crane’s purified leghemoglobin.” Pet., 47-48 (emphasis omitted). Petitioner, however, fails to establish that the relied-upon references disclose the claim limitation because Petitioner’s arguments are not commensurate with its proposed combination, which relies on the *modification* of Rovaart’s products in view of Conrad and Crane.

In support of its combination, Petitioner argues that “Rovaart [] teaches methods of **enhancing**—not merely producing—meaty flavor, which a POSITA would recognize as advantageous.” Pet., 48 (original emphasis). Indeed, Petitioner’s own obviousness arguments propose adding animal heme-containing protein to improve the meat flavor of Rovaart’s product. In particular, Petitioner proposes the addition of a “heme-containing protein” that would “further enhance Rovaart’s products’ meaty flavor” based on Conrad, which discloses the addition of **animal** blood/hemoglobin that would “improve[] the meat flavour of the final product.” *Id.*, 51 (citing EX1013, 4:3-17) (emphasis omitted). Rovaart, however, does not exclude animal proteins, stating that its food products “are generally prepared...from substances rich in protein of plant, **animal** or microbial origin.” EX1125, 1:5-13 (emphasis added).

Petitioner’s unwillingness to address, or even acknowledge, the references as a whole and their teachings as part of the proposed combination further showcases Petitioner’s failure to establish that the applied references disclose a meat replica matrix that has “a non-animal heme-containing protein.”

Accordingly, for this reason, Petitioner’s Ground 3 fails.

b) Petitioner fails to establish the combination of Rovaart, Conrad, and Crane discloses “0.01% %-5% (by weight of the meat replica matrix) of a non-animal heme-containing protein”

Petitioner asserts that Conrad teaches “adding ‘up to’ about 5% heme-protein by weight.” Pet., 49. Petitioner’s assertion is unsubstantiated and based on a mischaracterization of Conrad’s grain/wheat meat product as a meat replica matrix. section IV.A.4.a, *supra*.

Conrad does not teach the addition of heme-protein per se, much less 0.01%-5% by weight heme-protein, to its grain/wheat meat. Rather, Conrad teaches adding ***blood or the “hemoglobin part*** of whole blood from slaughtered animals” (emphasis added) to its grain/wheat meat replacement product. See EX1013, 1: 56-61; 4: 3-17. Petitioner recognizes that the “hemoglobin part” of whole blood recited in Conrad is ***not hemoglobin*** itself, asserting that the “hemoglobin part” instead refers to red blood cells that comprise hemoglobin protein. Pet., 21. Petitioner then sets forth a series of calculations to identify how much heme-protein may be present in the blood, or the “hemoglobin part” of blood in Conrad, based on unsubstantiated calculations a “POSITA would understand,” rather than explicit teachings of an amount of heme-containing protein in Conrad. See Pet., 21-23. Thus, Petitioner fails to show that the blood or “hemoglobin part” of the blood of Conrad necessarily satisfies the “0.01%-5% (by weight of the meat replica matrix)” limitation. This oversight undermines Petitioner’s assertions that Conrad

discloses this limitation. *Par Pharm. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir. 2014) (inherency cannot be established “by probabilities or possibilities”).

Accordingly, Petitioner’s Ground 3 fails for this additional reason.

- c) **Petitioner fails to establish the combination of Rovaart, Conrad, and Crane discloses “upon cooking of the meat replica matrix, at least two volatile compounds are generated that are associated with a beef-like aroma”**

Claim 1 also recites that, upon cooking of the meat-replica matrix, “at least two volatile compounds are generated that are associated with a beef-like aroma.”

Petitioner relies on Rovaart for this limitation, arguing that a POSA “would recognize [that] heating the Rovaart products will *naturally generate* at least two compounds associated with beef-like aroma.” Pet., 53 (emphasis added).

Petitioner’s argument fails because, in addition to failing to address what is disclosed by the proposed combination, Petitioner’s contentions rely on inherency, which Petitioner fails to establish.

Petitioner relies solely on Rovaart as allegedly disclosing the claim element. To be clear, however, Rovaart does not expressly disclose “upon cooking of the meat replica matrix, at least two volatile compounds are generated that are associated with a beef-like aroma,” nor does Petitioner contend otherwise. Instead, Petitioner’s arguments are based on inherency, but Petitioner fails to reach the high

threshold of establishing inherency in obviousness, which requires a showing that the claimed volatile compounds will be **necessarily** present as a result of the **combined** references' disclosure. See *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (inherency requires showing that a characteristic would necessarily be present in disclosure); *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1369 (Fed. Cir. 2012) (requirement that the claimed property be "necessarily present" in the prior art); *In re Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981) (Inherency "may not be established by probabilities or possibilities," and "[t]he mere fact that a certain thing *may* result from a given set of circumstances is not sufficient."); *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1195 (Fed. Cir. 2014) (Inherency is a "high standard," that is "carefully circumscribed in the context of obviousness.").

First, Petitioner's inherency showing fails to meet the requisite standard because Petitioner's arguments focus on Rovaart alone, which is not the relevant analysis. Petitioner's ground is premised on the **combined product** of Rovaart, Conrad, and Crane, and Petitioner fails to provide any argument or support that a POSA would recognize that the combined product would necessarily produce "at least two volatile compounds [] associated with a beef-like aroma." Whether or not Rovaart's products in isolation would produce the claimed compounds is irrelevant because Petitioner is ultimately proposing modification to those

products, and it is these combined products that Petitioner must show will ***necessarily*** produce the claimed volatile compounds.

Furthermore, even if Rovaart is considered in isolation, Petitioner ignores the language of the claims, which recite that the volatile compounds “have a beef-like ***aroma***.” Instead, Petitioner equates discussion of “flavors” in Rovaart with the claimed “aroma” to support its contention that “heating the Rovaart products will naturally generate at least two compounds associated with beef-like aroma.” Pet., 53-54 (citing Example 2 as “a product having the flavour of boiled beef (emphasis omitted)); *id.* (citing Example 4 as having a “boiled beef ‘flavour’” similar to that of roast beef (emphasis omitted)). Yet Petitioner provides no explanation or evidence to the assumption that a “meat-like flavor” is the same as the claimed “beef-like aroma.”

Petitioner’s flawed inherency argument also conflates Rovaart’s manufacturing process, which subjects its food mixtures to high temperatures and increased pressure, with cooking the meat replica matrix as claimed. *See* Pet., 53. Rovaart discloses that its “mixture is preferably heated at a temperature of between 160° and 180°C under a pressure of the order of 5 to 150 atmospheres.” EX1125, 2:63-65. Elsewhere, Petitioner acknowledges that “heating [Rovaart’s composition] at a temperature below 150°C,” *i.e.*, cooking temperature, “does not produce the desired flavor.” Pet., 48 (quoting EX1125, 2:46-51). Petitioner fails

to demonstrate that Rovaart’s manufacturing process, performed under high temperatures and increased pressures, demonstrates that “cooking” the proposed modified products necessarily process the required volatile compounds with a “beef-like aroma.”

Accordingly, Petitioner’s Ground 3 fails for this additional reason.

5. Petitioner’s challenge of independent claim 13 under Ground 3 also fails

Petitioner relies on the same arguments for independent claim 13 as raised for claim 1 in asserting the obviousness of claim 13 over Rovaart, Conrad and Crane. Pet., 60-61. Accordingly, for the same reasons provided above with respect to claim 1, Petitioner’s Ground 3 also fails with respect to claim 13.

6. Petitioner’s challenge of dependent claims 3-8, 10-12, 15-20, and 22-23 under Ground 3 fails

Dependent claims 3-8, 10-12, 15-20, and 22-23 depend from either independent claims 1 or 13. As such, Petitioner fails to establish the obviousness of these claims over Rovaart, Conrad and Crane for the same reasons identified above with respect to claims 1 and 13.

D. Ground 4 Fails

Petitioner relies on the same arguments in Ground 4 for claims 1, 3-8, 10-13, 15-20, and 22-23 as for Ground 2 and Ground 3. Pet., 61-62 (“For the same reasons explained above in Ground 2 (§VII, supra), a POSITA would be motivated to substitute Proulx’s soybean-sourced leghemoglobin for Crane’s recombinant

leghemoglobin in each of the challenged claims of Ground 3, with a reasonable expectation of success.” Proulx discusses iron fortification with soybean leghemoglobin in flour tortillas, a reference that was vetted in this and related patents and patent applications.⁴

Given the above, Petitioner fails to establish the obviousness of the challenged claims under Ground 4 for the same reasons given above with respect to Ground 3. That is, the combination with Proulx continues to suffer from: 1) Petitioner’s illogical combination of and lack of motivation to combine Rovaart and Conrad (section IV.C.2.a, *supra*); 2) Petitioner’s lack of motivation to combine

⁴ The Examiner stated in the Notice of Allowance for the ’250 patent that “[w]hile Proulx et al. provides motivation to include leghemoglobin, a non-animal heme-containing protein, in a foodstuff, the reference is silent with respect to the influence of heme-containing protein on beef associated flavor.” EX1149, 753-754; *see also* EX1148 (’306 patent), 3267; EX1150 (’241 patent), 1270-1271; EX1002 (’096 patent), 1180 (“Note, while Proulx et al. [disclose] that hemoglobin from soy root nodules (i.e. non-animal heme-containing protein) is a good source of bioavailable iron and can be used as a food forticant, there is no motivation to include the forticant, in combination with the claimed sugars and amino acids to produce meat associated flavors.”).

Rovaart and Conrad, and now Proulx (section IV.C.2.b, *supra*); 3) Petitioner’s lack of a reasonable expectation of success in combining Rovaart and Conrad, and now Proulx (section IV.C.3, *supra*) and 4) Petitioner’s failure to establish that the combination of Rovaart, Conrad and now Proulx, discloses each element of the claims (sections IV.C.4.a-b, *supra*). Indeed, Petitioner’s attempt to equate Conrad’s “red blood cells that comprise hemoglobin protein” to Proulx’s “plant-sourced leghemoglobin” is even further afield, and Petitioner points to no basis in the references that a POSA would have expected Proulx’s “plant-sourced leghemoglobin” to provide the same benefits identified by Conrad with its addition of “red blood cells that comprise hemoglobin protein.” Petitioner’s additional reliance on Proulx’s alleged teaching regarding the improved bioavailability of heme iron compared to nonheme iron (Pet., 40, Ground 2) is also inapt as Conrad already includes a heme-containing protein to its wheat meat, which is then added to a meat product.

For these reasons, Petitioner’s combination continues to be a litigation-driven claim mapping exercise that merely fashions the claimed invention through hindsight. Such a rationale is insufficient to establish obviousness and thus Petitioner’s Ground 4 also fails for this reason.

E. Ground 5 Fails

Ground 5 relies on the combination of Conrad, Mottram, Crane/Proulx, and Boye for allegedly rendering obvious dependent claims 8-9 and 20-21. Claims 8-9 and 19-20 depend from independent claims 1 and 13, respectively. As such, Petitioner fails to establish the obviousness of these claims over the combination of Conrad, Mottram, Crane/Proulx, and Boye, for the same reasons identified above with respect to claims 1 and 13.

F. Ground 6 Fails

Ground 6 relies on the combination of Rovaart, Conrad, Crane/Proulx, and Boye for allegedly rendering obvious dependent claims 8-9 and 20-21. Claims 8-9 and 19-20 depend from independent claims 1 and 13, respectively. As such, Petitioner fails to establish the obviousness of these claims over the combination of Rovaart, Conrad, Crane/Proulx, and Boye, for the same reasons identified above with respect to claims 1 and 13.

V. INSTITUTION SHOULD BE DENIED UNDER § 325(D)

Separately, the Board should deny institution under § 325(d) because Petitioner relies on substantially the same prior art or arguments previously considered by the Office, and Petitioner fails to show that the Office materially erred.

A two-part analysis applies to the Board's authority to deny institution under § 325(d). *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*,

IPR2019-01469, Paper 6 at 9-10 (precedential). First, the Board considers whether “the same or substantially the same” art or arguments were previously presented to the Office. *Id.*, 8. If either is met, the Board then considers whether the petition demonstrates that the Office “erred in a manner material to the patentability of the challenged claims.” *Id.* In applying the two-part framework, the Board considers several nonexclusive factors set forth in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17-18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first paragraph).

The Board should exercise its discretionary powers under § 325(d) for two reasons: 1) the art asserted in the petition is substantially the same as what was asserted by the Examiner during prosecution; and 2) the Examiner pursued the same line of arguments asserted by Petitioner, which Patent Owner overcame through extensive declarations and evidence presented during prosecution.

A. Petitioner Presents Substantially the Same Art and Arguments Previously Considered by the Office

While Petitioner admits that secondary references Mottram and Proulx were before the Examiner, and that Proulx was cited by the Examiner during prosecution, Petitioner asserts that “during prosecution of the parent ’970 application, PO did not persuade the Examiner that combinations with Proulx were non-obvious.” Pet., 70-71 (citing EX1148, 3267). This is non-sensical, and further evidence of the consistent mischaracterizations by Petitioner. Evidence that

Proulx was overcome as part of an obviousness combination is in the Examiner's "Reasons for Allowance" for the parent '306 patent cited by Petitioner: The combination of Proulx and Hseih et al. "is silent with respect to the influence of heme-containing protein on beef-associated flavor." EX1148, 3267. **Proulx has been consistently cited as prior art during prosecution, and consistently overcome in obviousness rejections, in the '306 patent and related applications.** See EX1148, 3267; EX1149 ('250 patent), 753-754; EX1150 ('241 patent), 1270-1271; EX1002 ('096 patent), 1180. The reasons for allowance in related U.S. Patent 9,943,096 stated: "Note, while Proulx et al. [disclose] that hemoglobin from soy root nodules (i.e. non-animal heme-containing protein) is a good source of bioavailable iron and can be used as a food fortificant, ***there is no motivation to include the fortificant, in combination with the claimed sugars and amino acids to produce meat associated flavors.***" EX1002, 1180 (citations omitted) (emphasis added). To state that Proulx was not overcome during prosecution is wrong.

Petitioner's arguments with regards to Conrad's meat replacement product is also substantially the same as what the Office relied upon with the Hseih reference (US 2012/0093994; EX2010), which the Examiner described as "disclos[ing] structured plant protein products having protein fibers that are substantially aligned and having a desirable meat-like moisture, texture, mouthfeel, flavor and color."

EX1148, 3267.⁵ For example, the Examiner relied on Hseih for “disclos[ing] structured plant protein products having protein fibers that are substantially aligned and having a desirable meat-like moisture, texture, mouthfeel, flavor and color.” EX1148, 3267. Specifically, the Examiner looked to Hseih as providing “a flavoring agent including animal meat flavor, it follows that the structured plant protein product would exhibit, upon cooking, meaty flavor notes.” *Id.*, 2126. Petitioner’s arguments with regard to Conrad and Rovaart thus mirror what the Examiner already considered during prosecution.

Similarly, the use of Cerny (Agric. Food Chem., 2003, vol. 51, 2714-2721; EX2011) by the Examiner mirrors Petitioner’s Mottram reference, including that Cerny “teaches that the Maillard reaction plays a substantial role in flavor generation during the cooking of meat. Cerny et al. teach that besides, thiamine, the precursors ribose and cysteine are important for meat aroma and are consequently employed in the product of meat flavors.” EX1148, 3268; *cf.* Pet., 14 (describing Mottram as “teach[ing] ‘[t]he characteristic flavour of cooked meat deriv[ing]...principally [from] the Maillard reaction...”).

⁵ Compare with Petitioner’s description of Conrad as “‘a meat replacement product’ ... provid[ing] ‘advantageous[.]...meat colour’ and ‘desired taste improvement as it improves the meat flavour of the final product.’” Pet., 13.

Petitioner also advances substantially the same theories in combining Conrad, Rovaart, and Mottram with the asserted secondary references Crane and Proulx.

Thus, the first part of the *Advanced Bionics* test is satisfied because “the same or substantially the same” art and arguments were previously presented to the Office.

B. Petitioner Fails to Demonstrate that the Office Materially Erred

Prosecution of the '306 patent, the parent patent to the '250 patent, underwent numerous rejections, with the Examiner relying on Hseih, Proulx and Cerny for substantially the same reasons as Petitioner here. The Examiner's notice of allowance over the cited references referenced the extensive evidence submitted by Patent Owner to overcome the rejections, including six declarations by Patent Owner: Dr. Keith Cadwallader (EX2004), commenting on the prior art's disclosure of heme iron as associated with oxidation reactions, producing off-flavors in meat products (*id.*, 2715-2716); two declarations from Dr. Celeste Holz-Schietinger (EX2005 and EX2006), reporting on the novel volatile compounds produced with the combination of a heme protein (leghemoglobin) and the sugar/sulfur compound combination ribose and cysteine (*id.*, 2717-2718); Dr. Devin Grant Peterson (EX2007), commenting on the potency of the volatile compounds produced with the heme protein-ribose-cysteine combination (*id.*,

2721); Dr. S. Christopher Davis (EX2008), commenting on heme protein testing; and Dr. David Lipman (EX2009), commenting on the diversity of heme-containing proteins (*id.*, 2721-2722). Nothing in the Petition addresses the numerous unexpected results presented by Patent Owner during prosecution, including that the inclusion of heme-containing protein can contribute to off-flavors in meat. See sections IV.A.3 and IV.C.3, *supra*. Petitioner's conclusory argument that the Examiner did not have benefit of its expert testimony is inapplicable given the failure of Petitioner's arguments as detailed above. In any case, the submission of a declaration is not *per se* sufficient to transform Petitioner's substantially similar arguments into a new ground. *Sensata Technologies Inc. v. Danfoss Power Solutions Inc.*, IPR2017-02069, Paper 8, 16-17 (2018) (denying institution).

Petitioner's obviousness grounds under various combinations of Conrad, Rovaart, Mottram, Crane and Proulx are just a farther removed re-hash of the same rationale to combine Hseih, Cerny and Proulx as was advanced by the Examiner. For these reasons, this Board should exercise its discretionary powers under § 325(d) and deny institution.

VI. CONCLUSION

Accordingly, for at least the reasons set forth above, institution of *inter partes* review should be *denied*.

Respectfully submitted,

Date: March 20, 2023

/ Michael T. Rosato /

Michael T. Rosato, Lead Counsel

Reg. No. 52,182

CERTIFICATE OF COMPLIANCE

Pursuant to §42.24(d), the undersigned certifies that this paper contains no more than 14,000 words, not including the portions of the paper exempted by §42.24(b). According to the word-processing system used to prepare this paper, the paper contains 13,248 words.

Respectfully submitted,

Date: March 20, 2023

/ Michael T. Rosato /
Michael T. Rosato, Lead Counsel
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VII. APPENDIX

EXHIBIT NO.	DESCRIPTION
2001	Request for Certificate of Correction, Certificate of Correction and Petition to Accept Unintentionally Delayed Benefit Claims Under 37 C.F.R. §§ 1.78(c) and 1.78(e) for US Patent No. 9,700,067 and US Patent No. 10,172,381
2002	Goldfine, “A brief history of Impossible Foods: how ‘bleeding’ plant-based burgers started a food industry trend,” The Business of Business, https://www.businessofbusiness.com/articles/impossible-foods-plant-based-burgers-milk-food-industry-trend-data/ , Last Accessed July 27, 2022
2003	Proulx, “Diversified strategies for improving iron bioavailability of maize” Ph.D. Thesis, Iowa State University, 2007
2004	Declaration of Dr. Keith Cadwallader, excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2005	Declaration of Dr. Celeste Holz-Schietinger (dated December 2, 2016), excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2006	Declaration of Dr. Celeste Holz-Schietinger (dated August 17, 2017), excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2007	Declaration of Dr. Devin Grant Peterson, excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2008	Declaration of Dr. S. Christopher Davis, excerpt from ’306 patent prosecution file history, submitted October 17, 2017

2009	Declaration of Dr. David Lipman, excerpt from '306 patent prosecution file history, submitted October 17, 2017
2010	U.S. Patent Publication No. 2012/0093994 to Hseih et al.
2011	Cerny, "Formation of aroma compounds from ribose and cysteine during the Maillard Reaction" <i>J. Agric. Food Chem.</i> 51:2714-2721 (2003)
2012	File History of U.S. Provisional Application 61/671,069 filed on July 12, 2012.
2013	G. Reineccius, Flavor Chemistry and Technology"2 nd Ed., 2006, Chap. 7, " <i>Off-Flavors and Taints in Foods</i> ", p.161-199

CERTIFICATE OF SERVICE

I certify that the foregoing Patent Owner's Preliminary Response and Exhibits 2001-2013 were served on this 20 day of March, 2023, on the Petitioner at the following electronic service addresses:

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