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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KARL DEISSEROTH, VIKAAS SOHAL, and LISA GUNAYDIN

Appeal 2019-006462
Application[1] 13/882,566
Technology Center 1600

Before RICHARD M. LEBOVITZ, FRANCISCO C. PRATS, and RACHEL H. TOWNSEND, *Administrative Patent Judges*.

TOWNSEND, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a method of identifying a candidate compound for treating psychosis, which have been rejected for non-enablement. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

STATEMENT OF THE CASE

Schizophrenia involves psychotic behavior and impaired cognition. (Spec. 1.) "It is widely believed that dysfunction of the prefrontal cortex (PFC) underlies many of the most debilitating aspects of schizophrenia."

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as The Board of Trustees of the Leland Stanford Junior University. (Appeal Br. 3.)

(*Id.*) "Identifying and understanding the neural pathways linked to psychosis-related patterns of activity within the PFC region may aid in the discovery of pharmacological therapies to treat patients with schizophrenia." (*Id.*) "[T]here remains a need for a useful animal model system for schizophrenia that would allow for identification of these intricate neural pathogenic pathways." (*Id.*) Such a model "would allow for screening and identification of pharmacological therapies that improve the pathogenic patterns of neural activity that contribute to the symptoms of schizophrenia." (*Id.*) Appellant's invention is directed to an animal model for psychosis and its use in screening a compound that may be used for treating psychosis. (*Id.*)

Claims 13–16, 51, 52, 54–61, and 63–69 are on appeal. Claim 13 is representative and reads as follows:

> 13. A method of identifying a candidate compound for treating psychosis, the method comprising:
>
> a) exposing layer V pyramidal neurons in the prefrontal cortex of a rat or mouse to light, wherein a subset of layer V pyramidal neurons express on their cell membrane a light-responsive depolarizing opsin, wherein the light-responsive depolarizing opsin comprises an amino acid sequence having at least 90% amino acid sequence identity with the amino acid sequence set forth in one of SEQ ID NOs: 1-7, and wherein exposure of the subset of layer V pyramidal neurons to light induces depolarization of the membrane and induces a psychotic state in the rat or mouse;
>
> b) administering the compound to the rat or mouse having the induced psychotic state; and
>
> c) measuring a psychotic state of the rat or mouse before and after administering the compound, wherein a decrease in

> the psychotic state indicates that the compound is a candidate for treating psychosis.

(Appeal Br. Claims Appendix i.)

The following ground of rejection by the Examiner is before us on review:

Claims 13–16, 51, 52, 54–61, and 63–69 under 35 U.S.C. § 112 first paragraph as not being enabled.

DISCUSSION

The Examiner finds that Appellant's Specification enables "identifying a compound that decreases depolarization of the membrane of a layer V pyramidal neuron in the prefrontal cortex" where the method employs "a mouse that expresses an exogenous nucleic acid sequence encoding a channel rhodopsin 2 (ChR2) on the membrane of a layer V pyramidal neuron in the prefrontal cortex" where "the ChR2 has an amino acid sequence that is at least 90% identical to the amino acid sequence of SEQ ID NO: 1[–]7." (Ans. 3.) The Examiner asserts that the Specification does not provide enablement for

> 1) exposing the mouse/rat to light such that psychosis is induced,
>
> 2) using the mouse/rat to screen for compounds that treat any symptom of psychosis other than the depolarization of the pyramidal neuron membrane,
>
> 3) making/using any layer V pyramidal neurons in the prefrontal cortex of a mouse or rat that express a light responsive opsin having any structure as broadly encompassed by claim 13 other than genetically modified mice made by transgenesis or gene therapy,

> 4) the specific combination of "light-responsive depolarizing opsin" and "exposure to light" encompassed by claim 13 that "induces psychosis" or
>
> 5) using the method to study the role of ChR2 or any other light-sensitive opsin in psychosis or depolarization.

(Ans. 4 (paragraphing added).)

Regarding categories 1, 2, 4, and 5, as to the term "psychosis," the Examiner finds it:

> is as narrow as decreased socialization in an open field test (a behavioral measurement as in claim 15) or depolarizing neurons of the prefrontal cortex (a cellular measurement as in claim 15). The concept encompasses causing hallucinations, breaks with reality, a change personality, delusions, violence, or paranoia - or all of the aforementioned symptoms in the rat/mouse. The concept of "inducing psychosis" is also a broad umbrella for inducing schizophrenia, bipolar disorder, or drug use.

(Ans. 5 (emphasis omitted).)

In arriving at the conclusion of non-enablement as to the claimed animal model for psychosis, the Examiner reviewed the state of the art of rat/mouse models in optogenetics and concluded that of the five articles that were considered, they

> did not teach the rats/mice had psychosis, symptoms associated with psychosis, schizophrenia, bipolar disorder, drug use, decreased polarization of neurons in the prefrontal cortex, decreased exploration in an open field test, or any other cellular or behavioral measurements associated with psychosis.

(Ans. 5–7.)

The Examiner further finds that "[i]t was unpredictable how to obtain a rat/mouse that models the genus of psychosis, or the species of schizophrenia or bipolar disorder within the genus of psychosis." (*Id.* at 7.) The Examiner arrives at this conclusion primarily because

a) one prior art article indicated that "the precise etiologies of the human schizophrenia" are not yet understood and "[j]ust as patients do no [sic] not manifest every possible symptom of the disease, an animal model will not necessarily exhibit all symptoms of the disease," and

b) a second prior art article, which studied depolarization of the membrane of layer V pyramidal neurons in prefrontal cortex of guinea pigs," although finding "the prefrontal cortex was associated with psychosis . . . did not teach depolarization of neurons in the prefrontal cortex was equivalent to a psychotic state." (*Id.* at 8 (emphasis omitted).)

The Examiner further finds that it was "unpredictable how to use a rat/mouse that has any behavioral or cellular abnormality, specifically decreased exploration in an open field test and depolarized neurons in the prefrontal cortex, as a model of psychosis, or of schizophrenia or bipolar disorder within the genus of psychosis." (Ans. 9.) The Examiner arrives at this conclusion because the Examiner concludes that "decreased exploration in an open field test and depolarized neurons in the prefrontal cortex" does not meet the standard in the prior art of "obtaining a reasonable number of features of psychosis." (*Id.*) The Examiner points to prior art that "shows that a behavioral response such as decreased exploration in an open field test is generic and may be caused by 'altered expectations of reward or punishment.'" (*Id.* at 10.) Thus, the Examiner finds that "[d]ecreased social exploration is generic to numerous disorders that affect motor function, cognitive function, neuropsycho pathways" and "does not represent the genus of 'psychosis' required in claim 13." (*Id.* at 12.)

Against that backdrop, the Examiner then addresses the teachings in the Specification. (Ans. 11.) The Examiner notes that the Specification

exemplifies a single mouse model: a transgenic mouse that expresses ChR2. (*Id.*) The Examiner further finds that "[t]he specification asserts the mice have psychotic behavior (pg 31, line 29) and can be used to model schizophrenia (pg 33, line 12)." (*Id.*) The mice in Example 1 were found to have "decreased exploration in open field testing (pg 33, lines 1-4)" and depolarization assays were performed. (*Id.*)

The Examiner finds that Example 2 of the Specification describes measuring the effect of a compound on depolarization or open field tests on mice after exposing their prefrontal neurons to light. (Ans. 11.) As to Example 3, the Examiner finds similar measurements to Example 2 were carried out, but were made after administering PCP to the mouse and exposing the prefrontal neurons to light and then administering compounds to determine the effect of the compound. (*Id.*)

Further, regarding Example 3, the Examiner finds "applicants fail to correlate the mouse to psychosis, specifically psychosis found after drug use as encompassed by claim 13." (Ans. 13.)

The Examiner finds that while "[p]aragraph[s] 84, 109, [and] 111 assert disrupting social exploration in an open field test correlates to psychosis or schizophrenia," those paragraphs:

(a) "fail to provide adequate guidance that the decreased exploration in an open field test observed in Examples 1 or 3 is a result of psychosis and not a result of expectations of reward or punishment" (Ans. 13),

(b) "fail to provide adequate guidance that the decreased exploration in an open field test observed in Examples 1 or 3 correlates to a reasonable number of symptoms of psychosis as required by claim 13" (*id.*),

(c) "fail to provide adequate guidance that administering PCP and observing decreased exploration in an open field test observed in Example 3 correlates to a reasonable number of symptoms of psychosis as required by claim 13" (*id.*), and

(d) "fail to correlate decreased exploration in an open field test to hallucinating, breaking with reality, changing personality, delusions, violence, paranoia" (*id.* at 13–14).

The Examiner concludes that Appellant's Specification "fail[s] to provide adequate guidance that the decreased exploration in an open field test observed in Examples 1 or 3 is a result of psychosis and not a result of expectations of reward or punishment." (Ans. 12.) The Examiner further concludes that Appellant's Specification "fail[s] to provide adequate guidance that the decreased exploration in an open field test and the depolarization of prefrontal neurons observed in Examples 1 or 3 correlates to a reasonable number of symptoms of [any] psychosis as required by claim 13." (*Id.*) Consequently, the Examiner concludes that "[t]he claims should be limited to assaying the depolarization of prefrontal neurons." (*Id.* at 14.) The Examiner also finds that the lack of correlation, combined "with the unpredictability in art at the time of filing, the field of optogenetics, and the limited teachings in the specification," that the Specification "does not enable measuring any 'psychotic state' in the rat/mouse or identifying compounds that treat any symptom of psychosis other than the depolarization of the pyramidal neuron membrane as broadly encompassed by the claims." (*Id.* at 14–15.)

Regarding lack of enablement category 3 (i.e., expression of an opsin having at least 90% identity to the claimed sequences on the membrane of

the neurons in the prefrontal cortex), the Examiner finds the following. First, the Examiner finds that the claim requires "that at least some of the neurons [in layer V pyramidal neurons in the prefrontal cortex] express a light responsive depolarizing opsin that is at least 90% identical to SEQ ID NO: 1–7 on their cell membrane." (Ans. 16.) The Examiner also finds that the claims include a rat/mouse that endogenously expresses the opsin. (*Id.*)

The Examiner finds that the prior art "was limited to a rat/mouse with neurons comprising an exogenous sequence" encoding ChR2, and Appellant "do[es] not teach any endogenous rat/mouse proteins" that meet the claimed limitations. (Ans. 18.) According to the Examiner, the prior art teaches that "the promoter required to obtain the desired expression of ChR2 in the desired target neuron was unpredictable." (*Id.* at 10.) And the Examiner finds Appellant "do[es] not teach how to express an opsin having at least 90% identity to algae ChR2 of SEQ ID NO: 1-7 on the membrane of the neurons in the prefrontal cortex of rats/mice without genetic modification." (*Id.* at 18.)

Regarding lack of enablement category 4 (the specific combination of "light-responsive depolarizing opsin" and "exposure to light" encompassed by claim 13 that "induces psychosis"), the Examiner finds that the Specification lacks an adequate description of the "claimed model psychosis upon exposure to any 'light'." (Ans. 19–20.) The Examiner further finds that Appellant has

> left those of skill to determine the specific combination of opsin expressed by the Thy1 promoter and light conditions required to induce psychosis or the amount of opsin, promoter specificity and light conditions required to induce psychosis as claimed . . . [and] left those of skill to determine other

> promoters (if any) that provide adequate expression levels and tissue specificity required to induce psychosis.

(*Id.* at 20.)

We agree with the Examiner that the full scope of Appellant's claims are not enabled. However, we agree only as to a narrow point raised by the Examiner regarding the scope of Appellant's claims, namely, that Appellant has not enabled the method without the use of the transgenic mouse described in Example 1 of the Specification.

The Specification

"To quantify cognitive impairment and negative symptoms characteristic of schizophrenia," Example 1 of the Specification describes optical stimulation of a mouse that has been transgenically modified to express channel rhodospins-2 (ChR2) in layer V pyramidal neurons within the prefrontal cortex. (Spec. 32 (Example 1 ("the well-established Thy1::ChR18 transgenic mice").) The optical stimulation "was achieved by unilateral optical fiber placement above the infralimbic prefrontal cortex." (*Id.*) And "[t]o quantify cognitive impairment and negative symptoms characteristic of schizophrenia, social exploration was measured in these mice and for assessment of positive-like symptoms, disorganized or catatonic behavior including stereotyped movements and rigidity were measured." (*Id.*)

The Specification reports that "relatively modest optical stimulation (470 nm, 0.4 mW, 5 msec @ 10 Hz) was sufficient to markedly disrupt social exploration without affecting normal locomotion." (Spec. 32.) In addition, it is reported that "[i]ncreasing the frequency of stimulation (470 nm, 0.4 mW, 2.5 msec @ 40 Hz) almost completely abolished social behavior and elicited a variety of catatonic like behaviors," namely

"increased time spent in a catatonic-like rigid posture" as well as "increased time spent engaging in repetitive side-to-side head movements." (*Id.* at 32–33.) The Specification indicates that "[t]hese results further validate the idea that aberrant activity in layer V pyramidal neurons in the PFC can contribute to schizophrenia-like behaviors" and "demonstrate that optical stimulation of ChR2-expressing layer V pyramidal neurons in the Thyl::ChR2-EYFP mouse line allows this mouse to be used as an animal model for schizophrenia." (*Id.* at 33.)

Example 2 of the Specification describes analysis of Thy1::ChR2 mice prefrontal brain slices for "network activity evoked by light in the presence or absence of quinpirole [a dopamine receptor 2 agonist] followed by treatment with known D2 [dopamine receptor 2] antagonists." (Spec. 33.) It is noted that "D2 receptors play a key role in schizophrenia, and the D2 agonist quinpirole, elicits schizophrenia-like behaviors in animals." (*Id.*) The experiments were undertaken "[t]o explore processes by which pharmacologic manipulations relevant to schizophrenia could affect these layer V pyramidal neurons in the PFC." (*Id.*) The neurons were monitored by electrophysiological recordings for cellular responses to trains of light flashes. (*Id.*) It was found that "the effects of D2 agonists and antagonists appeared to reflect effects on repetitive action potentials." (*Id.* at 34–35.) In particular, "D2 activation with quinpirole (purple trace) enhanced the spike afterhyperpolarization" whereas "D2 blockade with sulpiride [D2 antagonist] widened action potentials." (*Id.* at 35.) It was confirmed that the activity dependent depolarization was mediated by D2 receptors because it could be elicited with various doses of the D2 agonist quinpirole and

blocked by using the antipsychotic haloperidol, as well as the D2 antagonist sulpiride. (*Id.* at 36.)

In addition, in Example 3, it was determined that L-type Ca^{2+} ion channels were involved in the activity-dependent depolarization. (Spec. 36–38.) In that Example, PCP activity-dependent depolarization effects were not blocked by the D2 antagonist sulpiride, but were blocked by the L-type Ca^{2+} channel antagonist nifedipine. (*Id.* at 38.) It was also noted that PCP produced a similar range of effects via the activity-dependent depolarization as did quinpirole. (*Id.*) It was also found in social behavior testing of the mouse that nifedipine alone impaired sociability in a dose-dependent fashion and nifedipine ameliorated social deficits induced by PCP with a similar dose-dependence. (*Id.* at 39.) In addition, it was found that nifedipine "reduced the incidence of catatonic-like behaviors, e.g. circling and rigidity, elicited by PCP alone." (*Id.*) The Specification concluded "that the D2 agonist quinpirole and the psychotomimetic phencyclidine, which produce schizophrenia-like behaviors in humans and animals but act via different receptors, converge upon a novel activity-dependent depolarization phenotype in a subset of layer V pyramidal neurons in the PFC" which involve the Ca^{2+} L-type channel. (Spec. 31.) Thus, the Specification describes the discovery that the schizophrenic-like behaviors induced by dopamine agonists and PCP converge on this calcium channel.

Appellant's Response Re: Mouse Model and Psychosis

In the Reply Brief, Appellant explains how the Specification adequately enables the claimed method. Of particular note is the explanation that PCP is a known psychotomimetic that impairs social exploration and the Specification describes experiments that demonstrate the

correlation of cellular responses of pyramidal V neurons to depolarizing current in the presence and absence of PCP, which acts on L-type Ca 2^{+}, "with behavioral measurements indicative of psychosis, and found that mice expressing a depolarizing light-responsive opsin, in response to light, showed 'significantly decreased social exploration of a novel juvenile in 6 of 6 Thy1::ChR2-EYFP animals tested'." (Reply Br. 7–8.)

Appellant further explains that it was known in the prior art that D2 receptors play a key role in schizophrenia and the D2 agonist quinpirole elicits schizophrenia-like behaviors in animals. (Reply Br. 6–8.) Appellant further explains that the Specification describes measuring a psychotic state in brain slices of Thy1::ChR2 mouse, which mouse expresses ChR2 in layer V pyramidal neurons in the PFC, through electrical recordings of network activity evoked by light in the presence of and absence of quinpirole followed by treatment with known D2 antagonists. (*Id.*)

Appellant provides further explanation, that one of ordinary skill in the art would have understood the foregoing to provide adequate guidance that decreased exploration in the open field test was a result of psychosis, consistent with the three criteria set forth in the prior art for validating mouse models of psychiatric disease, construct validity, face validity, and predictive validity. (Reply Br. 14–19.) In particular, Appellant explains that the examples of the Specification indicate "that there is an activity-dependent depolarization phenotype in layer V pyramidal neurons in the prefrontal cortex associated with phenotypes of psychosis." (*Id.* at 14.)

Additionally, explains Appellant, Chadman[2] "discloses that measuring social behavior using an open field assay and sensorimotor gating are **valuable in schizophrenia-related behavioral tests in mouse models**." (*Id.* at 15–16.) And, the Specification describes that with optical stimulation of the transgenic mouse Thy1::Chr18, optical stimulation at 10 Hz disrupted social exploration without affecting normal locomotion and at 40 Hz almost completely abolished social behavior and elicited catatonic like behaviors. (*Id.* at 16–17.) Furthermore, explains Appellant, the Specification examples provide predictive validity of the model where the catatonic-like behaviors elicited by the known psychotomimetic, PCP, were reduced with the L-type Ca 2^{+}antagonist, nifedipine. (*Id.* at 17–18.)

Appellant also explains, that the Specification enables that the exploration in open field tests in the described mouse model, depolarization of neurons of the PFC, as well as catatonic-like behaviors are correlated with psychosis. (Reply Br. 18–19.) Appellant notes that prior art states: "that 'validity of a mouse model for schizophrenia is greatest when phenotypes relevant to **two or more** of the symptoms appear.'" (*Id.* at 19.)

Appellant addresses two of the primary prior art references cited by the Examiner in support of non-enablement and explains how they do not lead to finding non-enablement of the claimed animal model of psychosis in light of the foregoing. (Reply Br. 21–22.) We agree with Appellant's assessment. That one of these references indicated in 2006 that an "ideal

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[2] Kathryn K. Chadman et al., *Criteria for Validating Mouse Models of Psychiatric Diseases*, 150B(1) Am. J. Med. Genet. B Neuropsychiatr. Genet. 1–11 (2009). We reviewed the Author manuscript provided by Appellant with the Reply Brief.

animal model" for schizophrenia does not exist because the "precise etiologies" of the disorder is not understood (Ans. 7–8), does not establish that the model set forth in the Specification, which describes how the model "recapitulates some features" of psychosis (*id.* at 8), is not an appropriate model. Furthermore, that another reference "did not teach depolarization of neurons in the prefrontal cortex was equivalent to a psychotic state" (*id.* at 8) (emphasis omitted) is simply beside the point. The studies presented in Appellant's Specification, discussed above, demonstrate the relationship of depolarization of V pyramidal neurons to psychosis. Also, that a third reference did not have sufficient data to establish that the "[c]hanges in the animals' preference for the open field or the sheltered periphery may be caused by artificially altered expectations of reward or punishment" (*id.* at 10) (emphasis omitted), is also beside the point. The studies presented in Appellant's Specification, discussed above, demonstrate that exploration in open field tests in the described mouse model, depolarization of neurons of the PFC, as well as catatonic-like behaviors are correlated with psychosis.

We find that the Appellant has adequately explained why the Examiner's cited references do not cast doubt on the enablement of the Thy1::CHR18 mouse model for use in inducing psychosis by light as exemplified in the Specification. Thus, we disagree with the Examiner's categories 1, 2, 4, and 5 of non-enablement noted above.

Generically Claimed Mouse Model

We turn to Appellant's response to the category 3 non-enablement position by the Examiner, i.e., enablement of other mouse or rat models that have a subset of layer V pyramidal neurons in the PFC that express on their cell membrane a light-responsive depolarizing opsin that are not the

Thy1::ChR2 transgenic mouse described in Example 1 of the Specification. (Ans. 18, 19–20.)

Appellant argues that "[t]he manner in which the light-responsive opsin is introduced into the mouse or rat is not relevant to the presently claimed screening method." (Appeal Br. 9.) According to Appellant "an expression construct can be administered to the prefrontal cortex of the rat or mouse, where the expression construct comprises a nucleotide sequence encoding a depolarizing opsin, and where the depolarizing opsin is then expressed on the cell membrane of at least a subset of pyramidal V neurons of the prefrontal cortex." (*Id.* at 8–9.)

Appellant explains in the Reply Brief that the "specification describes how an expression vector encoding a light-activated opsin can be introduced into a non-human mammal" such as by being "'delivered directly to the pyramidal neurons of the prefrontal cortex of an animal using a needle, catheter, or related device, using neurosurgical techniques known in the art, such as by stereotactic injection.' (PCT Publication, page 16, lines 16–24)." (Reply Br. 9–10) (emphasis omitted).) The Appellant further explains that "genetically modifying cells in any of a variety of non-human mammals using recombinant viral vectors was a routine matter" as of the time the application was filed. (*Id.* at 10 (citing prior art).) In addition, the Appellant explains that "genetically modifying cells in various non-human mammals to express light-activated opsins had been achieved," such as by using adeno-associated virus (AAV) vectors and lentiviral vectors. (*Id.* at 10–11 (citing prior art).)

We find that the Specification adequately enables the use of a Thy1::ChR2 transgenic mouse, such that the neurons functionally express a

light-responsive protein that when exposed to light induce depolarization of the neuronal membrane. However, we do not agree that the art and the guidance in the Specification provide enablement for any other manner of modifying layer V pyramidal neurons of a rat or mouse in the prefrontal cortex such that the neurons functionally express a light-responsive protein that when exposed to light would induce membrane depolarization. That the Specification describes methods for delivery of a viral vector construct directly to the neurons in the prefrontal cortex, or that AAV vectors have been used in optogenetic studies does not establish enablement because existence of methods to deliver a gene to cells does not provide evidence that the specific V pyramidal neurons in the brain would express the opsin in an effective amount to induce psychosis upon depolarization.

We note in this regard that Cardin,[3] the article cited by Appellant in support of broad enablement, states: "[s]uccessful use of optogenetic techniques relies on sufficient expression levels of the light-activated channels." (Cardin 3.) Cardin notes that "[t]he most commonly used strategy to date for the expression of ChR2 in brain tissue is through viral transduction." (*Id.* at 2.) Cardin notes that AAV has provided "extensive spatial spread [to brain regions] and high expression levels" and lentiviral vectors have been used in the cortex "but do not appear to spread as effectively as AAV vectors." (*Id.*) However, Cardin notes "targeting expression to cell types" is more problematic. (*Id.* at 3.) In particular,

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[3] Jessica A. Cardin et al., *Targeted optogenetic stimulation and recording of neurons in vivo using cell-type-specific expression of Channelrhodopsin-2*, 5(2) Nature Protocols 247–54 (2010). We rely on the Author manuscript submitted by Appellant with the Reply Brief paginated 1–16.

Cardin explains that "[i]n most cases, cellular promoters are not yet identified or are incompatible for use in viruses because of size limitations." (*Id.*) And Cardin further notes "[c]ellular promoters may also fail to render enough specificity or sufficient expression levels for meaningful optogenetic studies." (*Id.*) The claim, however, is not restricted as to what promoter is used, while the experiments described in the Specification utilized only a single promoter.

Cardin describes a method to "circumvent issues of specificity and expression levels." (*Id.*) However, Appellant does not cite that as knowledge in the prior art (Reply Br. 10–11).

In light of the foregoing only, we agree with the Examiner that Appellant's claims on appeal are not enabled for their full scope. *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993) ("[T]o be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'")

Thus, we affirm the Examiner's rejection of claims 13–16, 51, 52, 54–61, and 63–69 under 35 U.S.C. § 112 first paragraph as not being enabled.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
13–16, 51, 52, 54–61, 63–69	112	Enablement	13–16, 51, 52, 54–61, 63–69	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED