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May 21, 2021

VIA EDGAR

Office of Life Sciences
Division of Corporation Finance
United States Securities and Exchange Commission
100 F Street N.E.
Washington, D.C. 20549
Attn: Kristin Lochhead
Daniel Gordon
Jane Park
Jeffrey Gabor

Re: Graphite Bio, Inc.
Draft Registration Statement on Form S-1
Submitted on April 16, 2021
CIK No. 0001815776

Ladies and Gentlemen:

This letter is being submitted on behalf of Graphite Bio, Inc. (the "**Company**") in response to comments contained in the letter dated May 14, 2021 (the "**Letter**") from the Staff (the "**Staff**") of the Securities and Exchange Commission (the "**Commission**") to Josh Lehrer, Chief Executive Officer of the Company, with respect to the Company's confidential submission of the Draft Registration Statement on Form S-1 that was submitted on April 16, 2021 (the "**Draft Registration Statement**"). The Company is concurrently filing an Amended Draft Registration Statement (the "**Amended Draft Registration Statement**"), including changes in response to the Staff's comments.

The responses set forth below have been organized in the same manner in which the Commission's comments were organized and, unless otherwise indicated, all page references in the recitations of the Staff's comments refer to the Draft Registration Statement and page references in the Company's response refer to the Amended Draft Registration Statement as marked. Copies of this letter and its attachments will also be provided to Kristin Lochhead, Daniel Gordon, Jane Park and Jeffrey Gabor of the Commission.

Overview, page 1

1. *Please clarify the meaning of scientific or technical terms the first time they are used in order to ensure that lay readers will understand the disclosure. For example, please briefly explain what you mean by insertional oncogenesis, XSCID, CCR5, and HbgS.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure accordingly to include explanations of the above-referenced terms where they are first used on pages 3, 2, 6 and 5, respectively.

2. *Given your dependence on intellectual property licensed from third parties, particularly Stanford University, please revise this section to state that your gene editing platform relies on certain patent rights and proprietary technology from third parties.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 1 to refer to patent rights and proprietary technology licensed from Stanford University.

3. *We note your statement that you believe your approach could enable "limitless applications." Please place this selected disclosure in its proper context by revising your Summary disclosure to make it clear, per the disclosure on page 43, that the Stanford License Agreement provides that your field of use is solely for the development of prophylactics and therapeutics for sickle cell disease, XSCID, and beta-thalassemia.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on pages 1, 94 and 112 to indicate the Company believes its approach could enable "broad" rather than "nearly limitless" applications. In addition, we have revised the Prospectus Summary disclosure on page 6 to clarify the scope of the Company's licensed intellectual property rights from Stanford.

Our Pipeline, page 7

4. *We note that you have combined the columns for Phase 1 and 2 trials in your pipeline table. Please revise to include a separate column for the Phase 2 trial. In addition, we note the inclusion of "Other non-HSC discovery programs" for undisclosed indications in the last row of your pipeline table. Given the status of development and limited disclosure regarding the discovery programs, it seems premature to highlight these programs prominently in your Summary pipeline table. Please remove them from the Summary table and on page 112 or advise.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the pipeline table on pages 7 and 115 to include a separate column for Phase 2 and to remove the row for "Other non-HSC discovery programs."

5. *We refer to the fourth and fifth rows in your pipeline table under the headings "Therapeutic protein production (CCR5 locus)" and "Therapeutic protein production (alpha-globin)." Given the early-stage development of these programs, please explain why these programs are sufficiently material to your business to warrant inclusion in your pipeline table. If they are material, please expand your disclosure in your Business section to provide a more fulsome discussion of these programs, including a description of preclinical studies or other development activities conducted. Alternatively, remove any programs that are not currently material from your pipeline table.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and advises the Staff that the "Therapeutic protein production (CCR5 locus)" and "Therapeutic protein production (alpha-globin)" programs are material to the Company because they represent potential applications of the Company's targeted gene insertion approach that the Company is currently pursuing. The Company has included additional preclinical data on its research in each of these programs on pages 139 to 140 and pages 140 to 141, respectively.

Our Strategy, page 7

6. *We note your disclosure under the first bullet point on pages 8 and 113 that your strategy is to "rapidly demonstrate" clinicalproof-of-concept for gene correction with your lead product candidate. Please revise these statements and any similar disclosure to remove any implication that you will be successful in advancing your product candidate in a rapid or accelerated manner as such statements are speculative.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on pages 8 and 116 to remove references to "rapidly" and "expeditiously."

Our Team and Investors, page 7

7. *We note that your website lists Dr. Daniel Dever a co-founder and the Head of Discovery Research of the company. Please explain whether Dr. Dever remains involved in the company, and if so, in what capacity. If material, please revise the prospectus, where appropriate, to discuss Dr. Dever's role in founding the company and describe his current role, including any compensation derived from his services.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on pages 7 and 116 to include references to Dr. Dever's role as a scientific founder and his current position at the Company. The Company respectfully advises the Staff that Dr. Dever is not an executive officer of the Company, and the compensation derived from his services is not material.

We face significant competition in an environment of rapid technological change..., page 28

8. *We note your disclosure on pages 29 and 138 that several of your competitors in preclinical or clinical development also utilize CRISPR nuclease technology in gene editing therapies. Please disclose whether any of your competitors are utilizing CRISPR technology with HDR or for the treatment of sickle cell disease, XSCID or Gaucher disease.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has updated the disclosure on pages 29 and 143 to disclose competitors developing gene editing or gene therapy product candidates for sickle cell disease, XSCID and Gaucher disease, and competitors utilizing CRISPR technology with HDR.

Our rights to develop and commercialize our gene editing platform technology and product candidates are subject..., page 42

9. We note your disclosure that the in-licensed patent rights from the Stanford License are jointly owned by Stanford University and a third party. Please identify the third party or tell us why this information is not material.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 43 to disclose the identity of the third party as Agilent Technologies, Inc.

Our amended and restated by-laws will designate the Court of Chancery of the State of Delaware..., page 78

10. We note your disclosure that the forum selection provision in your amendedby-laws may limit your stockholders' ability to litigate disputes with you in a different judicial forum. Please revise this risk factor and your disclosure in the Business section to disclose that there is also a risk that your forum selection provision may result in increased costs for investors to bring a claim.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has included additional disclosure on pages 78 and 196 regarding the risk that its forum selection provisions may result in increased litigation costs for its stockholders.

Gene Replacement, page 111

11. We note your disclosure here and elsewhere in the prospectus that you have an agreement to investigate the potential use of a clinical-stage non-genotoxic HSC targeted conditioning regimen with GPH201. Please expand your disclosure to discuss the material terms of and the parties to the agreement. If material, please also file the agreement as an exhibit to the registration statement as required by Item 601(b)(10) of Regulation S-K or tell us why you believe you are not required to do so.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on pages 5, 114 and 134 to name the party to the applicable agreement and disclose the material terms thereof. The Company respectfully advises the Staff that the agreement is not a material agreement, as contemplated by Item 601(b)(10) of Regulation S-K because the agreement was entered into in the ordinary course of the Company's business, it is not material in amount or significance, and the Company is not substantially dependent on the agreement.

Preclinical Validation, page 128

12. We note your disclosure on pages 132 and 135 concerning the preclinical data for each of your GPH201 and GPH301 product candidates. Please revise to include more detailed descriptions of each preclinical trial conducted, including the number of tests conducted, the number of samples used in each test and the range of results observed.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure to include the additional information requested by the Staff for GPH201 in the figures on page 136 and for GPH301 in the figure on page 139.

13. We refer to the graphics on right panel of the figure on page 129 and the lower right panel of the figure on page 132 under the heading "IL2RG gene replacement in XSCID patient..." Please expand your disclosure, where appropriate, to discuss your results concerning the lymphoid and myeloid/erythroid cells.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 136 to describe the results concerning lymphoid and myeloid/erythroid cells in greater detail.

14. We note that the graphics on page 135 under the heading "Figure: Insertion of the GBA gene in the CCR5 safe harbor..." contain text that is illegible. Please revise accordingly.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has included graphics that it believes should be legible on page 139.

GPH101 Phase 1/2 Clinical Trial Design, page 130

15. Please revise this section to explain the primary and secondary endpoints of your Phase 1/2 clinical trial of GPH101, as well as for your Phase 1/2 trials for GPH201 and GPH301 on pages 133 and 135 respectively, if any. We also note that you have not yet completed IND studies for your GPH201 and GPH301 product candidates. In this regard, please also disclose in this section when you expect to complete your IND-enabling studies for each of the GPH201 and GPH301 product candidates.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 134 to distinguish the primary and secondary objectives of its Phase 1/2 clinical trial of GPH101. Additionally, the Company has revised the disclosure on pages 137 and 139 to disclose additional detail regarding the objectives of its planned Phase 1/2 clinical trials and the expected timing for completion of its IND-enabling studies of GPH201 and GPH301, respectively.

Competition, page 138

16. Please revise your discussion of competitive conditions by describing in greater detail the current landscape for patent protections in your industry. In this regard, we note that across several risk factors on pages 41 to 50 you address specific risks stemming from existing third-party patents and patent applications. In your discussion of this landscape, identify specific patents and patent applications, if material, as well as their holders/applicants.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 143 to refer to the fact that the listed competitors as well as other companies and research institutions hold numerous patents in the relevant fields, and these or other third parties could allege they have patent rights encompassing the Company's product candidates, technologies or methods. The Company respectfully advises the Staff that it is not aware of any specific third-party patents or patent applications that are material to the Company's intellectual property position.

Competition, page 139

17. We note your disclosure on page 139 that you intend to obtain rights to various components of your genome editing platform through one or more licenses from third parties. To the extent known, please disclose the third parties you intend to license patent applications from. Please also clarify whether your platform is dependent upon these rights. If so, please include appropriate risk factor disclosure.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 144 to clarify that it intends to expand and extend its genome editing platform by obtaining rights to additional components and technologies through one or more licenses from third parties. The Company respectfully notes the risk factor under the heading "Our rights to develop and commercialize our gene editing platform technology and product candidates are subject, in part, to the terms and conditions of licenses granted to us by others" with respect to the disclosure of risks related to its dependency on intellectual property licensed from third parties and the terms of such licenses.

18. You disclose on page 139 that you own one provisional patent application relating to the gene editing and replacement for the treatment of beta-thalassemia. Please also disclose the type of patent protection that would be provided for this patent application.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 144 to disclose the type and scope of patent protection that would be provided by this patent application.

19. We note your disclosure of seven in-licensed patent applications from Stanford. Please expand your disclosure to include the patent protections afforded to each of the seven patent applications, as well as the jurisdictions of the six ex-U.S. patent applications. We also refer to your disclosure on page 43 that your in-licensed patent rights under the Stanford License Agreement are jointly owned by Stanford University and another third party. Please disclose in this section the third party that jointly owns your in-licensed patent rights.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 144 to clarify the type of patent protections afforded by the above-referenced patent applications and to disclose the specific jurisdictions of each of the six ex-U.S. patent applications. Additionally, the Company has revised the disclosure on page 144 to indicate that the in-licensed patents are jointly owned by Stanford and Agilent Technologies, Inc.

Exclusive License Agreement with the Board of Trustees of the Leland Stanford Junior University, page 140

20. Please disclose when the last-to-expire licensed patent is scheduled to expire and the aggregate amounts paid to date under the Stanford License Agreement.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 145 to disclose when thelast-to-expire licensed patent is scheduled to expire and the aggregate amounts paid to date under the Stanford License Agreement.

Principal Stockholders, page 184

21. In your revised prospectus, please include footnotes to your table to identify the natural persons who are the beneficial owners of the shares held by entities affiliated with Versant Ventures and Samsara BioCapital.

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the table of principal stockholders to include footnotes identifying the natural persons who are the beneficial owners of the shares held by entities affiliated with Versant Ventures and Samsara BioCapital on page 191.

General

22. Please provide us with supplemental copies of all written communications, as defined in Rule 405 under the Securities Act, that you, or anyone authorized to do so on your behalf, have presented or expect to present to potential investors in reliance on Section 5(d) of the Securities Act, whether or not you retained, or intend to retain, copies of those communications.

RESPONSE: The Company respectfully acknowledges the Staff's comment and advises the Staff that it will supplementally provide to the Staff a copy of the Company's presentation to potential investors in testing-the-waters meetings conducted in reliance on Section 5(d) of the Securities Act. In the event that the Company presents additional written communications to potential investors in reliance on Section 5(d) of the Securities Act, the Company will supplementally provide the Staff with copies of all such written communications too. The Company further advises the Staff that investors will not retain copies of any such materials.

If you require additional information, please telephone the undersigned at (415) 733-6071.

Sincerely,

/s/ Maggie Wong
Maggie Wong

Enclosures:
cc: Josh Lehrer, Graphite Bio, Inc.
Shoaib Ghias, Goodwin Procter LLP
Mitchell S. Bloom, *Goodwin Procter LLP*
Charlie Kim, *Cooley LLP*

Kristin VanderPas, *Cooley LLP*
Denny Won, *Cooley LLP*
David Peinsipp, *Cooley LLP*