
**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**
Washington, D.C. 20549

Post-Effective Amendment No. 1
to
FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

Voyager Therapeutics, Inc.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

2836
(Primary Standard Industrial
Classification Code Number)

46-3003182
(I.R.S. Employer
Identification Number)

**75 Sidney Street
Cambridge, Massachusetts 02139
(857) 259-5340**

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Steven M. Paul, M.D.
President and Chief Executive Officer
Voyager Therapeutics, Inc.
75 Sidney Street
Cambridge, Massachusetts 02139
(857) 259-5340

(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Mitchell S. Bloom
Edwin M. O'Connor
Laurie A. Burlingame
Goodwin Procter LLP
Exchange Place
53 State Street
Boston, Massachusetts 02109
(617) 570-1000

Marc A. Recht
Richard C. Segal
Cooley LLP
500 Boylston Street
Boston, Massachusetts 02116
(617) 937-2300

Approximate date of commencement of proposed sale to public: As soon as practicable after this Registration Statement is declared effective.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box.

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. (File No. 333-207367)

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer

Accelerated filer

Non-accelerated filer
(Do not check if a
smaller reporting company)

Smaller reporting company

This post-effective amendment shall become effective upon filing with the Securities and Exchange Commission in accordance with Rule 462(d) under the Securities Act of 1933, as amended.

Explanatory Note

This Post-Effective Amendment No. 1 (this "Amendment") relates to the Registrant's Registration Statement on Form S-1 (File No. 333-207367), as amended, declared effective on November 10, 2015 by the Securities and Exchange Commission. The Registrant is filing this Amendment for the sole purpose of replacing Exhibit 5.1 to the Registration Statement. This Amendment does not modify any provision of Part I or Part II of the Registration Statement other than Item 16(a) of Part II as set forth below.

PART II

Information not required in prospectus

Item 16. Exhibits and Financial Statement Schedules

- (a) **Exhibits.** See the Exhibit Index attached to this Registration Statement, which is incorporated by reference herein.

EXHIBIT INDEX

Exhibit number	Description of exhibit
1.1**	Form of Underwriting Agreement.
3.1**	Certificate of Incorporation (as currently in effect).
3.2**	Form of Amended and Restated Certificate of Incorporation (to be in effect upon completion of this offering).
3.3**	By-laws (as currently in effect).
3.4**	Form of Amended and Restated Bylaws (to be in effect upon completion of this offering).
4.1**	Form of Common Stock Certificate.
4.2**	Second Amended and Restated Investors' Rights Agreement by and among the Registrant and certain of its stockholders dated as of April 10, 2015.
5.1	Opinion of Goodwin Procter LLP.
10.1#**	2014 Stock Option and Grant Plan and forms of award agreements thereunder.
10.2#**	2015 Stock Option and Incentive Plan and forms of award agreements thereunder.
10.3†###	Collaboration Agreement by and between the Registrant and Genzyme Corporation, dated February 11, 2015.
10.4†**	Exclusive License Agreement by and between the Registrant and the University of Massachusetts, dated January 30, 2014.
10.5**	Lease Agreement by and between the Registrant and UP ⁴⁵ /75 Sidney Street, LLC, dated as of April 1, 2014.
10.6#**	Offer Letter by and between the Registrant and Bernard Ravina, M.D., dated January 15, 2014.
10.7#**	Offer Letter by and between the Registrant and Robert Pietrusko, Pharm. D., dated May 13, 2014.
10.8#**	Offer Letter by and between the Registrant and Steven Paul, M.D., dated July 24, 2014.
10.9**	Form of Indemnification Agreement to be entered into between the Registrant and its directors.
10.10**	Form of Indemnification Agreement to be entered into between the Registrant and its executive officers.
10.11†**	License Agreement, by and between the Registrant and ReGenX Biosciences, LLC, dated May 28, 2014.
10.12#**	2015 Employee Stock Purchase Plan.
23.1**	Consent of Ernst & Young LLP, Independent Registered Public Accounting Firm.
23.2	Consent of Goodwin Procter LLP (included in Exhibit 5.1).
24.1**	Power of Attorney (included on signature page).

** Previously filed.

† Portions of this exhibit (indicated by asterisks) have been omitted pursuant to a request for confidential treatment and this exhibit has been submitted separately to the SEC.

Represents management compensation plan.

Certain exhibits and schedules to these agreements have been omitted from the registration statement pursuant to Item 601(b)(2) of Regulation S-K. The registrant will furnish copies of any of the exhibits and schedules to the Securities and Exchange Commission upon request.

QuickLinks

[PART II Information not required in prospectus](#)

[Item 16. Exhibits and Financial Statement Schedules](#)

[SIGNATURES](#)

[EXHIBIT INDEX](#)

November 10, 2015

Voyager Therapeutics, Inc.
75 Sidney Street
Cambridge, Massachusetts 02139

Re: *Securities Registered under Registration Statement on Form S-1*

Ladies and Gentlemen:

We have acted as counsel to you in connection with your filing of a Registration Statement on Form S-1 (File No. 333-207367) (as amended or supplemented, the "Registration Statement") pursuant to the Securities Act of 1933, as amended (the "Securities Act"), relating to the registration of the offering by Voyager Therapeutics, Inc., a Delaware corporation (the "Company") of up to 5,750,000 shares (the "Shares") of the Company's Common Stock, \$0.001 par value per share, including Shares purchasable by the underwriters upon their exercise of an over-allotment option granted to the underwriters by the Company. The Shares are being sold to the several underwriters named in, and pursuant to, an underwriting agreement among the Company and such underwriters (the "Underwriting Agreement").

We have reviewed such documents and made such examination of law as we have deemed appropriate to give the opinions set forth below. We have relied, without independent verification, on certificates of public officials and, as to matters of fact material to the opinions set forth below, on certificates of officers of the Company.

The opinion set forth below is limited to the Delaware General Corporation Law (which includes reported judicial decisions interpreting the Delaware General Corporation Law).

Based on the foregoing, we are of the opinion that the Shares have been duly authorized and, upon issuance and delivery against payment therefor in accordance with the terms of the Underwriting Agreement, the Shares will be validly issued, fully paid and non-assessable.

We hereby consent to the inclusion of this opinion as Exhibit 5.1 to the Registration Statement and to the references to our firm under the caption "Legal Matters" in the Registration Statement. In giving our consent, we do not admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations thereunder.

Very truly yours,
/s/ Goodwin Procter LLP
GOODWIN PROCTER LLP

QuickLinks

[Exhibit 5.1](#)

[November 10, 2015](#)