

PROSPECTUS



**11,612,582 Shares of
Common Stock**

The selling stockholders of Molecular Templates, Inc. (“Molecular,” “we,” “us” or the “Company”) listed beginning on page 9 of this prospectus may offer and resell under this prospectus (i) up to 8,716,056 shares of our common stock and (ii) up to 2,896,526 shares of our common stock issuable upon exercise of warrants acquired by certain of the selling stockholders under the Financing Securities Purchase Agreement (defined below) (the “Warrants”). The selling stockholders acquired the shares of common stock and the Warrants from us either:

- pursuant to a Securities Purchase Agreement (the “Financing Securities Purchase Agreement”), dated August 1, 2017, by and among the Company and the investors listed therein (the “PIPE Investors”); or
- pursuant to a Stock Purchase Agreement (the “Takeda Stock Purchase Agreement”), dated June 23, 2017, by and between the Company and Millennium Pharmaceuticals, Inc., a wholly owned subsidiary of Takeda Pharmaceutical Company Ltd. (“Takeda,” and together with the PIPE Investors, the “Investors”).

We are registering the resale of the shares of common stock covered by this prospectus as required by the Registration Rights Agreement we entered into with the Investors on August 1, 2017. The selling stockholders will receive all of the proceeds from any sales of the shares offered hereby. We will not receive any of the proceeds, but we will incur expenses in connection with the offering. To the extent the Warrants are exercised for cash, if at all, we will receive the exercise price of the Warrants.

The selling stockholders may sell these shares through public or private transactions at market prices prevailing at the time of sale or at negotiated prices. The timing and amount of any sale are within the sole discretion of the selling stockholders. Our registration of the shares of common stock covered by this prospectus does not mean that the selling stockholders will offer or sell any of the shares. For further information regarding the possible methods by which the shares may be distributed, see “Plan of Distribution” beginning on page 13 of this prospectus.

Our common stock is listed on The NASDAQ Capital Market under the symbol “MTEM.” The last reported sale price of our common stock on October 19, 2017 was \$9.33 per share.

Investing in our common stock is highly speculative and involves a significant degree of risk. Please consider carefully the specific factors set forth under “[Risk Factors](#)” beginning on page 3 of this prospectus and in our filings with the Securities and Exchange Commission.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the accuracy or adequacy of the disclosures in this prospectus. Any representation to the contrary is a criminal offense.

The date of this prospectus is October 20, 2017

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ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement that we have filed with the Securities and Exchange Commission (the “SEC”) pursuant to which the selling stockholders named herein may, from time to time, offer and sell or otherwise dispose of the shares of our common stock covered by this prospectus. You should not assume that the information contained in this prospectus is accurate on any date subsequent to the date set forth on the front cover of this prospectus or that any information we have incorporated by reference is correct on any date subsequent to the date of the document incorporated by reference, even though this prospectus is delivered or shares of common stock are sold or otherwise disposed of on a later date. It is important for you to read and consider all information contained in this prospectus, including the documents incorporated by reference therein, in making your investment decision. You should also read and consider the information in the documents to which we have referred you under “Where You Can Find Additional Information” and “Information Incorporated by Reference” in this prospectus.

We have not authorized anyone to give any information or to make any representation to you other than those contained or incorporated by reference in this prospectus. You must not rely upon any information or representation not contained or incorporated by reference in this prospectus. This prospectus does not constitute an offer to sell or the solicitation of an offer to buy any of our shares of common stock other than the shares of our common stock covered hereby, nor does this prospectus constitute an offer to sell or the solicitation of an offer to buy any securities in any jurisdiction to any person to whom it is unlawful to make such offer or solicitation in such jurisdiction. Persons who come into possession of this prospectus in jurisdictions outside the United States are required to inform themselves about, and to observe, any restrictions as to the offering and the distribution of this prospectus applicable to those jurisdictions.

Unless we have indicated otherwise, or the context otherwise requires, references in this prospectus to “Molecular,” the “Company,” “we,” “us” and “our” refer to Molecular Templates, Inc.

PROSPECTUS SUMMARY

This summary description about us and our business highlights selected information contained elsewhere in this prospectus or incorporated by reference into this prospectus. It does not contain all the information you should consider before investing in our securities. Important information is incorporated by reference into this prospectus. To understand this offering fully, you should read carefully the entire prospectus, including “Risk Factors” and “Cautionary Note Regarding Forward-Looking Statements,” together with the additional information described under “Information Incorporated by Reference.”

Our Company

We are a clinical-stage oncology company focused on the discovery and development of differentiated, targeted, biologic therapeutics for cancer. We believe our proprietary biologic drug platforms, which we refer to as engineered toxin bodies (“ETBs”), provide a differentiated mechanism of action that solves problems associated with currently available cancer therapeutics. We have developed ETBs for various targets, including CD20, CD38, HER2, PD-L1, and CD45. CD20 is central to B cell malignancies and is clinically validated as a target for the treatment of lymphomas and autoimmune disease. Our lead compound, MT-3724, is a first generation ETB that recognizes CD20, a B cell marker. MT-4019 is our most advanced second-generation ETB and specifically targets CD38. We have launched additional programs against the key targets HER2 and PD-L1.

Recent Developments

On August 1, 2017, we completed our business combination with Molecular Templates OpCo, Inc. (formerly known as Molecular Templates, Inc.), a privately held Delaware corporation (“Molecular Templates OpCo”), in accordance with the terms of an Agreement and Plan of Merger and Reorganization, dated as of March 16, 2017 (the “Merger Agreement”). Pursuant to the Merger Agreement, we formed a wholly owned subsidiary that merged with and into Molecular Templates OpCo, with Molecular Templates OpCo surviving the merger and becoming our wholly owned subsidiary (the “Merger”). Upon the consummation of the Merger, we changed our name from “Threshold Pharmaceuticals, Inc.” to “Molecular Templates, Inc.” See “The Merger” beginning on page 4 of this prospectus.

On August 1, 2017, we closed the Private Placement and the Takeda Financing. See “The Private Placement and the Takeda Financing” beginning on page 5 of this prospectus.

Corporate Information

We were incorporated in Delaware on October 17, 2001. Upon the consummation of the Merger, we changed our name from “Threshold Pharmaceuticals, Inc.” to “Molecular Templates, Inc.” Our principal executive offices are located at 9301 Amberglen Boulevard, Suite 100, Austin, Texas 78729, and our telephone number is (512) 869 1555. Our website address is www.mtem.com. Our website and the information contained on, or that can be accessed through, our website will not be deemed to be incorporated by reference in, and are not considered part of, this prospectus. You should not rely on our website or any such information in making your decision whether to purchase our common stock.

THE OFFERING

Shares of Common Stock that May be Offered by the Selling Stockholders

Up to 11,612,582 shares of common stock.

Use of Proceeds

We will not receive any proceeds from the sale of the common stock by the selling stockholders. However, if all of the Warrants are exercised for cash, we would receive gross proceeds of approximately \$19.8 million. We currently intend to use such proceeds, if any, for working capital and general corporate purposes.

Offering Price

The selling stockholders may sell all or a portion of their shares through public or private transactions at prevailing market prices or at privately negotiated prices.

NASDAQ Capital Market Symbol

MTEM

Risk Factors

Investing in our common stock involves a high degree of risk. See “Risk Factors” beginning on page 3 of this prospectus, and any other risk factors described in the documents incorporated by reference herein, for a discussion of certain factors to consider carefully before deciding to invest in our common stock.

Throughout this prospectus, when we refer to the shares of our common stock being registered on behalf of the selling stockholders for offer and sale, we are referring to the shares of common stock sold to the selling stockholders, as well as the shares of common stock issuable upon exercise of the Warrants, each as described under “The Private Placement and the Takeda Financing” and “Selling Stockholders.” When we refer to the selling stockholders in this prospectus, we are referring to the selling stockholders identified in this prospectus and, as applicable, their donees, pledgees, transferees or other successors-in-interest selling shares of common stock or interests in shares of common stock received after the date of this prospectus from a selling stockholder as a gift, pledge, partnership distribution or other transfer.

RISK FACTORS

An investment in our common stock involves a high degree of risk. Prior to making a decision about investing in our common stock, you should carefully consider the risks, uncertainties and assumptions discussed under Item 1A, “Risk Factors,” in our Annual Report on Form 10-K for the fiscal year ended December 31, 2016 filed with the SEC on March 27, 2017 (as amended by Amendment No. 1 on Form 10-K/A filed on April 28, 2017), as updated by our subsequent filings with the SEC under the Securities Exchange Act of 1934, as amended (the “Exchange Act”), which are incorporated herein by reference, together with the information in this prospectus and any other information incorporated by reference into this prospectus. See “Where You Can Find Additional Information” and “Information Incorporated by Reference.” Additional risks and uncertainties not presently known to us or that we currently deem immaterial may also affect our business, financial condition or results of operations. The occurrence of any of these known or unknown risks might cause you to lose all or part of your investment in our common stock.

THE MERGER

On August 1, 2017, we completed our business combination with Molecular Templates OpCo in accordance with the terms of the Merger Agreement. Pursuant to the Merger Agreement, we formed a wholly owned subsidiary that merged with and into Molecular Templates OpCo, with Molecular Templates OpCo surviving the Merger and becoming our wholly owned subsidiary. In connection with and prior to the consummation of the Merger, we effected an 11-for-1 reverse stock split (the “Reverse Stock Split”) of the shares of our common stock. The Merger and the Reverse Stock Split were both approved by our stockholders at the annual meeting of stockholders held on July 31, 2017. Upon the consummation of the Merger, we changed our name from “Threshold Pharmaceuticals, Inc.” to “Molecular Templates, Inc.”

Immediately prior to and in connection with the Merger, each outstanding share of Molecular Templates OpCo preferred stock was converted into one share of Molecular Templates OpCo common stock at ratios determined in accordance with Molecular Templates OpCo’s certificate of incorporation then in effect. Under the terms of the Merger Agreement, at the effective time of the Merger, we issued shares of our common stock to Molecular Templates OpCo stockholders at an exchange ratio of 7.7844 shares of our common stock, after taking into account the Reverse Stock Split, in exchange for each share of Molecular Templates OpCo common stock outstanding immediately prior to the Merger. The exchange ratio was determined through arms’-length negotiations between us and Molecular Templates OpCo. An aggregate of approximately 11,656,475 shares of our common stock were issued to the Molecular Templates OpCo stockholders in the Merger. We also assumed all of the stock options issued and outstanding under Molecular Templates OpCo’s 2009 Stock Plan, as amended, and issued and outstanding warrants of Molecular Templates OpCo, with such stock options and warrants henceforth representing the right to purchase a number of shares of our common stock equal to 7.7844 multiplied by the number of shares of Molecular Templates OpCo common stock previously represented by such stock options and warrants, as applicable, after taking into account the Reverse Stock Split.

The issuance of the shares of our common stock to the former stockholders of Molecular Templates OpCo was registered with the SEC on a Registration Statement on Form S-4 (Reg. No. 333-217993).

The foregoing description of the Merger and the Merger Agreement is not complete and is subject to and qualified in its entirety by reference to the Merger Agreement, a copy of which is filed as an exhibit hereto and is incorporated herein by reference. The representations, warranties and covenants made by us in the Merger Agreement were made solely for the benefit of the parties to such agreement, including, in some cases, for the purpose of allocating risk among the parties thereto, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were made as of an earlier date. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

THE PRIVATE PLACEMENT AND THE TAKEDA FINANCING

On August 1, 2017, we entered into the Financing Securities Purchase Agreement with Longitude Venture Partners III, L.P. and certain other accredited investors, pursuant to which we sold an aggregate of 5,793,063 units (the “Units”) having an aggregate purchase price of \$40.0 million, each such Unit consisting of (i) one (1) share (the “Shares”) of our common stock and (ii) a Warrant to purchase 0.50 shares of our common stock (the “Private Placement”). The Private Placement was pursuant to Equity Commitment Letter agreements entered into by and between us and each of the PIPE Investors in March and June 2017. The purchase price per Unit was \$6.9048. The Warrants will be exercisable for a period of seven years from the date of their issuance at a per-share exercise price of \$6.8423 (which exercise price shall be payable in cash or through a cashless exercise mechanic), subject to certain adjustments as specified in the Warrants.

In connection with the execution on June 23, 2017 of a collaboration and license agreement between Molecular Templates OpCo and Millennium Pharmaceuticals, Inc., a wholly owned subsidiary of Takeda, on June 23, 2017, we and Molecular Templates OpCo entered into the Takeda Stock Purchase Agreement with Takeda, pursuant to which Takeda agreed to purchase shares of our common stock to occur following the consummation of the Merger and the Private Placement. Pursuant to the Takeda Stock Purchase Agreement, on August 1, 2017, following the consummation of the Merger and the Private Placement, we sold 2,922,993 shares of our common stock to Takeda (the “Takeda Shares”) at a price per share of \$6.8423 (the “Takeda Financing”).

In connection with the Private Placement and the subsequent consummation of the Takeda Financing, we entered into a Registration Rights Agreement (the “Registration Rights Agreement”) with each Investor, pursuant to which we are obligated, among other things, to file a registration statement with the SEC within 45 days following the closing of the Private Placement and the Takeda Financing for purposes of registering the Shares and Takeda Shares and the shares of our common stock issuable upon exercise of the Warrants for resale by the PIPE Investors, (ii) use our commercially reasonable efforts to have the registration statement declared effective as soon as practicable after filing, and in any event no later than 120 days after the closing of the Private Placement and the Takeda Financing, and (iii) maintain the registration until all registrable securities may be sold pursuant to Rule 144 under the Securities Act of 1933, as amended (the “Securities Act”), without restriction as to volume. If the registration statement (i) is not filed with the SEC by the filing deadline, (ii) is not declared effective by the effectiveness deadline, (iii) in certain circumstances, ceases to be effective or the Investors are not permitted to use the prospectus to resell their shares, in each case, for more than 30 consecutive trading days or 60 trading days during any 12 month period, or (iv) is not effective and we fail to satisfy the current public information requirement pursuant to Rule 144(c)(1), we must pay liquidated damages equal to 1% of the aggregate purchase price paid by the Investor and, for each 30 day period thereafter, pay an additional 1%, subject to a maximum amount of 6% in the aggregate.

The foregoing description of the Registration Rights Agreement is not complete and is subject to and qualified in its entirety by reference to the Registration Rights Agreement, a copy of which is filed as an exhibit hereto and is incorporated herein by reference.

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus and the documents incorporated by reference herein contain forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act. These statements relate to future events or to our future financial performance and involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to be materially different from any future results, performances or achievements expressed or implied by the forward-looking statements. Forward-looking statements may include, but are not limited to, statements about:

- the timing and success of preclinical studies and clinical trials conducted by us and our development partners;
- the ability to obtain and maintain regulatory approval of our product candidates, and the labeling for any approved products;
- the size and growth of the potential markets for MT-3724 or other product candidates and the ability to serve those markets;
- our expectations regarding our expenses and revenue, the sufficiency of our cash resources and needs for additional financing;
- the rate and degree of market acceptance of any of MT-3724 or other product candidates;
- our expectations regarding competition;
- our anticipated growth strategies;
- our ability to attract or retain key personnel;
- our ability to establish and maintain development partnerships;
- our expectations regarding federal, state and foreign regulatory requirements;
- regulatory developments in the United States and foreign countries;
- our ability to obtain and maintain intellectual property protection for our product candidates; and
- the anticipated trends and challenges in our business and the market in which we operate.

In some cases, you can identify forward-looking statements by terms such as “anticipate,” “believe,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “project,” “should,” “target,” “will,” “would” or other words that convey uncertainty of future events or outcomes to identify these forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. Given these uncertainties, you should not place undue reliance on these forward-looking statements. We discuss many of these risks in greater detail in our reports filed from time to time under the Securities Act and/or the Exchange Act, including the risks identified in our Annual Report on Form 10-K for the fiscal year ended December 31, 2016 filed with the SEC on March 27, 2017 (as amended by Amendment No. 1 on Form 10-K/A filed on April 28, 2017), as updated by our subsequent filings with the SEC under the Exchange Act. We encourage you to read these filings as they are made. Also, these forward-looking statements represent our estimates and assumptions only as of the date of the document containing the applicable statement.

You should read this prospectus, the documents incorporated by reference herein, and any prospectus supplement or free writing prospectus that we have authorized for use in connection with this offering completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of the forward-looking statements in the foregoing documents by these cautionary statements.

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Unless required by law, we undertake no obligation to update or revise any forward-looking statements to reflect new information or future events or developments. Thus, you should not assume that our silence over time means that actual events are bearing out as expressed or implied in such forward-looking statements.

USE OF PROCEEDS

We will not receive any of the proceeds from the sale of the common stock by the selling stockholders named in this prospectus. The selling stockholders will receive all of the proceeds from this offering.

Pursuant to conditions set forth in the Warrants, the Warrants are exercisable under certain circumstances on a cashless basis, and should a selling stockholder elect to exercise on a cashless basis we will not receive any proceeds from the sale of common stock issued upon the cashless exercise of the Warrant. The holders of the Warrants are not obligated to exercise their Warrants, and we cannot predict whether holders of the Warrants will choose to exercise all or any of their Warrants or if they will do so for cash or on a cashless basis. However, if all of the Warrants were exercised for cash, we would receive gross proceeds of approximately \$19.8 million. We currently intend to use such proceeds, if any, for working capital and general corporate purposes.

SELLING STOCKHOLDERS

This prospectus relates to the sale or other disposition of up to 11,612,582 shares of our common stock and shares of common stock issuable to the selling stockholders upon exercise of the Warrants by the selling stockholders named below, and their donees, pledgees, transferees or other successors-in-interest selling shares of common stock or interests in shares of common stock received after the date of this prospectus from a selling stockholder as a gift, pledge, partnership distribution or other transfer. The shares of common stock covered hereby were issued by us in the Private Placement and the Takeda Financing. See “The Private Placement and the Takeda Financing” beginning on page 5 of this prospectus.

The table below sets forth information as of the date of this prospectus, to our knowledge, for the selling stockholders and other information regarding the beneficial ownership (as determined under Section 13(d) of the Exchange Act and the rules and regulations thereunder) of the shares of common stock held by the selling stockholders. The second column lists the number of shares of common stock beneficially owned by the selling stockholders as of August 15, 2017. The third column lists the maximum number of shares of common stock that may be sold or otherwise disposed of by the selling stockholders pursuant to the registration statement of which this prospectus forms a part. The selling stockholders may sell or otherwise dispose of some, all or none of their shares. Pursuant to Rules 13d-3 and 13d-5 of the Exchange Act, beneficial ownership includes any shares of our common stock as to which a stockholder has sole or shared voting power or investment power, and also any shares of our common stock which the stockholder has the right to acquire within 60 days of August 15, 2017. The percentage of beneficial ownership for the selling stockholders is based on 26,880,857 shares of our common stock outstanding as of August 15, 2017 and the number of shares of our common stock issuable upon exercise or conversion of convertible securities that are currently exercisable or convertible or are exercisable or convertible within 60 days of August 15, 2017 beneficially owned by the applicable selling stockholder. Except as described below, to our knowledge, none of the selling stockholders has been an officer or director of ours or of our affiliates within the past three years or has any material relationship with us or our affiliates within the past three years. Our knowledge is based on information provided by the selling stockholders in connection with the filing of this prospectus, as well as information obtained from relevant Schedule 13D and 13G filings.

The shares of common stock being covered hereby may be sold or otherwise disposed of from time to time during the period the registration statement of which this prospectus is a part remains effective, by or for the account of the selling stockholders. After the date of effectiveness of such registration statement, the selling stockholders may have sold or transferred, in transactions covered by this prospectus or in transactions exempt from the registration requirements of the Securities Act, some or all of their common stock.

Information about the selling stockholders may change over time. Any changed information will be set forth in an amendment to the registration statement or supplement to this prospectus, to the extent required by law.

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Selling Stockholder	Shares of Common Stock Beneficially Owned Before this Offering		Number of Shares of Common Stock Being Offered	Shares of Common Stock To Be Beneficially Owned Upon Completion of this Offering	
	Number	Percentage(1)		Number	Percentage
Perceptive Life Science Master Fund Ltd.	1,086,199(2)	3.99%	1,086,199	—	—
Biotechnology Value Fund, LP	505,525(3)	1.87%	505,525	—	—
Biotechnology Value Fund II, LP	325,609(4)	1.21%	325,609	—	—
Biotechnology Value Trading Fund OS, LP	90,571(5)	0.34%	90,571	—	—
Investment 10, LLC	57,979(6)	0.22%	57,979	—	—
MSI BVF SPV, LLC	106,512(7)	0.40%	106,512	—	—
AJU Growth and Healthcare Fund	232,384(8)	0.86%	72,412	159,972	0.59%
Santé Health Ventures Annex Fund, L.P.	869,492(9)	3.23%	14,482	855,010	3.18%
Santé Health Ventures I, L.P.	7,916,608(10)	29.43%	57,930	7,858,678	29.21%
Excel Venture Fund II, L.P.	1,497,696(11)	5.57%	72,412	1,425,284	5.30%
Longitude Venture Partners III, L.P.	4,344,802(12)	15.34%	4,344,802	—	—
Baker Bros. Advisors, LP	108,618(13)	0.40%	108,618	—	—
CDK Associates L.L.C.	1,520,680(14)	5.55%	1,520,680	—	—
Shrewsbury Capital Partners LLC	217,239(15)	0.81%	217,239	—	—
Franklin M. Berger	108,619(16)	0.40%	108,619	—	—
Millennium Pharmaceuticals, Inc.	2,922,993(17)	10.87%	2,922,993	—	—

- (1) Based on a denominator equal to the sum of (i) 26,880,857 shares of our common stock outstanding on August 15, 2017 and (ii) the number of shares of our common stock issuable upon exercise or conversion of convertible securities that are currently exercisable or convertible or are exercisable or convertible within 60 days of August 15, 2017 beneficially owned by the applicable selling stockholder.
- (2) Consists of (i) 724,133 shares of common stock held by the selling stockholder and (ii) 362,066 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The selling stockholder's address is 51 Astor Place, 10th Floor, New York, New York 10003.
- (3) Consists of (i) 337,017 shares of common stock held by the selling stockholder and (ii) 168,508 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. BVF Partners LP ("Partners"), as the general partner of Biotechnology Value Fund, LP (the "selling stockholder"), may be deemed to beneficially own the 337,017 shares of common stock and 168,508 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by the selling stockholder. BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 337,017 shares of common stock and 168,508 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by Partners. Mark Lampert ("Mr. Lampert"), as a director and officer of BVF Inc., may be deemed to beneficially own the 337,017 shares of common stock and 168,508 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF Inc. The foregoing should not be construed in and of itself as an admission by any BVF-managed or advised fund, entity or account (each a "Reporting Person" and collectively "Reporting Persons") as to beneficial ownership of any common stock owned by another Reporting Person. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the common stock beneficially owned by the selling stockholder, and the foregoing shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities. The selling stockholder's address is One Sansome Street, 30th Floor, San Francisco, California 94104.
- (4) Consists of (i) 217,073 shares of common stock held by the selling stockholder and (ii) 108,536 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. Partners, as the general partner of Biotechnology Value Fund II, LP (the "selling stockholder"), may be deemed to beneficially own the 217,073 shares of common stock and 108,536 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by the selling stockholder. BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 217,073 shares of common stock and 108,536 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by Partners. Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 217,073 shares of common stock and 108,536 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF Inc. The foregoing should not be construed in and of itself as an admission by any Reporting Person as to beneficial ownership of any common stock owned by another Reporting Person. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the common stock beneficially owned by the selling stockholder, and the foregoing shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities. The selling stockholder's address is One Sansome Street, 30th Floor, San Francisco, California 94104.

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- (5) Consists of (i) 60,381 shares of common stock held by the selling stockholder and (ii) 30,190 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. BVF Partners OS Ltd. (“BVF OS”), as the general partner of Biotechnology Value Trading Fund OS, LP (the “selling stockholder”), may be deemed to beneficially own the 60,381 shares of common stock and 30,190 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by the selling stockholder. Partners, as the sole shareholder of BVF OS, may be deemed to beneficially own the 60,381 shares of common stock and 30,190 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF OS. BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 60,381 shares of common stock and 30,190 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by Partners. Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 60,381 shares of common stock and 30,190 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF Inc. The foregoing should not be construed in and of itself as an admission by any Reporting Person as to beneficial ownership of any common stock owned by another Reporting Person. Each of BVF OS, Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the common stock beneficially owned by the selling stockholder, and the foregoing shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities. The selling stockholder’s address is Ugland House, South Church Street, George Town, Grand Cayman, KYI-1104, Cayman Islands.
- (6) Consists of (i) 38,653 shares of common stock held by the selling stockholder and (ii) 19,326 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. Partners, as the investment manager of Investment 10, LLC (the “selling stockholder”), may be deemed to beneficially own the 38,653 shares of common stock and 19,326 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by the selling stockholder. BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 38,653 shares of common stock and 19,326 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by Partners. Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 38,653 shares of common stock and 19,326 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF Inc. The foregoing should not be construed in and of itself as an admission by any Reporting Person as to beneficial ownership of any common stock owned by another Reporting Person. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the common stock beneficially owned by the selling stockholder, and the foregoing shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities. The selling stockholder’s address is 900 N. Michigan Avenue, Suite 1100, Chicago, Illinois 60611.
- (7) Consists of (i) 71,008 shares of common stock held by the selling stockholder and (ii) 35,504 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. Partners, as the investment manager of MSI BVF SPV LLC (the “selling stockholder”), may be deemed to beneficially own the 71,008 shares of common stock and 35,504 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by the selling stockholder. BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 71,008 shares of common stock and 35,504 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by Partners. Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 71,008 shares of common stock and 35,504 shares of common stock issuable upon exercise of Warrants held by the selling stockholder that are beneficially owned by BVF Inc. The foregoing should not be construed in and of itself as an admission by any Reporting Person as to beneficial ownership of any common stock owned by another Reporting Person. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the common stock beneficially owned by the selling stockholder, and the foregoing shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities. The selling stockholder’s address is Maples Corporate Services Ltd., PO Box 309, Ugland House, Grand Cayman, KYI-1104, Cayman Islands.
- (8) Includes (i) 208,247 shares of common stock held by AJU Growth and Healthcare Fund (“AJU Healthcare”) and (ii) 24,137 shares of common stock issuable upon the exercise of Warrants held by the AJU Healthcare. This figure excludes 1,080,562 shares of common stock held by AJU Life Science Overseas Platform Fund, an affiliate of the AJU Healthcare. The shares held by AJU Healthcare may be deemed to be beneficially owned by AJU IB Investment, Co., Ltd., its General Partner (“AJU IB”). AJU IB may be deemed to share voting and investment power over the shares held by AJU Healthcare and disclaims beneficial ownership of such shares except to the extent of its pecuniary interest therein. AJU Healthcare’s address is 800 Boylston St., Suite 2510, Boston, Massachusetts 02199.
- (9) Consists of (i) 864,665 shares of common stock held by the selling stockholder and (ii) 4,827 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The securities held by Sante Health Ventures I Annex Fund, L.P. may be deemed to be beneficially owned by Kevin Lalande, a member of our board of directors, Joe Cunningham, M.D. and Douglas D. French, who are managing directors (the “SHV Directors”) of SHV Management Services, LLC (“SHV Management”). SHV Management is the general partner of SHV Annex Services, LP, which is the general partner of Sante Health Ventures I Annex Fund, L.P. Each of the SHV Directors, SHV Management and SHV Annex Services, LP disclaims beneficial ownership of the reported securities except to the extent of his or its pecuniary interest therein. The selling stockholder’s address is 300 W. 6th Street, Suite 2300, Austin, Texas 78701.

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- (10) Consists of (i) 7,897,298 shares of common stock held by the selling stockholder and (ii) 19,310 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The securities held by Sante Health Ventures I, L.P. may be deemed to be beneficially owned by Kevin Lalande, a member of our board of directors, Joe Cunningham, M.D. and Douglas D. French, who are managing directors of SHV Management. SHV Management is the general partner of SHV Management Services, LP, which is the general partner of Sante Health Ventures I, L.P. Each of the SHV Directors, SHV Management and SHV Management Services, LP disclaims beneficial ownership of the reported securities except to the extent of his or its pecuniary interest therein. The selling stockholder's address is 300 W. 6th Street, Suite 2300, Austin, Texas 78701.
- (11) Consists of (i) 1,473,559 shares of common stock held by the selling stockholder and (ii) 24,137 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The securities held by Excel Venture Fund II, L.P. may be deemed to be beneficially owned by Steven R. Gullans, Juan Enriquez, Caleb M. Winder and Frederick R. Blume who are managing directors (the "Excel Directors") of Excel Ventures II GP, LLC ("Excel GP"). Excel GP is the general partner of Excel Venture Fund II, L.P. Each of the Excel Directors and Excel GP may be deemed to share voting and investment power over the shares held by Excel Venture Fund II and disclaims beneficial ownership of such shares except to the extent of its, his or her pecuniary interest therein. The selling stockholder's address is 800 Boylston Street, Suite 2825, Boston, MA 02199.
- (12) Consists of (i) 2,896,535 shares of common stock held by the selling stockholder and (ii) 1,448,267 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. Such securities are held by Longitude Venture Partners III, L.P. ("Longitude Venture III") and may be deemed to be beneficially owned by Longitude Capital Partners III, LLC ("Longitude Capital III"), David Hirsch, a member of our board of directors ("Dr. Hirsch"), Patrick G. Enright ("Mr. Enright"), and Juliet Tammenoms Bakker ("Ms. Bakker"). Longitude Capital III is the general partner of Longitude Venture III and may be deemed to share voting and investment power over our securities held by Longitude Venture III. Dr. Hirsch, Mr. Enright and Ms. Bakker are members of Longitude Capital III and Mr. Enright and Ms. Bakker are the managing members of Longitude Capital III, and all of them may be deemed to share voting and investment power over our securities held by Longitude Venture III. Each of Longitude Capital III, Dr. Hirsch, Mr. Enright and Ms. Bakker disclaims beneficial ownership of such securities except to the extent of its, his or her pecuniary interest therein. The selling stockholder's address is 2740 Sand Hill Road, 2nd Floor, Menlo Park, California 94025.
- (13) The shares of common stock reported to us as beneficially owned by Baker Bros. Advisors LP ("BBA") are held by the following selling stockholders: (i) 667, L.P. ("667") (7,322 shares of common stock and 3,661 shares of common stock issuable upon exercise of Warrants held by the selling stockholder) and (ii) Baker Brothers Life Sciences, L.P. ("BBLS") (65,090 shares of common stock and 32,545 shares of common stock issuable upon exercise of Warrants held by the selling stockholder). BBA is the management company and investment adviser to 667 and BBLS and may be deemed to beneficially own all of our securities held by 667 and BBLS. Baker Bros. Advisors (GP) LLC ("BBA-GP") is the sole general partner of BBA. Julian C. Baker and Felix J. Baker have voting and investment power over our securities held by each of 667 and BBLS, as principals of BBA-GP. Julian C. Baker, Felix J. Baker, BBA and BBA-GP disclaim beneficial ownership of our securities held by 667 and BBLS, except to the extent of their pecuniary interest therein. The selling stockholder's address is 667 Madison Avenue, New York, New York 10065.
- (14) Consists of (i) 1,013,787 shares of common stock held by the selling stockholder and (ii) 506,893 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. These shares are held by CDK Associates, L.L.C. and may be deemed to be beneficially owned by (x) Scott Morenstein, a member of our board of directors and a Managing Director of Caxton Alternative Management LP, the investment manager of CDK Associates, L.L.C., (y) Caxton Corporation, the manager of CDK Associates, LLC and (z) Bruce Kovner, the chairman and sole shareholder of Caxton Corporation. Caxton Corporation, Bruce Kovner and CDK Associates, L.L.C. may be considered directors by deputization due to their affiliation with Scott Morenstein. Each of Scott Morenstein, Caxton Corporation and Bruce Kovner disclaims beneficial ownership of these shares except to the extent of its or his pecuniary interest, if any, therein, and the foregoing shall not be deemed to be an admission that any such person is the beneficial owner of such securities for purposes of Section 16 or for any other purpose. The selling stockholder's address is 731 Alexander Road, Building 2, Suite 500, Princeton, New Jersey 08540.
- (15) Consists of (i) 144,826 shares of common stock held by the selling stockholder and (ii) 72,413 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The securities held by the selling stockholder may be deemed to be beneficially owned by Jonathan E. Gold, the Managing Member of the selling stockholder. Mr. Gold may be deemed to share voting and investment power over the shares held by the selling stockholder and disclaims beneficial ownership of such shares except to the extent of his pecuniary interest therein. The selling stockholder's address is PO Box 3322, New York, New York 10163.
- (16) Consists of (i) 72,413 shares of common stock held by the selling stockholder and (ii) 36,206 shares of common stock issuable upon exercise of Warrants held by the selling stockholder. The selling stockholder's address is 257 Park Avenue South, 15th Floor, New York, New York 10010.
- (17) Consists of 2,922,993 shares of common stock held by the selling stockholder. Millennium Pharmaceuticals, Inc. is a wholly owned subsidiary of Takeda Pharmaceutical Company Limited. The selling stockholder's address is 35 Landsdowne Street, Cambridge, Massachusetts 02139.

PLAN OF DISTRIBUTION

The selling stockholders, which as used herein includes donees, pledgees, transferees or other successors-in-interest selling shares of common stock or interests in shares of common stock received after the date of this prospectus from a selling stockholder as a gift, pledge, partnership distribution or other transfer, may, from time to time, sell, transfer or otherwise dispose of any or all of their shares of common stock or interests in shares of common stock on any stock exchange, market or trading facility on which the shares are traded or in private transactions. These dispositions may be at fixed prices, at prevailing market prices at the time of sale, at prices related to the prevailing market price, at varying prices determined at the time of sale, or at negotiated prices.

The selling stockholders may use any one or more of the following methods when disposing of shares or interests therein:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the shares as agent, but may position and resell a portion of the block as principal to facilitate the transaction;
- purchases by a broker-dealer as principal and resale by the broker-dealer for its account;
- an exchange distribution in accordance with the rules of the applicable exchange;
- privately negotiated transactions;
- short sales effected after the date the registration statement of which this prospectus is a part is declared effective by the SEC;
- through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- broker-dealers may agree with the selling stockholders to sell a specified number of such shares at a stipulated price per share;
- a combination of any such methods of sale; and
- any other method permitted by applicable law.

The selling stockholders may, from time to time, pledge or grant a security interest in some or all of the shares of common stock owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell the shares of common stock, from time to time, under this prospectus, or under an amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act amending the list of selling stockholders to include the pledgee, transferee or other successors-in-interest as selling stockholders under this prospectus. The selling stockholders also may transfer the shares of common stock in other circumstances, in which case the transferees, pledgees or other successors-in-interest will be the selling beneficial owners for purposes of this prospectus.

In connection with the sale of our common stock or interests therein, the selling stockholders may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of the common stock in the course of hedging the positions they assume. The selling stockholders may also sell shares of our common stock short and deliver these securities to close out their short positions, or loan or pledge the common stock to broker-dealers that in turn may sell these securities. The selling stockholders may also enter into option or other transactions with broker-dealers or other financial institutions or the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares offered by this prospectus, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

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The aggregate proceeds to the selling stockholders from the sale of the common stock offered by them will be the purchase price of the common stock less discounts or commissions, if any. Each of the selling stockholders reserves the right to accept and, together with their agents from time to time, to reject, in whole or in part, any proposed purchase of common stock to be made directly or through agents. We will not receive any of the proceeds from this offering. Upon any exercise of the Warrants by payment of cash, however, we will receive the exercise price of the Warrants.

The selling stockholders also may resell all or a portion of the shares in open market transactions in reliance upon Rule 144 under the Securities Act, provided that they meet the criteria and conform to the requirements of that rule.

The selling stockholders and any underwriters, broker-dealers or agents that participate in the sale of the common stock or interests therein may be “underwriters” within the meaning of Section 2(11) of the Securities Act. Any discounts, commissions, concessions or profit they earn on any resale of the shares may be underwriting discounts and commissions under the Securities Act. Selling stockholders who are “underwriters” within the meaning of Section 2(11) of the Securities Act will be subject to the prospectus delivery requirements of the Securities Act.

To the extent required, the shares of our common stock to be sold, the names of the selling stockholders, the respective purchase prices and public offering prices, the names of any agents, dealer or underwriter, any applicable commissions or discounts with respect to a particular offer will be set forth in an accompanying prospectus supplement or, if appropriate, a post-effective amendment to the registration statement of which this prospectus is a part.

In order to comply with the securities laws of some states, if applicable, the common stock may be sold in these jurisdictions only through registered or licensed brokers or dealers. In addition, in some states the common stock may not be sold unless it has been registered or qualified for sale or an exemption from registration or qualification requirements is available and is complied with.

We have advised the selling stockholders that the anti-manipulation rules of Regulation M under the Exchange Act may apply to sales of shares in the market and to the activities of the selling stockholders and their affiliates. In addition, to the extent applicable we will make copies of this prospectus (as it may be supplemented or amended from time to time) available to the selling stockholders for the purpose of satisfying the prospectus delivery requirements of the Securities Act. The selling stockholders may indemnify any broker-dealer that participates in transactions involving the sale of the shares against certain liabilities, including liabilities arising under the Securities Act.

We will pay all expenses of the registration of the shares of common stock pursuant to the Registration Rights Agreement, including, without limitation, SEC filing fees and expenses of compliance with state securities or “blue sky” laws; provided, however, that each selling stockholder will pay all underwriting discounts and selling commissions, if any and any related legal expenses incurred by it. We will indemnify the selling stockholders against certain liabilities, including some liabilities under the Securities Act, in accordance with the Registration Rights Agreement, or the selling stockholders will be entitled to contribution. We may be indemnified by the selling stockholders against civil liabilities, including liabilities under the Securities Act, that may arise from any written information furnished to us by the selling stockholders specifically for use in this prospectus, in accordance with the Registration Rights Agreement, or we may be entitled to contribution.

We have agreed with the selling stockholders to keep the registration statement of which this prospectus is a part effective until the earlier of (i) such time as all of the shares covered by this prospectus have been disposed of pursuant to and in accordance with the registration statement or (ii) the date on which all of the shares may be sold without restriction pursuant to Rule 144 of the Securities Act.

LEGAL MATTERS

The validity of the shares of common stock offered in this prospectus has been passed upon for us by Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts.

EXPERTS

The consolidated financial statements of Threshold Pharmaceuticals, Inc. appearing in Threshold Pharmaceuticals, Inc.'s Annual Report (Form 10-K) for the year ended December 31, 2016 have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their report thereon, included therein, and incorporated herein by reference. Such consolidated financial statements are incorporated herein by reference in reliance upon such report given on the authority of such firm as experts in accounting and auditing.

WHERE YOU CAN FIND ADDITIONAL INFORMATION

We are subject to the information requirements of the Exchange Act and we therefore file periodic reports, proxy statements and other information with the SEC relating to our business, financial statements and other matters. The reports, proxy statements and other information we file may be inspected and copied at prescribed rates at the SEC's Public Reference Room located at 100 F Street, N.E., Washington, D.C. 20549. You may obtain information on the operation of the SEC's Public Reference Room by calling the SEC at 1-800-SEC-0330. The SEC also maintains a website that contains reports, proxy and information statements and other information regarding issuers like us that file electronically with the SEC. The address of the SEC's website is <http://www.sec.gov>.

This prospectus constitutes part of a registration statement filed under the Securities Act with respect to the shares of common stock covered hereby. As permitted by the SEC's rules, this prospectus omits some of the information, exhibits and undertakings included in the registration statement. You may read and copy the information omitted from this prospectus but contained in the registration statement, as well as the periodic reports and other information we file with the SEC, at the public reference room and website of the SEC referred to above. You may also access our filings with the SEC on our website, which is located at <http://www.mtem.com/>. The information contained on our website is not part of this prospectus.

Statements contained in this prospectus as to the contents of any contract or other document are not necessarily complete, and in each instance we refer you to the copy of the contract or other document filed or incorporated by reference as an exhibit to the registration statement or as an exhibit to our Exchange Act filings, each such statement being qualified in all respects by such reference.

INFORMATION INCORPORATED BY REFERENCE

We are allowed to incorporate by reference information contained in documents that we file with the SEC. This means that we can disclose important information to you by referring you to those documents and that the information in this prospectus is not complete and you should read the information incorporated by reference for more detail. Information in this prospectus supersedes information incorporated by reference that we filed with the SEC prior to the date of this prospectus, while information that we file later with the SEC will automatically update and supersede the information in this prospectus.

We incorporate by reference the documents listed below and any future filings we will make with the SEC under Section 13(a), 13(c), 14 or 15 (d) of the Exchange Act (i) after the date of the initial filing of the registration statement of which this prospectus is a part and prior to effectiveness of such registration statement and (ii) from the date of this prospectus but prior to the termination of the offering of the securities covered by this prospectus (other than Current Reports or portions thereof furnished under Item 2.02 or 7.01 of Form 8-K):

- our Annual Report on Form 10-K for the fiscal year ended December 31, 2016, filed with the SEC on March 27, 2017 (as amended by Amendment No. 1 on Form 10-K/A filed on April 28, 2017);

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- our Quarterly Reports on Form 10-Q for the quarter ended March 31, 2017, filed with the SEC on May 15, 2017, and for the quarter ended June 30, 2017, filed with the SEC on July 31, 2017;
- our Current Reports on Form 8-K or 8-K/A that we filed with the SEC, as applicable, on March 17, 2017, March 29, 2017, March 30, 2017, June 2, 2017, June 22, 2017, July 20, 2017, August 1, 2017, August 7, 2017, October 13, 2017 and October 17, 2017 (other than any portions thereof deemed furnished and not filed); and
- the description of our common stock set forth in the registration statement on Form 8-A registering our common stock under Section 12 of the Exchange Act, which was filed with the SEC on August 9, 2006, including any amendments or reports filed for purposes of updating such description.

We will provide to each person, including any beneficial owner, to whom a prospectus is delivered, a copy of any or all of the information that is incorporated by reference in this prospectus but not delivered with this prospectus, including exhibits that are specifically incorporated by reference in such documents. You may request a copy of such documents, which will be provided to you at no cost, by writing or telephoning us at the following address or telephone number:

MOLECULAR TEMPLATES, INC.
9301 Amberglen Blvd, Suite 100
Austin, Texas 78729
Attention: Chief Executive Officer
Telephone: (512) 869-1555

11,612,582 Shares



Common Stock

PROSPECTUS
