

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

SCHEDULE 13G
(Rule 13d-102)

INFORMATION TO BE INCLUDED IN STATEMENTS FILED PURSUANT
TO RULES 13d-1(b), (c), AND (d) AND AMENDMENTS THERETO FILED
PURSUANT TO RULE 13d-2(b)

(Amendment No.)¹

X4 Pharmaceuticals, Inc.
(Name of Issuer)

Common Stock, \$0.001 par value
(Title of Class of Securities)

98420X103
(CUSIP Number)

April 16, 2019
(Date of Event Which Requires Filing of this Statement)

Check the appropriate box to designate the rule pursuant to which this Schedule is filed:

- Rule 13d-1(b)
- Rule 13d-1(c)
- Rule 13d-1(d)

¹ The remainder of this cover page shall be filled out for a reporting person's initial filing on this form with respect to the subject class of securities, and for any subsequent amendment containing information which would alter disclosures provided in a prior cover page.

The information required on the remainder of this cover page shall not be deemed to be "filed" for the purpose of Section 18 of the Securities Exchange Act of 1934 ("Act") or otherwise subject to the liabilities of that section of the Act but shall be subject to all other provisions of the Act (however, see the *Notes*).

| | | |
|---|--|--|
| 1 | NAME OF REPORTING PERSON Biotechnology Value Fund, L.P. | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Delaware | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 818,595* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 818,595* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 818,595* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 6.4%* | |
| 12 | TYPE OF REPORTING PERSON PN | |

* Includes 450,314 Shares issuable upon the exercise of certain Class A Warrants (defined in Item 4).

Excludes 530,425 Shares underlying certain Pre-Funded Warrants (defined in Item 4) held by BVF that may not be exercised due to the Pre-Funded Blocker (defined in Item 4).

| | | |
|---|--|--|
| 1 | NAME OF REPORTING PERSON Biotechnology Value Fund II, L.P. | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Delaware | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 394,758* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 394,758* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 394,758* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 3.2%* | |
| 12 | TYPE OF REPORTING PERSON PN | |

* Includes 97,102 Shares issuable upon the exercise of certain Class A Warrants. Excludes 266,708 Shares underlying Class A Warrants held by BVF2 that may not be exercised due to the Class A Blocker (defined in Item 4).

Excludes 428,704 Shares underlying certain Pre-Funded Warrants held by BVF2 that may not be exercised due to the Pre-Funded Blocker.

| | | |
|---|--|---|
| 1 | NAME OF REPORTING PERSON Biotechnology Value Trading Fund OS LP | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Cayman Islands | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 53,140* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 53,140* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 53,140* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) Less than 1%* | |
| 12 | TYPE OF REPORTING PERSON PN | |

* Excludes 64,996 Shares underlying certain Class A Warrants held by Trading Fund OS that may not be exercised due to the Class A Blocker.

Excludes 76,534 Shares underlying certain Pre-Funded Warrants held by Trading Fund OS that may not be exercised due to the Pre-Funded Blocker.

| | | |
|---|--|-------------------------------------|
| 1 | NAME OF REPORTING PERSON BVF Partners OS Ltd. | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Cayman Islands | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 53,140* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 53,140* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 53,140* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) Less than 1%* | |
| 12 | TYPE OF REPORTING PERSON CO | |

* Excludes 64,996 Shares underlying certain Class A Warrants held by Trading Fund OS that may not be exercised due to the Class A Blocker.

Excludes 76,534 Shares underlying certain Pre-Funded Warrants held by Trading Fund OS that may not be exercised due to the Pre-Funded Blocker.

| | | |
|---|--|--|
| 1 | NAME OF REPORTING PERSON BVF Partners L.P. | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Delaware | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 1,292,416* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 1,292,416* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,292,416* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99%* | |
| 12 | TYPE OF REPORTING PERSON PN, IA | |

* Includes 547,416 Shares issuable upon the exercise of certain Class A Warrants. Excludes 363,334 Shares underlying Class A Warrants that may not be exercised due to the Class A Blocker.

Excludes 1,073,000 Shares underlying certain Pre-Funded Warrants that may not be exercised due to the Pre-Funded Blocker.

| | | |
|---|--|--|
| 1 | NAME OF REPORTING PERSON BVF Inc. | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION Delaware | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 1,292,416* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 1,292,416* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,292,416* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99%* | |
| 12 | TYPE OF REPORTING PERSON CO | |

* Includes 547,416 Shares issuable upon the exercise of certain Class A Warrants. Excludes 363,334 Shares underlying Class A Warrants that may not be exercised due to the Class A Blocker.

Excludes 1,073,000 Shares underlying certain Pre-Funded Warrants that may not be exercised due to the Pre-Funded Blocker.

| | | |
|---|--|--|
| 1 | NAME OF REPORTING PERSON Mark N. Lampert | |
| 2 | CHECK THE APPROPRIATE BOX IF A MEMBER OF A GROUP (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> | |
| 3 | SEC USE ONLY | |
| 4 | CITIZENSHIP OR PLACE OF ORGANIZATION United States | |
| NUMBER OF SHARES BENEFICIALLY OWNED BY EACH REPORTING PERSON WITH | 5 | SOLE VOTING POWER 0 shares |
| | 6 | SHARED VOTING POWER 1,292,416* |
| | 7 | SOLE DISPOSITIVE POWER 0 shares |
| | 8 | SHARED DISPOSITIVE POWER 1,292,416* |
| 9 | AGGREGATE AMOUNT BENEFICIALLY OWNED BY EACH REPORTING PERSON 1,292,416* | |
| 10 | CHECK BOX IF THE AGGREGATE AMOUNT IN ROW (9) EXCLUDES CERTAIN SHARES <input type="checkbox"/> | |
| 11 | PERCENT OF CLASS REPRESENTED BY AMOUNT IN ROW (9) 9.99%* | |
| 12 | TYPE OF REPORTING PERSON IN | |

* Includes 547,416 Shares issuable upon the exercise of certain Class A Warrants. Excludes 363,334 Shares underlying Class A Warrants that may not be exercised due to the Class A Blocker.

Excludes 1,073,000 Shares underlying certain Pre-Funded Warrants that may not be exercised due to the Pre-Funded Blocker.

Item 1(a). Name of Issuer:
X4 Pharmaceuticals, Inc., a Delaware corporation (the "Issuer").

Item 1(b). Address of Issuer's Principal Executive Offices:

955 Massachusetts Avenue, 4th Floor
Cambridge, Massachusetts 02139

Item 2(a). Name of Person Filing

Item 2(b). Address of Principal Business Office or, if None, Residence

Item 2(c). Citizenship

Biotechnology Value Fund, L.P. ("BVF")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Biotechnology Value Fund II, L.P. ("BVF2")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Biotechnology Value Trading Fund OS LP ("Trading Fund OS")
PO Box 309 Uglan House
Grand Cayman, KY1-1104
Cayman Islands
Citizenship: Cayman Islands

BVF Partners OS Ltd. ("Partners OS")
PO Box 309 Uglan House
Grand Cayman, KY1-1104
Cayman Islands
Citizenship: Cayman Islands

BVF Partners L.P. ("Partners")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

BVF Inc.
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: Delaware

Mark N. Lampert ("Mr. Lampert")
44 Montgomery St., 40th Floor
San Francisco, California 94104
Citizenship: United States

Each of the foregoing is referred to as a "Reporting Person" and collectively as the "Reporting Persons."

CUSIP NO. 98420X103

Item 2(d). Title of Class of Securities:

Common Stock, \$0.001 par value (the "Shares")

Item 2(e). CUSIP Number:

98420X103

Item 3. If This Statement is Filed Pursuant to Rule 13d-1(b), or 13d-2(b) or (c), Check Whether the Person Filing is a:

- /x/ Not applicable.
- (a) // Broker or dealer registered under Section 15 of the Exchange Act.
- (b) // Bank as defined in Section 3(a)(6) of the Exchange Act.
- (c) // Insurance company as defined in Section 3(a)(19) of the Exchange Act.
- (d) // Investment company registered under Section 8 of the Investment Company Act.
- (e) // An investment adviser in accordance with Rule 13d-1(b)(1)(ii)(E).
- (f) // An employee benefit plan or endowment fund in accordance with Rule 13d-1(b)(1)(ii)(F).
- (g) // A parent holding company or control person in accordance with Rule 13d-1(b)(1)(ii)(G).
- (h) // A savings association as defined in Section 3(b) of the Federal Deposit Insurance Act.
- (i) // A church plan that is excluded from the definition of an investment company under Section 3(c)(14) of the Investment Company Act.
- (j) // Group, in accordance with Rule 13d-1(b)(1)(ii)(J).
- (k) // Group, in accordance with Rule 240.13d-1(b)(1)(ii)(K). If filing as a non-U.S. institution in accordance with Rule 240.13d-1(b)(1)(ii)(J), please specify the type of institution: _____

Item 4. Ownership

- (a) Amount beneficially owned:

As of the close of business on April 22, 2019, the Reporting Persons held 910,750 Class A Warrants (the “Class A Warrants”) exercisable into an aggregate of 910,750 Shares. Each Class A Warrant has an exercise price per Share equal to \$13.20 and expires 60 months from the date of issuance. The Class A Warrants are exercisable, at the option of each holder, provided that the holder will be prohibited, subject to certain exceptions, from exercising the Class A Warrants for Shares to the extent that immediately prior to or after giving effect to such exercise, the holder, together with its affiliates and other attribution parties, would own more than 9.99% of the total number of Shares then issued and outstanding (the “Class A Blocker”). As of the close of business on April 22, 2019, the Class A Blocker limits the aggregate exercise of Class A Warrants by the Reporting Persons to 547,416 out of 910,750 Shares underlying the Class A Warrants owned by the Reporting Persons in the aggregate. In providing beneficial ownership described herein, the Reporting Persons have assumed that all of the Class A Warrants held by BVF to acquire 450,314 Shares and certain of the Class A Warrants held by BVF2 to acquire 97,102 Shares would be exercised, which would bring the Reporting Persons to the aggregate 9.99% limitation, and the remaining Class A Warrants exercisable into 266,708 Shares owned by BVF2, the Class A Warrants exercisable into 64,996 Shares owned by Trading Fund OS, and the Class A Warrants exercisable into 31,630 Shares held in a certain Partners managed account (the “Partners Managed Account”), would not be exercised due to the Class A Blocker.

As of the close of business on April 22, 2019, the Reporting Persons held 1,073,000 Pre-Funded Warrants (the “Pre-Funded Warrants”) exercisable into an aggregate of 1,073,000 Shares. Each Pre-Funded Warrant has an exercise price per Share equal to \$0.001 per Share. The Pre-Funded Warrants are exercisable at any time after their original issuance and do not expire. However, under the Pre-Funded Warrants, the Issuer may not effect the exercise of any Pre-Funded Warrant, and a holder will not be entitled to exercise any portion of any Pre-Funded Warrant, which, upon giving effect to such exercise, would cause (i) the aggregate number of Shares beneficially owned by the holder (together with its affiliates) to exceed 9.99% of the number of Shares outstanding immediately after giving effect to the exercise, or (ii) the combined voting power of the Issuer’s securities beneficially owned by the holder (together with its affiliates) to exceed 9.99% of the combined voting power of all of the Issuer’s securities then outstanding immediately after giving effect to the exercise, as such percentage ownership is determined in accordance with the terms of the Pre-Funded Warrants (the “Pre-Funded Blocker” and together with the Class A Blocker, the “Beneficial Ownership Limitation”). As of the close of business on April 22, 2019, the Pre-Funded Blocker limits the exercise of Pre-Funded Warrants by the Reporting Persons to zero out of the 1,073,000 Shares underlying the Pre-Funded Warrants owned by the Reporting Persons in the aggregate. BVF holds Pre-Funded Warrants to purchase 530,425 additional Shares which are excluded herein as a result of the Pre-Funded Blocker. BVF2 holds Pre-Funded Warrants to purchase 428,704 additional Shares which are excluded herein as a result of the Pre-Funded Blocker. BVTOS holds Pre-Funded Warrants to purchase 76,534 additional Shares which are excluded herein as a result of the Pre-Funded Blocker. The Reporting Persons through the Partners Managed Account holds Pre-Funded Warrants to purchase 37,337 additional Shares which are excluded herein as a result of the Pre-Funded Blocker.

The Reporting Persons may choose to exercise the Class A Warrants or the Pre-Funded Warrants in other amounts among the Reporting Persons, while continuing to comply with the Beneficial Ownership Limitation.

As of the close of business on April 22, 2019 (i) BVF beneficially owned 818,595 Shares, (ii) BVF2 beneficially owned 394,758 Shares, and (iii) Trading Fund OS beneficially owned 53,140 Shares.

Partners OS, as the general partner of Trading Fund OS, may be deemed to beneficially own the 53,140 Shares beneficially owned by Trading Fund OS.

Partners, as the general partner of BVF, BVF2, the investment manager of Trading Fund OS, and the sole member of Partners OS, may be deemed to beneficially own the 1,292,416 Shares beneficially owned in the aggregate by BVF, BVF2, Trading Fund OS, and the Partners Managed Accounts, including 25,923 Shares held in the Partners Managed Accounts.

BVF Inc., as the general partner of Partners, may be deemed to beneficially own the 1,292,416 Shares beneficially owned by Partners.

Mr. Lampert, as a director and officer of BVF Inc., may be deemed to beneficially own the 1,292,416 Shares 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 Shares owned by another Reporting Person. Partners OS disclaims beneficial ownership of the Shares beneficially owned by Trading Fund OS. Each of Partners, BVF Inc. and Mr. Lampert disclaims beneficial ownership of the Shares beneficially owned by BVF, BVF2, Trading Fund OS, and the Partners Managed Account, and the filing of this statement shall not be construed as an admission that any such person or entity is the beneficial owner of any such securities.

(b) Percent of class:

The following percentages are based on a denominator that is the sum of (i) 12,389,684 Shares outstanding as disclosed in the Issuer's Prospectus Supplement filed with the Securities and Exchange Commission on April 15, 2019 and (ii) certain or all of the 547,416 Shares issuable upon the exercise of the Class A Warrants, as applicable.

As of the close of business on April 22, 2019 (i) BVF beneficially owned approximately 6.4% of the outstanding Shares, (ii) BVF2 beneficially owned approximately 3.2% of the outstanding Shares, (iii) Trading Fund OS beneficially owned less than 1% of the outstanding Shares, (iv) Partners OS may be deemed to beneficially own less than 1% of the outstanding Shares, and (v) each of Partners, BVF Inc. and Mr. Lampert may be deemed to beneficially own approximately 9.99% of the outstanding Shares (less than 1% of the outstanding Shares is held in the Partners Managed Account).

(c) Number of shares as to which such person has:

(i) Sole power to vote or to direct the vote

See Cover Pages Items 5-9.

(ii) Shared power to vote or to direct the vote

See Cover Pages Items 5-9.

(iii) Sole power to dispose or to direct the disposition of

See Cover Pages Items 5-9.

(iv) Shared power to dispose or to direct the disposition of

See Cover Pages Items 5-9.

Item 5. Ownership of Five Percent or Less of a Class.

Not Applicable.

Item 6. Ownership of More than Five Percent on Behalf of Another Person.

Partners, BVF Inc. and Mr. Lampert share voting and dispositive power over the Shares beneficially owned by BVF, BVF2, Trading Fund OS, and the Partners Managed Account.

Item 7. Identification and Classification of the Subsidiary That Acquired the Security Being Reported on by the Parent Holding Company or Control Person.

Not Applicable.

Item 8. Identification and Classification of Members of the Group.

See Exhibit 99.1.

Item 9. Notice of Dissolution of Group.

Not Applicable.

Item 10. Certifications.

By signing below each of the undersigned certifies that, to the best of its knowledge and belief, the securities referred to above were not acquired and are not held for the purpose of or with the effect of changing or influencing the control of the issuer of the securities and were not acquired and are not held in connection with or as a participant in any transaction having that purpose or effect.

SIGNATURE

After reasonable inquiry and to the best of his knowledge and belief, each of the undersigned certifies that the information set forth in this statement is true, complete and correct.

Dated: April 23, 2019

BIOTECHNOLOGY VALUE FUND, L.P.

By: BVF Partners L.P., its general partner
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF INC.

By: /s/ Mark N. Lampert
Mark N. Lampert
President

/s/ Mark N. Lampert
MARK N. LAMPERT

BIOTECHNOLOGY VALUE FUND II, L.P.

By: BVF Partners L.P., its general partner
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF PARTNERS L.P.

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF PARTNERS OS LTD.

By: BVF Partners L.P., its sole member
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BIOTECHNOLOGY VALUE TRADING FUND OS LP

By: BVF Partners L.P., its investment manager
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

Joint Filing Agreement

The undersigned hereby agree that the Statement on Schedule 13G dated April 23, 2019 with respect to the common stock, par value \$0.001 per share of X4 Pharmaceuticals, Inc., and any further amendments thereto executed by each and any of the undersigned shall be filed on behalf of each of the undersigned pursuant to and in accordance with the provisions of Rule 13d-1(k)(1) under the Securities Exchange Act of 1934, as amended.

Dated: April 23, 2019

BIOTECHNOLOGY VALUE FUND, L.P.

By: BVF Partners L.P., its general partner
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF INC.

By: /s/ Mark N. Lampert
Mark N. Lampert
President

/s/ Mark N. Lampert
MARK N. LAMPERT

BIOTECHNOLOGY VALUE FUND II, L.P.

By: BVF Partners L.P., its general partner
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF PARTNERS L.P.

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BVF PARTNERS OS LTD.

By: BVF Partners L.P., its sole member
By: BVF Inc., its general partner

By: /s/ Mark N. Lampert
Mark N. Lampert
President

BIOTECHNOLOGY VALUE TRADING FUND OS LP

By: BVF Partners L.P., its investment manager

By: BVF Inc., its general partner

By: /s/ Mark N. Lampert

Mark N. Lampert

President