

**STATEMENT OF CHANGES IN BENEFICIAL OWNERSHIP**

Check this box if no longer subject to Section 16. Form 4 or Form 5 obligations may continue. See Instruction 1(b).

Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934 or Section 30(h) of the Investment Company Act of 1940

| OMB APPROVAL                                 |           |
|--|-----------|
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|  |   |  |
|--|---|--|
| 1. Name and Address of Reporting Person*<br><b>GILLIS STEVEN</b><br><br>(Last) (First) (Middle)<br><b>C/O ARCH VENTURE PARTNERS</b><br><b>8725 WEST HIGGINS ROAD, SUITE 290</b><br><br>(Street)<br><b>CHICAGO IL 60631</b><br><br>(City) (State) (Zip) | 2. Issuer Name and Ticker or Trading Symbol<br><b>bluebird bio, Inc. [ BLUE ]</b> | 5. Relationship of Reporting Person(s) to Issuer<br>(Check all applicable)<br><br><input checked="" type="checkbox"/> Director 10% Owner<br><br>Officer (give title below) Other (specify below) |
|  | 3. Date of Earliest Transaction (Month/Day/Year)<br><b>09/30/2014</b>             |  |
|  | 4. If Amendment, Date of Original Filed (Month/Day/Year)                          |  |

**Table I - Non-Derivative Securities Acquired, Disposed of, or Beneficially Owned**

| 1. Title of Security (Instr. 3) | 2. Transaction Date (Month/Day/Year) | 2A. Deemed Execution Date, if any (Month/Day/Year) | 3. Transaction Code (Instr. 8) |   | 4. Securities Acquired (A) or Disposed Of (D) (Instr. 3, 4 and 5) |            |                        | 5. Amount of Securities Beneficially Owned Following Reported Transaction(s) (Instr. 3 and 4) | 6. Ownership Form: Direct (D) or Indirect (I) (Instr. 4) | 7. Nature of Indirect Beneficial Ownership (Instr. 4) |
|---------------------------------|--------------------------------------|--|--------------------------------|---|---|------------|------------------------|---|--|---|
|                                 |                                      |  | Code                           | V | Amount  | (A) or (D) | Price                  |   |  |   |
| Common Stock                    | 09/30/2014                           |  | s                              |   | 32,095  | D          | \$36.08 <sup>(1)</sup> | 1,272,616   | I  | By ARCH Venture Fund VII, L.P. <sup>(4)(5)</sup>      |
| Common Stock                    | 10/01/2014                           |  | s                              |   | 11,516  | D          | \$34.75 <sup>(2)</sup> | 1,261,100   | I  | By ARCH Venture Fund VII, L.P. <sup>(4)(5)</sup>      |
| Common Stock                    | 10/02/2014                           |  | s                              |   | 47,554  | D          | \$34.87 <sup>(3)</sup> | 1,213,546   | I  | By ARCH Venture Fund VII, L.P. <sup>(4)(5)</sup>      |

**Table II - Derivative Securities Acquired, Disposed of, or Beneficially Owned (e.g., puts, calls, warrants, options, convertible securities)**

| 1. Title of Derivative Security (Instr. 3) | 2. Conversion or Exercise Price of Derivative Security | 3. Transaction Date (Month/Day/Year) | 3A. Deemed Execution Date, if any (Month/Day/Year) | 4. Transaction Code (Instr. 8) |   | 5. Number of Derivative Securities Acquired (A) or Disposed of (D) (Instr. 3, 4 and 5) |     | 6. Date Exercisable and Expiration Date (Month/Day/Year) |                 | 7. Title and Amount of Securities Underlying Derivative Security (Instr. 3 and 4) | 8. Price of Derivative Security (Instr. 5) | 9. Number of derivative Securities Beneficially Owned Following Reported Transaction(s) (Instr. 4) | 10. Ownership Form: Direct (D) or Indirect (I) (Instr. 4) | 11. Nature of Indirect Beneficial Ownership (Instr. 4) |
|--|--|--------------------------------------|--|--------------------------------|---|--|-----|--|-----------------|---|--|--|---|--|
|  |  |                                      |  | Code                           | V | (A)  | (D) | Date Exercisable   | Expiration Date |   |  |  |   |  |

**Explanation of Responses:**

- The price reported in Column 4 is a weighted average price. These shares were sold in multiple transactions at prices ranging from \$36.00 to \$36.315, inclusive. The reporting person undertakes to provide to BLUE, any security holder of BLUE, or the staff of the Securities and Exchange Commission, upon request, full information regarding the number of shares sold at each separate price within the ranges set forth in footnotes (1), (2), and (3) to this Form 4.
- The price reported in Column 4 is a weighted average price. These shares were sold in multiple transactions at prices ranging from \$34.75 to \$34.795, inclusive.
- The price reported in Column 4 is a weighted average price. These shares were sold in multiple transactions at prices ranging from \$34.75 to \$35.03, inclusive.
- These shares are owned directly by ARCH Venture Fund VII, L.P. ("ARCH Fund VII"). The sole general partner of ARCH Fund VII is ARCH Venture Partners VII, L.P. ("ARCH Partners VII"). The sole general partner of ARCH Partners VII is ARCH Venture Partners VII, LLC ("ARCH VII LLC"). The Managing Directors of ARCH VII LLC, Robert T. Nelsen, Keith Crandell and Clinton Bybee, are deemed to have voting and dispositive power over the shares and may be deemed to beneficially own Fund shares held by ARCH Fund VII. Each Managing Director disclaims beneficial ownership of these securities, except to the extent of his pecuniary interest therein, and this report shall not be deemed an admission that such Managing Directors are the beneficial owners of such securities for Section 16 or any other purpose.
- Steven Gillis owns an interest in ARCH Partners VII but does not have voting or investment control over the shares held by ARCH Fund VII and disclaims beneficial ownership of such shares, except to the extent of any pecuniary interest therein, and this report shall not be deemed an admission that Steven Gillis is the beneficial owner of such securities for Section 16 or any other purpose.

**Remarks:**

/s/ Steven Gillis

10/02/2014

\*\* Signature of Reporting Person

Date

\* If the form is filed by more than one reporting person, see Instruction 4 (b)(v).

\*\* Intentional misstatements or omissions of facts constitute Federal Criminal Violations See 18 U.S.C. 1001 and 15 U.S.C. 78ff(a).

Note: File three copies of this Form, one of which must be manually signed. If space is insufficient, see Instruction 6 for procedure.

**Persons who respond to the collection of information contained in this form are not required to respond unless the form displays a currently valid OMB Number.**