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

DIVISION OF
CORPORATION FINANCE

July 20, 2011

Via E-mail
Mr. Richard Brajer
Chief Executive Officer
LipoScience, Inc.
2500 Sumner Boulevard
Raleigh, NC 27616

Re: LipoScience, Inc.
Registration Statement on Form S-1
Filed June 23, 2011
File No. 333-175102

Dear Mr. Brajer:

We have reviewed your registration statement and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter by amending your registration statement and providing the requested information. If you do not believe our comments apply to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing any amendment to your registration statement and the information you provide in response to these comments, we may have additional comments.

General

1. Prior to the effectiveness of the company's registration statement, please have a FINRA representative call the staff to confirm whether or not the amount of compensation allowable or payable to the Underwriters has received clearance.

2. Prior to effectiveness, please have a NASDAQ Global Market representative call the staff to confirm that your securities have been approved for listing.

3. We will process your amendments without price ranges. As the price range you select will affect disclosure in several sections of the filing, we will need sufficient time to process your amendments once a price range is included and the material information now appearing blank throughout the document has been provided. Please understand that the effect of the price range on disclosure throughout the document may cause us to raise issues on areas not previously commented on.

4. Throughout your document you reference numerous studies such as the Multi-Ethnic Study of Atherosclerosis and the Framingham Offspring Study which support the efficacy of your test. Please provide us copies of all reports referenced on a supplemental basis.

5. We note the picture following your financial statements which appears to be the Vantera system presently in its final stages of development. It is unclear whether this picture is a working prototype of your proposed system or not. Please advise.

6. We note on page F-28 that the Company engaged a third-party valuation specialist to assist in the determination of the estimated fair market value of the Company's common stock. We further note on page F-20 and F-23 that the fair value of the warrants was determined with the assistance of a third-party valuation specialist using a probability weighted valuation model. Please tell us the nature and extent of the involvement of the third party valuation specialist(s) and tell us whether you believe they are acting as experts as defined in the Securities Act of 1933.

Prospectus Cover Page

7. Please revise your cover to include a placeholder to indicate the total number of shares purchasable by the underwriters pursuant to the overallotment option. See Item 501(b)(2) of Regulation S-K.

Prospectus Summary

8. Please provide us with your basis for making the statement that you believe "the inherent analytical and clinical advantages of NMR-based technology will also allow [you] to expand [y]our diagnostic test menu."

9. We note disclosure on page three and elsewhere regarding FDA clearance for certain tests, as well as government review of other "lipoprotein measures," which have not been cleared by the FDA. Please revise here and Government Regulation on page 83 to clarify why some products and services have been cleared but others have not. Your revised disclosure should explain the difference, if any, between a "test" and a "measure." Details should be located on page 83.

10. In this regard, we note comment 37 from our letter dated March 28, 2002 and pertaining to registration statement number 333-83602.

11. Consider revising the second set of bullet points on page five to address, in quantified terms, your indebtedness, history of losses and accumulated deficit.

Risk Factors, page 12

12. Please revise your risk factors to remove repetitive disclosure and speculative or generic risk factors, or revise them to specifically apply to you. In this regard we specifically note your page 19 risk factor "If we expand sales of our products outside the United States …," your page 28 risk factor "Failure to obtain regulatory approval in international jurisdictions …"and your page 30 risk factor "If securities or industry analysts …" as examples.

13. We note the statements in the first risk factor on page 25 regarding your NMR LipoProfile laboratory developed tests, including the statement that future FDA action "could restrict [y]our ability to provide the portions of [y]our test that are not cleared by the FDA or potentially delay the launch of future tests." We also note references in your page 26 risk factor to "non-acceptance of [y]our currently pending 510(k) notification for software modifications" and "certain non-cleared portions of [y]our test." Please revise risk factors, the reference on page three to "measures" not cleared by the FDA and where appropriate to clarify the nature and magnitude of your operations and resulting revenues not covered by FDA clearance.

14. Please revise the last risk factor on page 20 to quantify the "specified liquidity ratio" and "certain monthly revenue targets."

Use of Proceeds, page 36

15. We note your statement that management will have "significant flexibility in applying the net proceeds of the offering" and that you "cannot predict with certainty all of the particular uses … or the amounts that [you] will actually spend …" We direct your attention to Instruction 7 to Item 504 of Regulation S-K, which allows the company to reserve the right to change the use of proceeds, provided such reservation is due to certain contingencies that are discussed specifically and the alternatives to such use in that event are indicated. Please revise the disclosure accordingly.

16. We note that you reserve funds for working capital and other general purposes. Currently it is unclear how much of your offering proceeds will be allocated to this category. Please note that we may have further comment once the amount allocated to this category becomes known and it may be necessary to provide more specific disclosure addressing your intended use of proceeds or to explain the decision to raise funds at this time. See Item 504 of Regulation S-K.

17. We note on page F-24 that through March 31, 2011, $4.8 million of Series F Dividends have been accrued and are reflected in the carrying amount of Series F on the December 31, 2010 balance sheet. We further note on page 7 and 36 that you currently expect to use offering proceeds of approximately $5.2 million to pay accrued dividends on the outstanding shares of Series F redeemable convertible preferred stock that will convert to

common stock. Please revise your disclosure on page 7 and 36 to disclose what the difference represents.

Management's Discussion and Analysis of Financial Condition and Results of Operations, page 44

Financial Operations Overview, page 44

18. We note that the overall average selling price of NMR LipoProfile tests decreased 5.7% to $31.60 for the year ended December 31, 2010 from $33.50 for the year ended December 31, 2009 (page 58); and decreased 9.8% to $29.40 for the three months ended March 31, 2011 from $32.60 for the three months ended March 31, 2010 (page 56). We further note that the decrease in revenues from sales of ancillary tests for the three months ended March 31, 2011 was primarily driven by the shift in testing mix and an overall reduction of reimbursement rates from Medicare. Please revise to further discuss these recent average selling price and Medicare reimbursement rate trends, and the effects on your revenues within this section. To the extent that you reasonably expect these trends will have a material favorable or unfavorable impact on your future revenue, income from operations or liquidity, also revise to provide the disclosure required by Item 303(a)(1) or 303(a)(3)(ii) of Regulation S-K as applicable.

19. Also, to the extent material, please revise to address your Vantera-related goals and "publication or policy coverage goals," which you indicate on page 105 were not met.

20. We note the reference to "standard analytical chemistry tests" on page 44. With a view to clarifying disclosure, advise us whether they relate to the LDT referred to in the first risk factor on page 25. Also, to the extent material, please address the degree to which these tests have price and margin characteristics that are dissimilar to your NMR LipoProfile tests.

21. Your Management's Discussion and Analysis, Summary, Use of Proceeds, and other disclosure indicate your intention to increase your sales and marketing activity to expand sales of your existing test and increase research and development in connection with new offerings such as the Vantera system. Please revise your page 65 discussion of capital expenditures and where appropriate to provide quantitative information about your plans and expenses.

Critical Accounting Policies and Significant Judgments and Estimates, page 47

Redeemable Convertible Preferred Stock Warrants, page 48

22. We note on page F-12 that the aggregate intrinsic value of warrants is calculated based on the difference between the exercise price of the warrants and the estimated fair market value of the Company's Series E and Series F Redeemable Convertible Preferred Stock

as of the respective dates. Please revise to disclose your valuation methodologies for the Series E and Series F Redeemable Convertible Preferred Stock. Also describe the changes in assumptions and/or intervening events that occurred between each valuation date, and discuss how they impacted the estimated fair market value of the Series E and Series F Redeemable Convertible Preferred Stock.

Stock-Based Compensation Expense, page 48

Determination of the Fair Value of Common Stock on Grant Dates, page 49

Common Stock Valuation Methodologies, page 51

23. Please revise your common stock valuation methodologies disclosure to describe the changes in assumptions and/or intervening events that occurred between each valuation date, and discuss how they impacted the estimated fair market value of your common stock per share. To the extent that the estimated IPO price range is substantially in excess of the December 2010 estimated fair market value of $3.40 per share, also discuss the significant factors that contributed to the increase in future amendments to your Form S-1 that include the estimated IPO price range.

24. We note on page 51 that each of your valuations reflects a marketability discount, resulting from the illiquidity of your common stock. Please disclose how you determined the marketability discount and quantify the discount applied for each of your valuations.

25. We note on page 54 that the estimated fair market value of your common stock as of December 31, 2009 was based on the relative weights of the IPO scenarios, the two sale scenarios, the continuing operations scenario and the liquidation scenario. We further note that the estimated fair market value of your common stock as of June 30, 2010, November 30, 2010 and December 31, 2010 was based on the relative weights of the IPO scenarios, the two sale scenarios and the liquidation scenario. For each valuation date, please revise to disclose how each scenario used in the valuation was weighted.

Retrospective Valuation as of September 30, 2009, page 52

26. We note that in connection with the preparations for this offering, you retrospectively estimated that the value of your common stock was $2.27 per share as of September 30, 2009. We further note that you made two option grants for a total of 88,200 shares from September 2009 through December 2009 based on the October 31, 2008 valuation of $1.21 per share. Finally, we note you determined that had you used the higher September 30, 2009 value of the common stock for financial reporting purposes, the effect would not have been material and, therefore, no adjustment to your financial statements was necessary. Please tell us and revise to disclose how the higher September 30, 2009 value of your common stock would have affected the incremental stock-based compensation for the October 2009 stock option exchange.

Aggregate Intrinsic Value of Equity Awards, page 54

27. We note that you began using the $3.34 estimated fair market value per share for stock options granted after November 30, 2010, the first of which were granted in April 2011. Please tell us the grant date, number of options granted and exercise price for all options that you granted after March 31, 2011. Also revise to describe the significant factors, assumptions and methodologies that you used to estimate the fair market value of your common stock as of each grant date subsequent to March 31, 2011.

Results of Operations, page 56

28. We note that you provide multiple business reasons for changes in your operating expenses for the comparable periods presented. To the extent practicable, please revise the discussion of your operating results to both quantitatively and qualitatively describe the significant underlying factors that materially affected your operating expenses. Refer to Item 303(a)(3) of Regulations S-K and FRC 501.04 for additional guidance.

29. We on page 12 and F-13 that Health Diagnostics Laboratory Inc. accounted for 15% of your revenues for the three months ended March 31, 2011, and zero percent of your revenues in prior periods. Please revise to disclose the effects of this new customer on your revenues for the three months ended March 31, 2011, or tell us why you believe such disclosure is not required under Item 303 of Regulation S-K.

Comparison of Years Ended December 31, 2009 and 2010

30. On page 59 you indicate you were released from a $2.7 million payment obligation for prior research and development services. With a view to potential disclosure, please advise us of the nature of the claim, scope of the release, and the company's potential exposures related to this dispute.

Liquidity and Capital Resources, page 62

31. We note your disclosure of certain expired patents, and patents that will expire in March 2011 and August 2011 on page 23, 82 and F-34. Please tell us if you reasonably expect these patent expirations to have a material favorable or unfavorable impact on your revenue, income from operations or liquidity and, if so, revise to provide the disclosure required by Item 303(a)(1) or 303(a)(3)(ii) of Regulation S-K.

Operating and Capital Expenditure Requirements, page 65

32. We note on page F-19 that your property and equipment includes construction in progress for the periods presented. Please describe to us the nature of the construction in progress, and tell us your expected future cash flows to complete this construction. Also revise to

disclose your anticipated capital expenditures for fiscal 2011, including for construction in progress and the expected funding resources for these expenditures.

Contractual Commitments and Obligations, page 66

33. We note on page 81 that you are obligated to purchase all of your NMR-related component requirements from Agilent under a collaboration agreement. Please tell us if this obligation constitutes a purchase obligation that is required to be disclosed in the contractual obligation table pursuant to Item 303(a)(5) of Regulation S-K.

Business, page 69

34. On page 69 you state that two studies "indicate that a patient's number of LDL particles, as measured by the NMR LipoProfile test, is more strongly associated with the risk of developing cardiovascular disease than is his or her level of LDL-C." However, the relationship between these studies and your test is unclear. Please revise to address the relationship between your diagnostic test and these studies and to address how your test was developed.

35. Please revise your Business disclosure and elsewhere to briefly address the nature of your test. It is unclear, for example, whether LDL particle levels vary year to year and can be managed such that annual patient testing would be advisable or, in the alternate, whether the test is more likely to be ordered once in a patient's lifetime, and how this affects the size of your market opportunity and the nature of your revenue stream.

36. On page 80 you indicate your intention to seek FDA clearance for an enhanced assay used in assessing insulin resistance. Please address the timeframe for this. In this respect it is unclear if this is the same test referred to in your prior Form S-1 from September 2002.

37. We note the reference on page 82 and elsewhere to the August 2011 patent expiration. Please disclose, here and elsewhere, how the expiration of this patent may or will impact the competitive landscape for your test, and the degree to which your business relies upon this patent.

38. We note the disclosure on page 79 regarding your competitors' tests, which require "physical separation methods" that are more time-consuming and more costly to perform than your test. With a view to clarifying disclosure, please advise us whether samples are required to be separated before your test is conducted. We may have further comment.

39. Please list any material patents on which your business relies.

Non-Employee Director Compensation, page 98

40. We note you do not provide disclosure pursuant to Item 402(k) of Regulation S-K for Dr. Otvos who served on your board during 2010 but did not receive compensation for his services because he was an employee. We further note that Dr. Otvos is not a named executive officer pursuant to your disclosure. Please advise us how you considered the requirements of Item 402(k) and 404 of Regulation S-K with respect to Dr. Otvos' compensation. For additional helpful guidance, please consider Regulation S-K Compliance and Disclosure Interpretation numbers 227.02 and 227.03.

Principal Stockholders, page 129

41. Please consider expanding footnote 11 to clarify whether the presentation of shares held by officers and directors as a group includes the shares held by Dr. Otvos.

42. Please advise us why footnote three applies to both Dr. Otvos and Mr. Benson.

Report of Independent Registered Public Accounting Firm, page F-2

43. Please obtain and file an audit report that identifies your independent registered public accounting firm, and contains either a manual or conformed signature of your independent registered public accounting firm. Refer to Rule 2-02(a)(2) of Regulation S-X.

Statements of Operations, page F-4

44. We note the undistributed earnings re-allocated to common stockholders in fiscal 2010 and the three months ended March 31, 2010. Please tell us what this line item represents.

Notes to Financial Statements, page F-7

1. Description of Business and Significant Accounting Policies, page F-7

Registration Rights

45. We note your registration rights disclosure on pages 133-134 and 138. Please revise to provide ASC 825-20-50 registration payment arrangements disclosures, as applicable.

Shipping and Handling

46. Please revise to disclose your accounting policy relating to shipping and handling costs, including whether you charge your customers for shipping and handling fees and if you include such amounts in revenue.

Revenue Recognition, page F-8

47. We note that revenues from diagnostic tests for patient care, which consist of sales of the NMR LipoProfile test and sales of ancillary tests, are recognized on the accrual basis when the following revenue recognition criteria are met: (1) persuasive evidence that an arrangement exists; (2) services have been rendered or at the time final results are reported; (3) the fee is fixed or determinable; and (4) collectability is reasonably assured. We further note that testing services provided for patient care are covered by clinical diagnostic laboratories, programs with commercial insurance carriers (including managed care organizations) and various governmental programs, primarily Medicare; billing for diagnostic testing services is complex; in some cases tests are performed in advance of payment and without certainty as to the outcome of the billing process; and each payor typically has different billing requirements. Please tell us if there are differences in your revenue recognition policy for clinical diagnostic laboratories, commercial insurance carriers and governmental payors and, if so, revise to separately disclose each policy in greater detail.

48. We note that billings for diagnostic tests for patient care under governmental and physician-based programs are included in revenues net of contractual adjustments; and that these contractual adjustments represent the difference between the list price for tests performed and the reimbursement rate set by commercial insurance carriers or governmental programs. We further note that adjustments to the estimated payment amounts, based on final settlement with the programs, are recorded upon settlement as an adjustment to revenues. Please quantify for us the amount of adjustments that you recorded upon final settlement for each period presented. To the extent that the final settlement adjustments are material, also tell us how you considered these adjustments in your determination that the fee is fixed or determinable; and collectability is reasonably assured.

Preferred Stock Warrant Liability, page F-12

49. We note on page 48 that you estimated the fair value of the warrants at each balance sheet date using a modified Black-Scholes option pricing model. We further note your disclosure of the fair value of the warrants as of each balance sheet on page F-23. Please revise to disclose the actual valuation technique(s) used to measure the fair value of the warrants in greater detail, including the assumptions used for each period presented. Also include a discussion of any changes in the valuation technique(s) used, as applicable.

50. We note that the warrants to purchase 245,115 shares of the Company's Series E and Series F Redeemable Convertible Preferred Stock will automatically become warrants to purchase common stock upon completion of an initial public offering; and that the preferred stock warranty liability of $632,439 will be reclassified into additional paid-in capital immediately prior to the closing of the IPO (page F-7). We further note the

warrant to purchase stock agreements filed as Exhibits 10.2 through 10.6 to your Form S-1. Please further describe to us the circumstances in which the exercise price of the warrants may be adjusted, including adjustments under Section 4.4 of Exhibit 10.3, Section 2.3 of Exhibit 10.4 and Section 2.4 of Exhibits 10.5 and 10.6. To the extent that the warrants include down-round protection, please provide us with your analysis of ASC 815-40-15 that you used to determine the warrants are considered indexed to your own stock, and should be recorded as equity instead of a derivative liability.

Net (Loss) Income Per Share, page F-15

51. We note the table of anti-dilutive common share equivalents for each period presented on page F-16. Please tell us why each type of common share equivalent is anti-dilutive for the year ended December 31, 2010, and three months ended March 31, 2011.

Pro Forma Net Income (Loss) Per Share, page F-16

52. We note on page 36 that you expect to pay approximately $5.2 million from the proceeds of the offering to pay accrued dividends on the outstanding shares of Series F redeemable convertible preferred stock. However, it appears to us that your pro forma per share data does not give effect to the number of shares whose proceeds would be necessary to pay the dividend. Please tell us how you considered SAB Topic 1B.3.

8. Gain on Extinguishment of Other Long-Term Liabilities, page F-22

53. We note that on September 16, 2009, the Company and a third-party research and development contractor entered into an agreement whereby each party would, subject to certain circumstances, release the other from certain obligations set forth in two prior agreements between the parties; and that one of the obligations of the Company was to pay $2.7 million to such third party for prior research and development services. We further note that based on the events that occurred after September 16, 2009, the Company was released from the payment obligation of such long-term liabilities in September 2010; and that a $2.7 million gain on extinguishment of other long-term liabilities was recorded upon the release of these in fiscal 2010. Please advise us of the following:

    a. Further describe to us the terms of the two prior agreements, including the obligations of each party;

    b. Tell us which obligations(s) each party was released from, and which obligation(s) remain;

    c. Tell us the events that occurred after September 16, 2009 that resulted in the Company's release from the payment obligation; and

d. Tell us how you considered ASC 405-20-40-1 to arrive at your conclusion that the liability has been extinguished.

10. Stock Option and Equity Incentive Plans, page F-27

54. We note on page 52, 127 and II-2 that you conducted a stock option exchange program in October 2009 under which you issued new stock options at an exercise price of $1.21 per share in exchange for the cancellation of previously granted stock options with exercise prices of at least $1.88 per share. Please revise to provide the disclosures required by ASC 718-10-50-2(h)(2) for these stock option modifications.

11. Related-Party Transactions, page F-31

55. We note your discussion of related party transactions on page 127 and 128, including those with Agilent Technologies Inc. ("Agilent"). We further note on page 15 that you currently rely on Agilent for the magnet, probe and console incorporated in the *Vantera* system. Please revise to provide all related party disclosures required by FASB ASC 850-10-50-1 with respect to your Agilent transactions.

12. Income Taxes, page F-32

56. We note on page F-33 that you had not recorded a contingent tax liability as a result of the implementation of FASB's guidance on accounting for uncertainty in income taxes. We further note your gross unrecognized tax benefits as of fiscal year end 2008-2010 on page F-34. Please define for us your use of "contingent tax liability."

57. We note your unrecognized tax benefit of $327,500 as of December 31, 2010. Please tell us where you present the unrecognized tax benefit liability on your balance sheet. To the extent that you can make reasonably reliable estimates of the amount and timing of cash settlement of your unrecognized tax benefits, also include such amounts in your contractual obligation table on page 66. Otherwise, disclose such obligations in a note to the table.

17. Subsequent Events (unaudited)

58. Please revise to disclose the date through which you have evaluated subsequent events and whether that date is either the date the financial statements were issued or the date the financial statements were available to be issued. Refer to ASC 855-10-50-1

Part II

Item 15

59. In your recent sales of unregistered securities discussion you make reference to shares sold pursuant to Section 4(2) and Regulation D. It is unclear why no Form Ds were filed, please advise.

Exhibits

60. On page 12 and elsewhere you indicate that 33% and 15% of your revenues come from sales to Laboratory Corporation of America Holdings and Health Diagnostics Laboratory, Inc. Please file these agreements or advise us why such agreements are not material pursuant to Item 601(b)(10) of Regulation S-K.

61. Please file your credit agreements with Square 1 Bank.

62. We note you have not filed several exhibits, including exhibits 5.1, 10.9, 10.10., 10.11 and others. Please note that we review, and frequently comment upon, these documents. Please allow for sufficient time for us to do so. In addition, we note the asterisks indicating you are requesting confidential treatment for portions of an exhibit. Currently the exhibit is not identified, please advise or revise.

63. We note the references to your seeking confidential treatment for portions of an exhibit. This request will be handled separately and we may have comments when it is submitted. Please allow sufficient time for us to do so.

We urge all persons who are responsible for the accuracy and adequacy of the disclosure in the filing to be certain that the filing includes the information the Securities Act of 1933 and all applicable Securities Act rules require. Since the company and its management are in possession of all facts relating to a company's disclosure, they are responsible for the accuracy and adequacy of the disclosures they have made.

Notwithstanding our comments, in the event you request acceleration of the effective date of the pending registration statement please provide a written statement from the company acknowledging that:

- should the Commission or the staff, acting pursuant to delegated authority, declare the filing effective, it does not foreclose the Commission from taking any action with respect to the filing;

- the action of the Commission or the staff, acting pursuant to delegated authority, in declaring the filing effective, does not relieve the company from its full responsibility for the adequacy and accuracy of the disclosure in the filing; and

- the company may not assert staff comments and the declaration of effectiveness as a defense in any proceeding initiated by the Commission or any person under the federal securities laws of the United States.

Please refer to Rules 460 and 461 regarding requests for acceleration. We will consider a written request for acceleration of the effective date of the registration statement as confirmation of the fact that those requesting acceleration are aware of their respective responsibilities under the Securities Act of 1933 and the Securities Exchange Act of 1934 as they relate to the proposed public offering of the securities specified in the above registration statement. Please allow adequate time for us to review any amendment prior to the requested effective date of the registration statement.

You may contact Steve Lo at (202) 551-3394 or John Archfield at (202) 551-3315 if you have questions regarding comments on the financial statements and related matters. Please contact Jay Williamson at (202) 551-3393 or Jim Lopez at (202) 551-3536 with any other questions.

Sincerely,

/s/ John Reynolds

John Reynolds
Assistant Director