FLUIDIGM®

2018 ANNUAL REPORT and 2019 PROXY STATEMENT

April 23, 2019

Dear fellow stockholders,

In 2018, Fluidigm's long-term multi-omic strategy resonated with customers and investors as our technologies accelerated global research on multiple frontiers of human health.

Our focus on innovation, continuous improvement and financial discipline enabled us to return to double-digit growth and to decrease operating losses as we continued thoughtful management of our balance sheet.

For the year, total revenue increased 11 percent to $113 million. Our strong performance was powered by mass cytometry revenue growth of 27 percent, totaling $59.6 million. Microfluidics revenue decreased 3 percent to $53.4 million for the year. However, microfluidic consumables grew by double digits.

To build for the future, we expanded our markets, grew our installed instrument base and developed recurring revenue through new content, services and partnerships.

Fluidigm is a leading provider of indispensable life sciences tools, empowering a growing scientific community determined to unlock the extraordinary power of the immune system. Questions related to the immune system and immune response are driving one of the most profound and complex journeys of current scientific discovery. As part of this journey, scientists are working to identify meaningful biomarkers and accelerate development of more impactful therapies.

Researchers are following the thread of immune response through hundreds of diseases and disorders, as new discoveries point to the immune system playing critical roles not only in the traditional domains of cancer and inflammation but in many other areas, from autoimmune to vaccine response to pregnancy and preterm birth.

Researchers are increasingly using mass cytometry and microfluidics technology together to define the human immunome. Fluidigm is among the leaders enabling work on this exciting frontier and exploring the tremendous potential it represents.

In 2018, to position Fluidigm to further capitalize on that potential, we pursued a three-part strategy:

- Execute on an innovative pipeline to drive sustainable growth.
- Expand market adoption at leading translational research and biopharmaceutical companies.

- Accelerate growth with recurring revenue including from sales consumables with software solutions and from service offerings.

We delivered on innovation throughout 2018. Product launches included the Maxpar® Human Immune Monitoring Panel Kit for comprehensive immune cell profiling in cancer and immune-mediated diseases. We introduced the Advanta™ Sample ID Genotyping Panel for identification and quality assessment of human samples and cell lines in disease research. We enabled customer development of new applications for single-cell genomics. Fluidigm also entered into several agreements to offer new software tools to complement its products, fueling a dynamic and growing ecosystem as developers of leading-edge analytical resources integrate their tools with our transformative technology.

We believe that our CyTOF® technology, launched commercially in 2011, is becoming a premier technology to explore the human immune system. Our customers use Fluidigm microfluidics to develop genomic and proteomic content that drives new precision medicine research insights, including, for example, protein expression assays created on our integrated fluidic circuits for use with our instruments.

In 2018, we surpassed 2,500 scientific publications and 600 mass cytometry publications, with 20 publications in Imaging Mass Cytometry™. IMC™ provides researchers with a clear digital image of spatial context at the single-cell level for 37 markers simultaneously, a first in the market. At year-end, there were 240 mass cytometry systems in use worldwide and 50 commercially enabled IMC systems.

We continued to pursue strategic mass cytometry instrument placements in multiple markets, emphasizing cancer centers and pharma. Our mass cytometry instruments can now be found in more than half of U.S. Comprehensive Cancer Centers or their associated translational research institutions. We also expanded our global reach in cancer centers in Europe and Asia.

In 2018, immunology-related research in pharma and biotech also drove growth in multisystem placements. We expect this trend to continue in 2019.

Attracting and developing exceptional talent remained a priority as we added key senior leaders in areas that include global operations, R&D and, in early 2019, commercial operations. At the Board level, we welcomed veteran financial and biotech leader Laura M. Clague, adding expertise of great value to Fluidigm as our business in the translational and clinical research space expands.

We are well-positioned to support accelerating growth in 2019 as we execute on our multi-omic strategy. Fluidigm is the Life Science Industry Awards® Company to Watch in 2019 because of the incredible momentum we have established, and we believe the path ahead is even brighter.

None of this would have been possible without the determination and commitment of our employees and the confidence stockholders have placed in our strategy to empower customers to improve life through comprehensive health insight.

Onward and Upward.

S Christopher

Stephen Christopher Linthwaite
President and Chief Executive Officer

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

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2018

or

□ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission file number: 001-34180

FLUIDIGM CORPORATION

(Exact name of registrant as specified in its charter)

Delaware	**77-0513190**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification Number)
7000 Shoreline Court, Suite 100, **South San Francisco, California**	**94080**
(Address of principal executive offices)	(Zip Code)

Registrant's telephone number, including area code: **(650) 266-6000**

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, $0.001 Par Value per Share	The Nasdaq Global Select Market

Securities registered pursuant to Section 12(g) of the Act:

None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act of 1933, as amended. Yes ☒ No □

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended. Yes □ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No □

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No □

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☒

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

Large accelerated filer □	Accelerated filer ☒
Non-accelerated filer □	Smaller reporting company ☒
	Emerging growth company □

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided, pursuant to Section 13(a) of the Exchange Act. □

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes □ No ☒

As of June 30, 2018, the aggregate market value of voting and non-voting common equity held by non-affiliates of the registrant was approximately $151,752,358, based on the closing sale price on that date. Shares of common stock held by each executive officer and director and by each other person who may be deemed to be an affiliate of the Registrant have been excluded from this computation. The determination of affiliate status for this purpose is not necessarily a conclusive determination for other purposes.

As of March 13, 2019, there were 68,989,239 shares of the registrant's common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's Proxy Statement in connection with the registrant's annual meeting of stockholders, scheduled to be held in June 2019, are incorporated by reference in Part III of this report. Except as expressly incorporated by reference, the registrant's Proxy Statement shall not be deemed to be part of this report.

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Fluidigm Corporation

Fiscal Year 2018
Form 10-K
Annual Report

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Special Note Regarding Forward-looking Statements and Industry Data

This Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or Exchange Act, that are based on our management's beliefs and assumptions and on information currently available to our management. The forward-looking statements are contained principally in the sections entitled "Business," "Risk factors," and "Management's discussion and analysis of financial condition and results of operations." Forward-looking statements include information concerning our possible or assumed future cash flow, revenue, sources of revenue and results of operations, cost of product revenue and product margin, operating and other expenses, unit sales and the selling prices of our products, business strategies, financing plans, expansion of our business, competitive position, industry environment, potential growth opportunities, market growth expectations, and the effects of competition. Forward-looking statements include statements that are not historical facts and can be identified by terms such as "anticipates," "believes," "could," "seeks," "estimates," "expects," "intends," "may," "plans," "potential," "predicts, "projects," "should," "will," "would," or similar expressions and the negatives of those terms.

Forward-looking statements involve known and unknown risks, uncertainties, and other factors that may cause our actual results, performance, or achievements to be materially different from any future results, performance, or achievements expressed or implied by the forward-looking statements. We discuss these risks in greater detail in the section entitled "Risk factors" and elsewhere in this Form 10-K. Given these uncertainties, you should not place undue reliance on these forward-looking statements.

Forward-looking statements represent our management's beliefs and assumptions only as of the date of this Form 10-K. Except as required by law, we assume no obligation to update these forward-looking statements, or to update the reasons actual results could differ materially from those anticipated in these forward-looking statements, even if new information becomes available in the future. You should read this Form 10-K completely and with the understanding that our actual future results may be materially different from what we expect.

"Fluidigm," the Fluidigm logo, "Access Array," "Advanta," "Biomark," "C1," "Callisto," "CyTOF," "Delta Gene," "Digital Array," "Dynamic Array," "EP1," "Flex Six," "Helios," "Hyperion," "Imaging Mass Cytometry," "IMC," "Juno," "Maxpar," "MSL," "Polaris," "Script Builder," "Singular," and "SNP Type" are trademarks or registered trademarks of Fluidigm Corporation. Other service marks, trademarks and trade names referred to in this Form 10-K are the property of their respective owners.

Unless the context requires otherwise, references in this Annual Report on Form 10-K to "Fluidigm," the "Company," "we," "us," and "our" refer to Fluidigm Corporation and its subsidiaries.

PART I

ITEM 1. BUSINESS

Overview

Fluidigm is a global company that improves life through comprehensive health insight. Our innovative technologies and multi-omic tools are used by researchers to reveal meaningful insights into health and disease, identify biomarkers to inform decisions, and accelerate the development of more effective therapies. We create, manufacture, and market a range of products and services, including instruments, reagents and software that are used by researchers worldwide.

Our focus is on the most pressing needs in translational and clinical research, including cancer, immunology and immunotherapy. We use proprietary CyTOF® and microfluidics technologies to develop innovative end-to-end solutions that have the flexibility required to meet the needs of translational research and the robustness to support high-impact clinical research studies.

Our mass cytometry Helios™ system deeply profiles cell phenotype and function. Referenced by hundreds of peer-reviewed publications around the world, mass cytometry is setting a new standard in human immune profiling. Transforming biological imaging, our Hyperion™ Imaging System enables highly multiplexed protein biomarker detection in tissues and tumors while still preserving tissue architecture and cellular morphology information using Imaging Mass Cytometry™ (IMC™). Our microfluidic systems complement our mass cytometry offerings by providing highly scalable and automated workflows for quantitative polymerase chain reaction, or PCR, gene expression, copy number variation analysis, and next-generation sequencing library preparation. Used to detect somatic and genomic variations from a range of different sample types, these automated systems provide the cost efficiencies, flexibility and proven analytical performance that customers need to meet the increasing demands of molecular biomarker analysis.

We are a trusted partner of leading academic, government, pharmaceutical, biotechnology, and plant and animal research laboratories worldwide and we strive to increase the quality of life for all.

Market Opportunity

The current markets for our products address a broad range of biological analysis approaches, including the genome, proteome, transcriptome, epigenomics and microbiome used by academic life science research customers, as well as applied markets customers, including clinical research laboratories, biopharmaceutical companies, biorepositories and agricultural biotechnology entities. Our markets are increasingly looking to study data sets across these approaches in a concerted manner to answer pressing questions about immune function across cancer, immunology and immunotherapy.

Strategy

Key elements of our strategy include:

Offering innovative, differentiated products to researchers based on our mass cytometry and microfluidic technologies.

- Mass cytometry is a leading solution to analyze many cell-surface and intracellular proteins simultaneously in cell suspensions including blood and disassociated tissues. Our products enable innovative methods to characterize cells and other sample types not commonly achieved with other conventional technologies.

- Imaging Mass Cytometry is a pioneering technology allowing for high multiplexed imaging to understand the composition of tissue microenvironments at a subcellular resolution.

- Our microfluidic technologies enable a scalable and sensitive solution in fields requiring high-throughput molecular biomarker analysis, whether it be for the analysis of gene expression profiles, genotyping or library preparation in advance of gene sequencing. Microfluidic solutions also enable single-cell genomic analysis across a broad menu of applications.

Expanding addressable markets through attention to assay content, workflow efficiency, software improvements, desirable strategic partnerships and inorganic growth opportunities.

Our strategy addresses expanded and enhanced applications, workflows and analytics to allow our customers better productivity, increasing the value of our toolsets across our mass cytometry and microfluidics products.

- We have developed a new workflow for comprehensive human immune monitoring for use with our Helios system, as well as application, sample protocol, antibodies and reagents that researchers use to design their own experiments. We have collaborated with industry partners to enable workflows and software for both the Helios and Hyperion systems.
- We have developed and collaborated with industry partners to build our applications, software and assays on our microfluidic platforms for gene expression, genotyping and sequencing library preparations as well as single-cell applications for our C1 system. Our future development will leverage both in-house informatics as well as externally-partnered solutions to drive towards sample-to-answer functionality across all our platforms.

Products

We market innovative technologies and life science tools, including preparatory and analytical instruments for Mass Cytometry, PCR, Library Prep, Single Cell Genomics, and consumables, including integrated fluidic circuits (IFCs), assays, and reagents. Our primary product offerings are summarized in the table below:

Product	Product Description	Applications
Mass Cytometry		
Analytical Systems:		
Helios™, a CyTOF system	The Helios mass cytometry system performs high-parameter single-cell analysis using antibodies conjugated to metal isotopes.	Mass Cytometry
Hyperion™ Imaging System	The Hyperion Imaging System brings together imaging capability with proven high-parameter CyTOF technology to enable the simultaneous detection of up to 37 protein markers in the spatial context of the tissue microenvironment.	Imaging Mass Cytometry
Hyperion™ Tissue Imager	The Hyperion Tissue Imager scans tissues at 1 micron resolution. It can be purchased as an upgrade for the Helios system to enable imaging capability, then referred to as Hyperion Imaging System.	Imaging Mass Cytometry
Assays and Reagents:		
Maxpar® Reagents	Maxpar® reagents are included in multiple product lines addressing needs in functional and phenotypic profiling of single cells, as well as nucleic acid detection. The product lines include pre-conjugated antibodies, application specific kits, and custom antibody labeling services.	Mass Cytometry and Imaging Mass Cytometry.
Maxpar Human Immune Monitoring Panel Kit and Workflow	The kit contains 29 pre-titrated antibodies designed and optimized for deep immune profiling of human peripheral blood mononuclear cells. Enables comprehensive identification and characterization of key immune cell populations. The workflow includes protocol and data analysis.	Mass Cytometry

Product	Product Description	Applications
Microfluidics		
Preparatory Instruments:		
Access Array System	A modular, flexible system that automates amplicon-based library preparation of up to 480 amplicons across 48 unique samples per processing run. The resulting barcoded libraries are ready for targeted DNA sequencing on next-generation sequencing (NGS) platforms from Illumina® and Ion Torrent®.	Library preparation for targeted DNA sequencing on NGS systems
Juno System	An integrated system that automates the preparation of amplicon-based libraries for targeted next-generation DNA sequencing. Additionally, Juno automates microfluidic workflows for PCR-based gene expression, genotyping, digital PCR, and copy number variant analysis by processing IFCs prior to analysis on Biomark HD or EP1 platforms.	Library preparation for targeted DNA sequencing on NGS systems. End-Point PCR, SNP Genotyping, sample identification, Gene Expression, and digital PCR
Analytical Instruments:		
Biomark HD System	Real-time PCR analytical instrument for microfluidics-based analysis of gene expression, single-cell targeted gene expression, microRNA expression, sample identification, SNP genotyping, and real-time digital PCR.	SNP Genotyping, sample identification, Digital PCR, and Gene Expression, including Single-Cell Targeted Gene Expression
EP1 System	End-point PCR analytical instrument for microfluidics-based analysis of SNP genotyping and end-point digital PCR.	SNP Genotyping, sample identification, and Digital PCR
Integrated Fluidic Circuits (IFCs):		
LP IFCs	Library Preparation IFCs to support targeted DNA sequencing of 48 or 192 samples on next generation sequencing instruments.	Library preparation for targeted next-generation DNA sequencing
Juno Genotyping IFC	IFC that incorporates preamplification for genotyping of 96 samples and 96 markers on a single run.	Genotyping, sample identification
Dynamic Array IFCs	IFCs based on matrix architecture, allowing users to (i) individually assay up to 24 samples against up to 192 assays, (ii) individually assay up to 48 samples against up to 48 assays, (iii) individually assay up to 96 samples against up to 96 assays, or (iv) individually assay up to 192 samples against up to 24 assays.	Real-time qPCR, End-Point PCR, SNP Genotyping and Gene Expression, including Single-Cell Targeted Gene Expression, sample identification, copy number variant analysis
Digital Array IFCs	IFCs based on partitioning architecture allowing users to (i) individually assay up to 12 samples or panels across 765 chambers, or to (ii) individually assay up to 48 samples across 770 chambers per IFC.	Digital PCR, Copy Number Variation and Variant Detection
Flex Six IFC	IFC that incorporates six 12 X 12 partitions that can be organized in any configuration, in up to six separate experimental runs.	Gene Expression and SNP Genotyping

Product	Product Description	Applications
Assays and Reagents:		
Delta Gene and SNP Type Assays	Custom designed assays targeted to genomic regions of interest for genotyping and gene expression.	Gene Expression, Single-Cell Targeted Gene Expression, SNP Genotyping
Access Array Target-Specific Primers and Targeted Sequencing Prep Primers	Custom designed assays for NGS library preparation using Access Array chemistry on the Access Array or Juno systems.	Library preparation for targeted next-generation DNA sequencing
Targeted DNA Seq Library Assays	Custom designed assays for NGS library preparation using Targeted DNA Sequencing Library Preparation chemistry on the Access Array or Juno systems.	Library preparation for targeted next-generation DNA sequencing
Single Cell Microfluidics		
Preparatory Instrument:		
C1 System	Sample preparation system that rapidly and reliably isolates and processes individual cells for genomic analysis.	Single-Cell Targeted Gene Expression, Single-Cell microRNA Analysis, Single-Cell mRNA Sequencing (Full Length and End-Counting), Single-Cell Targeted DNA Sequencing, Single-Cell Whole Exome Sequencing, and Single-Cell Whole Genome DNA Sequencing, Single-Cell Epigenetics, Total RNA sequencing, T-ATAC-seq, REAP-Seq (RNA and Protein)
Preparatory Analytical Instruments:		
Polaris System	System and IFC that enables single cell contextual studies by facilitating active/live cell selection, isolation, imaging, dosing, and cell culturing workflows.	Functional Genomics Using Single-Cell mRNA Sequencing
C1 IFCs	IFCs that capture up to 800 cells between 5-25 microns in diameter and then automatically process the cells for a variety of genomic analysis using thermal and pneumatic controls at nanoliter scale.	Single-Cell Targeted Gene Expression, Single-Cell microRNA Analysis, Single-Cell mRNA Sequencing (Full Length and End-Counting), Single-Cell Targeted DNA Sequencing, Single-Cell Whole Exome DNA Sequencing, and Single-Cell Whole Genome DNA Sequencing, Total RNA sequencing, T-ATAC-seq, REAP-Seq (RNA and Protein). Additional customer and 3rd-party developed applications available through Fluidigm Script Hub
Polaris IFC	IFC that actively selects, captures and cultures up to 48 single-cells for up to 24 hours. It integrates media exchange, dosing and time course studies followed by cell lysis, reverse transcriptions and library preparation for single cell mRNA sequencing.	Functional Genomics of Single Cells

Technology

Multi-Layer Soft Lithography

Our IFCs are manufactured using multi-layer soft lithography technology, or MSL technology, to create valves, chambers, channels and other fluidic components on our IFCs that allow nanoliter quantities of fluids to be precisely manipulated within the IFC. We have developed commercial manufacturing processes to fabricate valves, channels, vias, and chambers with dimensions in the ten to 100 micron range, at high density and with high yields.

Integrated Fluidic Circuits

Our IFCs incorporate several different types of technology that together enable us to use MSL technology to rapidly design and deploy new microfluidic applications. The first level of our IFC technology is a library of components that perform basic microfluidic functions, such as pumps, mixers, single-cell capture chambers, separation columns, control logic, and reaction chambers. The second level of our IFC technology comprises the architectures we have designed to exploit our ability to conduct thousands of reactions on a single IFC. The third level of our IFC technology involves the interaction of our IFCs with the actual laboratory environment. Our IFCs are built on specially designed input frames that are compatible with most commonly used laboratory systems.

Instrumentation and Software

Our mass cytometry instrumentation technology includes a custom-designed inductively coupled plasma ion source, ion-optical and vacuum systems, and instrument control electronics. With our Helios system, which is an enhanced version of our CyTOF 2 system, individual cells are atomized, ionized, and extracted. A time-of-flight mass analyzer separates atomic ions of different mass-to-charge ratios, providing information on temporal distribution of ions. The Hyperion Imaging System combines mass cytometry technology with imaging capability to enable simultaneous interrogation of up to 37 protein markers in the spatial context of the tissue microenvironment. Our systems have the ability to utilize up to 135 channels to detect additional parameters to meet future market needs.

Our Biomark HD system includes our custom thermal cycler, the FC1 cycler, and a sophisticated fluorescence imaging system. Our EP1 instrument is a fluorescence reader designed for end-point imaging, suitable for genotyping and digital PCR applications. Our C1 system combines the hardware elements of our IFC controllers and FC1 cycler with sophisticated scripting and protocol control software to enable automation of single-cell capture and preparation for subsequent analysis. Certain capabilities of the C1 system have been used to create our Juno system, which serves as a universal controller and cycler for our Dynamic Array IFCs. Our Polaris system combines the capabilities of all these instruments by incorporating thermal cycling, IFC control, environmental regulation, and imaging.

We have developed instrumentation technology to load samples and reagents onto our IFCs and to control and monitor reactions within our IFCs. Our line of IFC controllers consists of commercial pneumatic components and both custom and commercial electronics. They apply precise control of multiple pressures to move fluid and control valve states in a microfluidic IFC.

We have also developed specialized software to manage and analyze the unusually large amounts of data produced by our systems. We offer Fluidigm Cytobank, our cloud-based platform of analytical tools, for use with the Helios system. Our bioinformatic toolset, the Singular software, facilitates the analysis and visualization of single-cell gene expression data. More recently, we extended the scope of the toolset to include DNA analysis tools. We also developed the C1 Script Builder software to enable customers to take full advantage of the flexibility of C1 IFC architecture by allowing them to program their own control scripts for the C1 system.

Assays and Reagents

We manufacture metal-conjugated antibodies for use with our mass cytometry instruments to allow detection of up to approximately 37 protein targets simultaneously in a single cell. Our metal-conjugated antibodies are manufactured using metal-chelating polymers, which are produced using proprietary polymerization processes and subsequent post-polymerization modifications.

Our Delta Gene and single-nucleotide polymorphism type, or SNP Type, assay products consist of assay design and custom content delivery systems for gene expression and genotyping, respectively. These offerings provide low-cost alternatives to other available chemistries, and allow customers to use IFCs in more flexible ways. PCR assay reagents need to be specific to the gene targets of interest but the process of designing a set of assays may delay the implementation experiments or require the use of expensive pre-designed assays. We have developed a process to provide customers with validated assays for their targets of interest.

Life Science Research

Our products enable comprehensive interrogation of biological samples across a range of genomic and protein molecular biomarkers.

Genomics

One primary area of focus within life science research is genetic analysis, the study of genes and their functions. The hereditary material or nucleic acid of an organism is often referred to as its genome, the protein-encoding regions of which are commonly known as genes. Analysis of variations in genomes, genes and gene activity in and between organisms can provide valuable insight into their health and functioning. Single-cell genomics is the study of the sequence and expression of genes and their ultimate functions at the individual cell level.

There are several forms of genetic analysis in use today, including genotyping, gene expression analysis and DNA sequencing:

- Genotyping involves the analysis of DNA variations across individual genomes. There are multiple forms of variants, including single nucleotide polymorphism, or SNPs, insertion-deletions and copy number variation. A common application of genotyping focuses on analyzing SNPs to determine whether a SNP or group of SNPs are associated with a particular genetic trait, such as propensity for a disease.

- Gene expression analysis involves measuring the levels of particular ribonucleic acid sequences known as messenger RNAs, or mRNAs, which have been transcribed from genes. Determining these levels is important because mRNAs are often translated by the cell into proteins, and may affect the activity of the cell or the larger organism.

- DNA sequencing is a process by which researchers are able to determine the particular order of nucleotide bases that comprise all or a portion of a particular gene or genome, and typically improves with target enrichment, such as complex sample preparation and tagging processes. Researchers are increasingly using next-generation DNA sequencers to rapidly and cost-effectively sequence portions of genomes, which is important for the identification of genetic variations that correlate with particular phenotypes.

Gene expression and genotyping are studied through a combination of various technology platforms that characterize gene function and genetic variation. These platforms often rely on PCR amplification to generate exponential copies of a DNA sample to provide sufficient signal to facilitate detection. Real-time quantitative PCR, or real-time qPCR, is a more advanced form of PCR that makes it possible to quantify the number of copies of DNA present in a sample.

Proteomics

Another focus within life science research is protein analysis, the study of proteins and their structures and functions. Proteins perform a vast array of functions within living organisms, including catalyzing metabolic reactions, replicating DNA, signaling response to stimuli and transporting molecules from one location to another. The proteome varies and is dynamic. Every cell in an individual organism has the same set of genes, but the set of proteins produced in different tissues differ from one another and are dependent on gene expression. Protein analysis is required to profile and understand cellular function as well as the interaction in tissues and other complex microenvironments.

There are several forms of high-throughput protein analysis in use today, including mass spectrometry, traditional flow cytometry, immunohistochemistry and both suspension and imaging mass cytometry.

- Mass spectrometry is an analytical chemistry technique that measures the mass-to-charge ratio in molecules using external electric and magnetic fields. Mass spectrometry techniques are limited to bulk samples and provide an understanding of global protein dynamics on a tissue or organism level, but do not, by themselves, enable researchers to analyze data at a single cell level.
- Traditional flow cytometry utilizes a suspension of cells in a stream of fluid and passes them through an electronic detection apparatus to allow simultaneous multi-parameter analysis of the physical and chemical characteristics of up to thousands of cells per second. Although traditional flow cytometry technologies are high-throughput with single-cell analysis capabilities, a key limitation is the use of fluorescent dyes to label antibodies for detection. These fluorescent labels have emission spectra that typically overlap, making it challenging to optimize reagents to analyze many protein markers at once. In general, the number of protein targets for conventional flow cytometry is less than about 10 with significant reagent optimization often involved.
- Immunohistochemistry is a method by which cells in a tissue section are stained with antibodies and then imaged with a conventional or fluorescent microscope. Antibodies selected to bind to proteins of interest can be conjugated with either chromogenic or fluorescent labels, allowing cellular proteins to be visualized in spatial context. Immunohistochemistry is used broadly throughout the life sciences industry, and in clinical research to better understand the characteristics and relationship of cancerous versus normal cells in biopsy tissue. In general, the number of simultaneously imageable proteins is less than five, with researchers only able to achieve a higher-parameter resolution using serial sections (several adjacent sections of the same tissue) or other highly laborious, more serial staining methods.
- Suspension mass cytometry is similar to traditional flow cytometry but is based primarily on antibodies using heavy metal isotope labels rather than fluorescent labels for detection of proteins, enabling the significant expansion of the number of parameters analyzed per individual cell versus conventional flow cytometry technologies. With high-throughput, single-cell analysis capabilities and the ability to analyze more protein markers per individual cell, researchers have more granular information, which allows them to identify and characterize even finer subpopulations of cells.
- Imaging mass cytometry is similar to immunohistochemistry, but is also based primarily on antibodies using heavy metal isotope labels rather than fluorescent or chromogenic labels for detection of proteins. This method enables a significant expansion of the number of parameters simultaneously analyzed per tissue section rather than in adjacent sections or via serial staining protocols.

Customers

We sell our instruments to leading academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories, and biopharmaceutical, biotechnology, and plant and animal research companies. No single customer represented more than 10% of our total revenue for 2018, 2017, or 2016.

Marketing, Sales, Service and Support

We distribute our systems through our direct sales force and support organizations located in North America, Europe, and Asia-Pacific, and through distributors or sales agents in several European, Latin American, Middle Eastern, and Asia-Pacific countries. Our sales and marketing efforts are targeted at laboratory directors and principal investigators at leading academic, translational research, healthcare consortiums, and biopharmaceutical companies who need reliable life science automation solutions to power their disease research with the goal of providing actionable insights.

Our sales process often involves numerous interactions and demonstrations with multiple people within an organization. Some potential customers conduct in-depth evaluations of the system, including running experiments on our system and competing systems. In addition, in most countries, sales to academic or governmental institutions require participation in a tender process involving preparation of extensive documentation and a lengthy review process. As a result of these factors and the budget cycles of our customers, our sales cycle, the time from initial contact with a customer to our receipt of a purchase order, can often be 12 months or longer.

As of December 31, 2018, we had 190 people employed in sales, technical support, and marketing, including 82 sales representatives and applications specialists located in the field.

Manufacturing

Our manufacturing operations are primarily located in Singapore and Canada. Our facility in Singapore manufactures our IFCs and manages production of our genomics instruments, which are assembled by our contract manufacturer located within our Singapore facility. All of our IFCs for commercial sale and some IFCs for our research and development purposes are also fabricated at our Singapore facility. Our mass cytometry instruments for commercial sale, as well as for internal research and development purposes, are manufactured at our facility in Canada. We also manufacture assays and reagents at our facilities in the United States. As part of our on-going efforts related to operational excellence and improving efficiencies, we are consolidating our North American production activities into our Canadian facility.

We rely on a limited number of suppliers for certain components and materials used in our products. Key components in our products that are supplied by sole or limited source suppliers include a specialized polymer and other specialized materials from which our IFC cores are fabricated, specialized custom camera lenses, fiber light guides, and other components required for the reader of our Biomark system; specialized pneumatic and electronic components for our C1, Juno, Callisto, and Polaris systems; the electron multiplier detector included in, and certain metal isotopes used with, our Helios system; specially developed lasers used in our Hyperion Imaging System; and certain raw materials for our Delta Gene and SNP Type assays and Access Array Target-Specific primers. The loss of a single or sole source supplier would require significant time and effort to locate and qualify an alternative source of supply, if at all, and could adversely impact our business. For additional information, please see the section entitled "Risk factors" in Part I, Item 1A of this Form 10-K.

Research and Development

We have assembled experienced research and development teams at our South San Francisco, California, Markham, Ontario, Canada, and Singapore locations with the scientific, engineering, software, bioinformatic, and process talent that we believe is required to grow our business.

The largest component of our current research and development effort is in the areas of new products, new applications and new content. We developed a high-throughput C1 IFC (HT IFC) for handling up to 800 medium sized cell types applied to the work-flows of the Fluidigm-installed base instruments. In the area of mass cytometry, we developed an initial prototype imaging mass cytometer instrument in 2016, and successfully launched the commercial Hyperion Imaging System in October 2017. The imaging mass cytometer system provides spatial resolution of protein expression in complex tissue samples at the single-cell level, quantitative measurement using metal isotope tags, and analysis of up to 37 proteins. We also developed metal-labeled antibodies compatible with formalin fixed paraffin embedded tissue samples, to be used with the Hyperion. We also invest significantly in research and development efforts to expand our single-cell and production genomics applications. For example, we continue to develop and commercialize various panel sets for cancer research for use with our systems. In 2017, we successfully launched the Advanta™ Immuno-Oncology Gene Expression Assay, which is a 170-gene expression qPCR assay that enables profiling of tumor immunobiology and new biomarker identification.

The second component of our research and development effort is to continuously develop new manufacturing processes and test methods to drive down manufacturing costs, increase manufacturing throughput, widen fabrication process capability, and support new microfluidic devices and designs.

Our research and development expenses were $30.0 million, $30.8 million and $38.4 million in 2018, 2017, and 2016 respectively. As of December 31, 2018, 103 of our employees were engaged in research and development activities.

Competition

The life science markets are highly competitive and expected to grow more competitive with the increasing knowledge gained from ongoing research and development. We believe that the principal competitive factors in our target markets include competition for human resources; cost of capital equipment and supplies; reputation among customers; innovation in product offerings; flexibility and ease of use; accuracy and reproducibility of results; and compatibility with existing laboratory processes, tools, and methods.

We compete with both established and development stage life science companies that design, manufacture, and market instruments for gene expression analysis, genotyping, other nucleic acid detection, protein expression analysis, imaging, and additional applications. In addition, a number of other companies and academic groups are in the process of developing novel technologies for life science markets. Many of our competitors enjoy several competitive advantages over us, including significantly greater name recognition; greater financial and human resources; broader product lines and product packages; larger sales forces and eCommerce channels; larger and more geographically dispersed customer support organization; substantial intellectual property portfolios; larger and more established customer bases and relationships; greater resources dedicated to marketing efforts; better established and larger scale manufacturing capability; and greater resources and longer experience in research and development. For additional information, please see the section entitled “Risk factors” in Part I, Item 1A of this Form 10-K.

To successfully compete with existing products and future technologies, we need to demonstrate to potential customers that the performance of our technologies and products, the solutions we provide our customers, as well as our customer support capabilities, are superior to those of our competitors. To differentiate our company from other, larger enterprises, we need to introduce new and innovative offerings regularly and maintain a well-staffed commercial team “in the field” to successfully communicate the advantages of our products and overcome potential obstacles to acceptance of our products. In addition, ongoing collaborations and partnerships with key opinion leaders are desirable to demonstrate both biological innovation and applications that solve customer problems.

Intellectual Property

Patents

We have developed a portfolio of issued patents and patent applications directed to commercial products and technologies in development. As of December 31, 2018, we owned or licensed over 550 patents and we had approximately 155 pending patent applications worldwide. Our patents have expiration dates ranging up to 2036.

License Agreements

We have entered into licenses for technologies from various companies and academic institutions.

Microfluidic Technologies. Our core microfluidics technology originated at the California Institute of Technology, or Caltech, in the laboratory of Professor Stephen Quake, who is a co-founder of Fluidigm. We license microfluidics technology from Caltech, Harvard University, and Caliper Life Sciences, Inc. (Caliper), which subsequently became a PerkinElmer company:

- We exclusively license from Caltech relevant patent filings relating to developed technologies that enable the production of specialized valves and pumps capable of controlling fluid flow at nanoliter volumes. The license agreement will terminate as to each country and licensed product upon expiration of the last-to-expire patent covering licensed products in each country. The U.S. issued patents we have licensed from Caltech expire between 2017 and 2030.

- We have entered into a co-exclusive license agreement with Harvard University for the license of relevant patent filings relating to microfluidic technology. The license agreement will terminate with the last-to-expire of the licensed patents. The U.S. issued patents we have licensed from Harvard University expire between 2019 and 2027.

- In May 2011, we entered into a license agreement with Caliper to license Caliper's existing patent portfolio in certain fields. The license agreement will terminate with the last-to-expire of the licensed patents. As later amended, the license agreement provides for certain royalty payments until mid-2018 for our existing products at the time of amendment and their future equivalents.

Instrumentation and Digital PCR. On June 30, 2011, we settled litigation and entered into a series of patent cross-license and sub-license agreements with Life Technologies Corporation (now part of Thermo Fisher Scientific) and its subsidiary Applied Biosystems, LLC, referred to as Life. The agreements involve a cross-license concerning our imaging readers and other patent filings and certain of Life's patent families relating to methods and instruments for conducting nucleic acid amplification, such as with PCR; a sub-license that provides us access to certain of Life's digital PCR patents; and a sublicense that provides Life access to certain of our non-core technology patents licensed from Caltech. In July 2011, pursuant to the terms of the agreements, we paid Life $2.0 million in connection with our exercise of an option to preclude Life from initiating litigation under its patents existing as of June 30, 2011 against our customers for two years and against our company, with respect to our current products and equivalent future products, for four years, subject to certain exceptions. In November 2017, we settled pending litigation with Life and, pursuant to the terms of the settlement, one of the patent license agreements was amended to provide Life with a fully paid-up license under the patents covered by the agreement, subject to certain field of use restrictions. The license agreement will terminate with the last-to-expire of the licensed patents, which is expected to be in 2028.

Mass Cytometry. Some of the intellectual property rights covering our mass cytometry products were subject to a license agreement, referred to as the Original License Agreement, between Fluidigm Canada Inc., referred to as Fluidigm Canada, and PerkinElmer Health Sciences, Inc., referred to as PerkinElmer. Under the Original License Agreement, Fluidigm Canada received an exclusive, royalty bearing, worldwide license to certain patents owned by PerkinElmer in the field of inductively coupled plasma, or ICP-based mass cytometry, including the analysis of elemental tagged materials in connection therewith, referred to as the Patents, and a non-exclusive license for reagents outside the field of ICP-based mass cytometry. On November 4, 2015, we entered into a patent purchase agreement with PerkinElmer pursuant to which we purchased the Patents for a purchase price of $6.5 million and a patent assignment agreement pursuant to which PerkinElmer transferred and assigned to us all rights, title, privileges, and interest in and to the Patents and the Original License Agreement. Accordingly, we have no further financial obligations to PerkinElmer under the Original License Agreement. Contemporaneously with the purchase of the Patents, we entered into a license agreement with PerkinElmer pursuant to which we granted PerkinElmer a worldwide, non-exclusive, fully paid-up license to the Patents in fields other than (i) ICP-based mass analysis of atomic elements associated with a biological material, including any elements that are unnaturally bound, directly or indirectly, to such biological material (Mass Analysis) and (ii) the development, design, manufacture, and use of equipment or associated reagents for such Mass Analysis. The license will terminate on the last expiration date of the Patents, currently expected to be in December 2025, unless earlier terminated pursuant to the terms of the license agreement.

Any loss, termination, or adverse modification of our licensed intellectual property rights could have a material adverse effect on our business, operating results, and financial condition. For additional information, please see the section entitled "Risk factors" in Part I, Item 1A of this Form 10-K.

Other

In addition to pursuing patents and licenses on key technologies, we have taken steps to protect our intellectual property and proprietary technology by entering into confidentiality agreements and intellectual property assignment agreements with our employees, consultants, corporate partners, and, when needed, our advisors.

Government Regulation

Our products are currently labeled and sold for research purposes only, and we sell them to academic institutions, life sciences and clinical research laboratories that conduct research, and biopharmaceutical and biotechnology companies for non-diagnostic and non-clinical purposes. Our products are not intended or promoted for use in clinical practice in the diagnosis of disease or other conditions, and they are labeled for research use only, not for use in diagnostic procedures. Accordingly, they are not subject to regulation by the U.S. Food and Drug Administration (FDA). Rather, while FDA regulations require that research use only products be labeled, "For Research Use Only. Not for use in diagnostic procedures," or RUO products, the regulations do not subject such products to the FDA's jurisdiction or the broader pre- and post-market controls for medical devices.

In November 2013, the FDA issued a final guidance document stating that merely including a labeling statement that the product is for research purposes only will not necessarily render the device exempt from the FDA's clearance, approval, or other regulatory requirements if the totality of circumstances surrounding the distribution of the product indicate that the manufacturer knows its product is being used by customers for diagnostic uses or the manufacturer intends such a use. These circumstances may include, among other things, written or verbal marketing claims regarding a product's performance in clinical diagnostic applications and a manufacturer's provision of technical support for such activities. In the future, certain of our products or related applications could become subject to regulation as medical devices by the FDA. If we wish to label and market our products for use in performing clinical diagnostics, thus subjecting them to regulation by the FDA under premarket and postmarket control as medical devices, unless an exemption applies, we would be required to obtain either prior 510(k) clearance or prior pre-market approval from the FDA before commercializing the product. The FDA classifies medical devices into one of three classes. Devices deemed to pose lower risk to the patient are placed in either class I or II, which, unless an exemption applies, requires the manufacturer to submit a pre-market notification requesting FDA clearance for commercial distribution pursuant to Section 510(k) of the FFDCA. This process, known as 510(k) clearance, requires that the manufacturer demonstrate that the device is substantially equivalent to a previously cleared and legally marketed 510(k) device or a "pre-amendment" class III device for which pre-market approval applications, or PMAs, have not been required by the FDA. This FDA review process typically takes from four to twelve months, although it can take longer. Most class I devices are exempted from this 510(k) premarket submission requirement. Devices deemed by the FDA to pose the greatest risk, such as life-sustaining, life-supporting, or implantable devices, or those deemed not substantially equivalent to a legally marketed predicate device, are placed in class III. Class III devices typically require PMA approval. To obtain PMA approval, an applicant must demonstrate the reasonable safety and effectiveness of the device based, in part, on data obtained in clinical studies. PMA reviews generally last between one and two years, although they can take longer. Both the 510(k) and the PMA processes can be expensive and lengthy and may not result in clearance or approval. If we are required to submit our products for pre-market review by the FDA, we may be required to delay marketing and commercialization while we obtain premarket clearance or approval from the FDA. There would be no assurance that we could ever obtain such clearance or approval.

In some cases, our customers may use our RUO products in their own laboratory-developed tests, or LDTs, or in other FDA-regulated products for clinical diagnostic use. The FDA has historically exercised enforcement discretion in not enforcing the medical device regulations against LDTs and LDT manufacturers. However, on October 3, 2014, the FDA issued two draft guidance documents that set forth the FDA's proposed risk-based framework for regulating LDTs, which are designed, manufactured, and used within a single laboratory. In January 2017, the FDA announced that it would not issue final guidance on the oversight of LDTs and LDT manufacturers, but would seek further public discussion on an appropriate oversight approach and give Congress an opportunity to develop a legislative solution. Any future legislative or administrative rule making or oversight of LDTs and LDT manufacturers if and when finalized, may impact the sales of our products and how customers use our products, and may require us to change our business model in order to maintain compliance with these laws.

We would become subject to additional FDA requirements if our products are determined to be medical devices or if we elect to seek 510(k) clearance or pre-market approval. We would need to continue to invest significant time and other resources to ensure ongoing compliance with FDA quality system regulations and other post-market regulatory requirements. For additional information, please see the section entitled "Risk factors" in Part I, Item 1A of this Form 10-K.

International sales of medical devices are subject to foreign government regulations, which vary substantially from country to country. Outside of the EU, regulatory approval needs to be sought on a country-by-country basis in order to market medical devices. Although there is a trend towards harmonization of quality system, standards and regulations in each country may vary substantially which can affect timelines of introduction.

Environmental Matters

We are subject to many federal, state, local, and foreign environmental regulations. To comply with applicable regulations, we have and will continue to incur significant expense and allocate valuable internal resources to manage compliance-related issues. In addition, such regulations could restrict our ability to expand or equip our facilities, or could require us to acquire costly equipment or to incur other significant expenses to comply with the regulations. For example, the Restriction on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive (RoHS) and the Waste Electrical and Electronic Equipment Directive (WEEE), both enacted in the European Union, regulate the use of certain hazardous substances in, and require the collection, reuse, and recycling of waste from, products we manufacture. Certain of our products sold in these countries are subject to RoHS and WEEE requirements. If we fail to comply with any present and future regulations, we could be subject to future fines, penalties, and restrictions, such as the suspension of manufacturing of our products or a prohibition on the sale of products we manufacture. For additional information, please see the section entitled "Risk factors" in Part I, Item 1A of this Form 10-K.

Additionally, our research and development and manufacturing processes involve the controlled use of hazardous materials, including flammables, toxics, corrosives, and biologics. Our research and manufacturing operations produce hazardous biological and chemical waste products. We seek to comply with applicable laws regarding the handling and disposal of such materials. The volume of such materials used or generated at our facilities is small. However, we cannot eliminate the risk of accidental contamination or discharge and any resultant injury from these materials. We do not currently maintain separate environmental liability coverage and any such contamination or discharge could result in significant cost to us in penalties, damages, and suspension of our operations.

Geographic Area Information

During the last three years, a significant portion of our revenue was generated outside of the United States. Total revenue received from customers outside the United States totaled $64.8 million, or 57% of our total revenue, in 2018, compared to $56.1 million, or 55% of our total revenue, in 2017, and $51.8 million, or 50% of our total revenue, in 2016. The majority of our long-lived assets are located within the United States, in Singapore and in Canada. Please see Note 3 and Note 12 to our audited consolidated financial statements for additional information regarding geographic areas.

Seasonality

Our business is not subject to significant seasonality. However, the timing of customer orders and shipments, customer budget and spending cycles, and new product releases can result in variability in our quarterly revenues.

Raw Materials

Certain raw materials used in our Delta Gene and SNP Type assays and Access Array target-specific primers are available from a limited number of sources. Additionally, certain metals used in our Maxpar reagents are available from a sole source. Currently, we do not have supply agreements with these suppliers. While we generally attempt to keep our inventory at minimal levels, we purchase incremental inventory as circumstances warrant to protect our supply chain.

Backlog

We manufacture products based on forecasts of our customers' demand and advance non-binding commitments from customers as to future purchases. Our customers generally do not place purchase orders far in advance. A substantial portion of our products are sold on the basis of standard purchase orders that are cancellable prior to shipment without penalty. Accordingly, backlog at any given time is not a meaningful indicator of future sales.

Employees

As of December 31, 2018, we had 535 employees, of which 103 work in research and development, 107 work in general and administrative, 135 work in manufacturing, and 190 work in sales, technical support, and marketing. None of our employees are represented by a labor union nor are they subject to a collective bargaining agreement.

Corporate and Available Information

We were incorporated in California in May 1999 as Mycometrix Corporation, changed our name to Fluidigm Corporation in April 2001, and reincorporated in Delaware in July 2007. Our principal executive offices are located at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080. Our telephone number is (650) 266-6000. Our website address is www.fluidigm.com. We make available on our website, free of charge, our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and any amendments to those reports, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission, or SEC. Our SEC reports can be accessed through the investor relations page of our website located at http://investors.fluidigm.com. The SEC also maintains an Internet site at www.sec.gov that contains reports, proxy and information statements, and other information regarding issuers that electronically file with the SEC.

The contents of our website are not a part of, and are not incorporated by reference into, this Annual Report on Form 10-K or any other report or document we file with the SEC. Any reference to our website is intended to be an inactive textual reference only.

ITEM 1A. RISK FACTORS

We operate in a rapidly changing environment that involves numerous uncertainties and risks. The following risks and uncertainties may have a material and adverse effect on our business, financial condition, or results of operations. You should consider these risks and uncertainties carefully, together with all of the other information included or incorporated by reference in this Form 10-K. The risks described below are not the only ones we face. Our business is also subject to the risks that affect many other companies, such as employment relations, general economic conditions, geopolitical events and international operations. Further, additional risks not currently known to us or that we currently believe are immaterial may in the future materially and adversely affect our business, operations, liquidity and stock price. If any of the risks or uncertainties we face were to occur, the trading price of our securities could decline, and you may lose all or part of your investment.

Risks Related to Fluidigm's Business and Strategy

Our financial results and revenue growth rates have varied significantly from quarter-to-quarter and year-to-year due to a number of factors, and a significant variance in our operating results or rates of growth, if any, could lead to substantial volatility in our stock price.

Our revenue, results of operations, and revenue growth rates have varied in the past and may continue to vary significantly from quarter-to-quarter or year-to-year. We may experience substantial variability in our product mix from period-to-period as revenue from sales of our instruments relative to sales of our consumables may fluctuate or deviate significantly from expectations. For example, our revenue declined year-over-year in 2016 compared to 2015, and in 2017 compared to 2016. In 2018, we returned to revenue growth, but we may not be able to achieve similar revenue growth in future periods. We are also increasingly dependent on our mass cytometry business, which is very capital intensive. Variability in our quarterly or annual results of operations, mix of product revenue, including any decline in our mass cytometry revenue, or variability in rates of revenue growth, if any, may lead to volatility in our stock price as research analysts and investors respond to these fluctuations. These fluctuations are due to numerous factors that are difficult to forecast, including: fluctuations in demand for our products; changes in customer budget cycles and capital spending; seasonal variations in customer operations; tendencies among some customers to defer purchase decisions to the end of the quarter; the large unit value of our systems, particularly our proteomics systems; changes in our pricing and sales policies or the pricing and sales policies of our competitors; our ability to design, manufacture, market, sell, and deliver products to our customers in a timely and cost-effective manner; fluctuations or reductions in revenue from sales of legacy instruments that may have contributed significant revenue in prior periods; quality control or yield problems in our manufacturing operations; our ability to timely obtain adequate quantities of the materials or components used in our products, which in certain cases are purchased through sole and single source suppliers; new product introductions and enhancements by us and our competitors; unanticipated increases in costs or expenses; our complex, variable and, at times, lengthy sales cycle; global economic conditions; and fluctuations in foreign currency exchange rates. Additionally, we have certain customers who have historically placed large orders in multiple quarters during a calendar year. A significant reduction in orders from one or more of these customers could adversely affect our revenue and operating results, and if these customers defer or cancel purchases or otherwise alter their purchasing patterns, our financial results and actual results of operations could be significantly impacted. Other unknown or unpredictable factors also could harm our results.

The foregoing factors, as well as other factors, could materially and adversely affect our quarterly and annual results of operations and rates of revenue growth, if any. We have experienced significant revenue growth in the past but we may not achieve similar growth rates in future periods. You should not rely on our operating results for any prior quarterly or annual period as an indication of our future operating performance. If we are unable to achieve adequate revenue growth, our operating results could suffer and our stock price could decline. In addition, a significant amount of our operating expenses are relatively fixed due to our manufacturing, research and development, and sales and general administrative efforts. Any failure to adjust spending quickly enough to compensate for a shortfall relative to our anticipated revenue could magnify the adverse impact of such shortfalls on our results of operations. We expect that our sales will continue to fluctuate on an annual and quarterly basis and that our financial results for some periods may be below those projected by securities analysts, which could significantly decrease the price of our common stock.

We have incurred losses since inception, and we may continue to incur substantial losses for the foreseeable future.

We have incurred significant losses in each fiscal year since our inception, including net losses of $59.0 million, $60.5 million, and $76.0 million during the years 2018, 2017, and 2016, respectively. As of December 31, 2018, we had an accumulated deficit of $558.9 million. These losses have resulted principally from costs incurred in our research and development programs, and from our manufacturing costs and selling, general, and administrative expenses. To date, we have funded our operations primarily through equity offerings, the issuance of debt instruments, and from sales of our products.

Until we are able to generate additional revenue to support our level of operating expenses, we will continue to incur operating and net losses and negative cash flow from operations. We believe that our continued investment in research and development, sales, and marketing is essential to our long-term competitive position and future revenue growth and, as a result, we may incur operating losses for the foreseeable future and may never achieve profitability.

The life science markets are highly competitive and subject to rapid technological change, and we may not be able to successfully compete.

The markets for our products are characterized by rapidly changing technology, evolving industry standards, changes in customer needs, emerging competition, new product introductions, and strong price competition. We compete with both established and development stage life science research companies that design, manufacture, and market instruments and consumables for gene expression analysis, single-cell targeted gene expression or protein expression analysis, single nucleotide polymorphism genotyping, or SNP genotyping, polymerase chain reaction, or PCR, digital PCR, other nucleic acid detection, flow cytometry, cell imaging, and additional applications using well established laboratory techniques, as well as newer technologies such as bead encoded arrays, microfluidics, nanotechnology, high-throughput DNA sequencing, microdroplets, and photolithographic arrays. Most of our current competitors have significantly greater name recognition, greater financial and human resources, broader product lines and product packages, larger sales forces, larger existing installed bases, larger intellectual property portfolios, and greater experience and scale in research and development, manufacturing, and marketing than we do. For example, companies such as 10X Genomics, Inc., Affymetrix, Inc. (now part of Thermo Fisher Scientific Inc.), Agena Bioscience, Inc., Agilent Technologies, Inc., Becton, Dickinson and Company, Bio-Rad Laboratories, Inc., Cellular Research, Inc. (now a part of Becton, Dickinson and Company), Danaher Corporation, Illumina, Inc., Life Technologies Corporation (now part of Thermo Fisher Scientific Inc.), LGC Limited, Luminex Corporation, Millipore Corporation, NanoString Technologies, Inc., PerkinElmer, Inc. (through its acquisition of Caliper Life Sciences, Inc.), RainDance Technologies, Inc. (acquisition by Bio-Rad Laboratories, Inc. pending), Roche Diagnostics Corporation, Sony Corporation, Thermo Fisher Scientific Inc., WaferGen Bio-systems, Inc., Cytek Biosciences, Inc., Akoya Biosciences, Inc., Innova Biosciences Ltd., QIAGEN N.V., 1CellBio, Inc., Berkeley Lights, Inc., and Mission Bio, Inc. have products that compete in certain segments of the market in which we sell our products. In addition, we have experienced increased competition in the single-cell genomics market, including new product releases from 10X Genomics, Inc. and WaferGen Bio-systems, Inc., as well as the acquisition of Cellular Research by Becton Dickinson and Company and an announced exclusive partnership between Illumina, Inc. and Bio-Rad Laboratories, Inc. In addition, due to the release of our Hyperion imaging mass cytometry system, we now are exposed to competition from companies offering imaging-based systems, specialized reagents and/or services including Carl Zeiss Inc., Leica Biosystems, Nikon Corporation, Olympus America Inc., Roche Diagnostics Corporation, PerkinElmer, Inc., Agilent Technologies, Inc., IonPath Inc., Zellwerk GmbH, Bruker Corporation, Shimadzu Corporation, NanoString Technologies, Inc., and Neogenomics (Multiomyx).

Competitors may be able to respond more quickly and effectively than we can to new or changing opportunities, technologies, standards, or customer requirements. In light of these advantages, even if our technology is more effective than the product or service offerings of our competitors, current or potential customers might accept competitive products and services in lieu of purchasing our technology. We anticipate that we will continue to face increased competition in the future as existing companies and competitors develop new or improved products and as new companies enter the market with new technologies. Increased competition is likely to result in pricing pressures, which could reduce our profit margins and increase our sales and marketing expenses. In addition, mergers, consolidations, or other strategic transactions between two or more of our competitors, or between our competitor and one of our key customers, could change the competitive landscape and weaken our competitive position, adversely affecting our business.

Market opportunities may not develop as quickly as we expect, limiting our ability to successfully sell our products, or our product development and strategic plans may change and our entry into certain markets may be delayed, if it occurs at all.

The application of our technologies to high-throughput genomics, single-cell genomics and, particularly, mass cytometry applications are in many cases emerging market opportunities. We believe these opportunities will take several years to develop or mature and we cannot be certain that these market opportunities will develop as we expect. The future growth of our markets and the success of our products depend on many factors beyond our control, including recognition and acceptance by the scientific community, and the growth, prevalence, and costs of competing methods of genetic and protein analysis. Additionally, our success depends on the ability of our sales organization to successfully sell our products into these new markets. If we are not able to successfully market and sell our products, or to achieve the revenue or margins we expect, our operating results may be harmed and we may not recover our product development and marketing expenditures. In addition, our product development and strategic plans may change, which could delay or impede our entry into these markets.

If our products fail to achieve and sustain sufficient market acceptance, our revenue will be adversely affected.

Our success depends on our ability to develop and market products that are recognized and accepted as reliable, enabling and cost-effective. Most of our potential customers already use expensive research systems in their laboratories and may be reluctant to replace those systems. Market acceptance of our systems will depend on many factors, including our ability to convince potential customers that our systems are an attractive alternative to existing technologies. Compared to some competing technologies, our technology is relatively new, and most potential customers have limited knowledge of, or experience with, our products. Prior to adopting our systems, some potential customers may need to devote time and effort to testing and validating our systems. Any failure of our systems to meet these customer benchmarks could result in customers choosing to retain their existing systems or to purchase systems other than ours, and revenue from the sale of legacy instruments that may have contributed significant revenue in prior periods may decrease.

In addition, it is important that our systems be perceived as accurate and reliable by the scientific and medical research community as a whole. Historically, a significant part of our sales and marketing efforts has been directed at convincing industry leaders of the advantages of our systems and encouraging such leaders to publish or present the results of their evaluation of our system. If we are unable to continue to induce leading researchers to use our systems, or if such researchers are unable to achieve and publish or present significant experimental results using our systems, acceptance and adoption of our systems will be slowed and our ability to increase our revenue would be adversely affected.

We may experience development or manufacturing problems or delays that could limit the potential growth of our revenue or increase our losses.

We may encounter unforeseen situations in the manufacturing and assembly of our products that would result in delays or shortfalls in our production. For example, our production processes and assembly methods may have to change to accommodate any significant future expansion of our manufacturing capacity, which may increase our manufacturing costs, delay production of our products, reduce our product margin, and adversely impact our business. Conversely, if demand for our products shifts such that a manufacturing facility is operated below its capacity for an extended period, we may adjust our manufacturing operations to reduce fixed costs, which could lead to uncertainty and delays in manufacturing times and quality during any transition period.

Additionally, all of our integrated fluidic circuits (IFCs) for commercial sale are manufactured at our facility in Singapore. Production of the elastomeric block that is at the core of our IFCs is a complex process requiring advanced clean rooms, sophisticated equipment, and strict adherence to procedures. Any contamination of the clean room, equipment malfunction, or failure to strictly follow procedures can significantly reduce our yield in one or more batches. We have in the past experienced variations in yields due to such factors. A drop in yield can increase our cost to manufacture our IFCs or, in more severe cases, require us to halt the manufacture of our IFCs until the problem is resolved. Identifying and resolving the cause of a drop in yield can require substantial time and resources.

Furthermore, developing an IFC for a new application may require developing a specific production process for that type of IFC. While all of our IFCs are produced using the same basic processes, significant variations may be required to ensure adequate yield of any particular type of IFC. Developing such a process can be very time consuming, and any unexpected difficulty in doing so can delay the introduction of a product.

If our manufacturing activities are adversely impacted, or if we are otherwise unable to keep up with demand for our products by successfully manufacturing, assembling, testing, and shipping our products in a timely manner, our revenue could be impaired, market acceptance for our products could be adversely affected and our customers might instead purchase our competitors' products.

If our research and product development efforts do not result in commercially viable products within anticipated timelines, if at all, our business and results of operations will be adversely affected.

Our business is dependent on the improvement of our existing products, our development of new products to serve existing markets, and our development of new products to create new markets and applications that were previously not practical with existing systems. We intend to devote significant personnel and financial resources to research and development activities designed to advance the capabilities of our technology. We have developed design rules for the implementation of our technology that are frequently revised to reflect new insights we have gained about the technology. In addition, we have discovered that biological or chemical reactions sometimes behave differently when implemented on our systems rather than in a standard laboratory environment. Furthermore, many such reactions take place within the confines of single cells, which have also demonstrated unexpected behavior when grown and manipulated within microfluidic environments. As a result, research and development efforts may be required to transfer certain reactions and cell handling techniques to our systems. In the past, product development projects have been significantly delayed when we encountered unanticipated difficulties in implementing a process on our systems. We may have similar delays in the future, and we may not obtain any benefits from our research and development activities. Any delay or failure by us to develop and release new products or product enhancements would have a substantial adverse effect on our business and results of operations.

Our products could have defects or errors, which may give rise to claims against us, adversely affect market adoption of our systems, and adversely affect our business, financial condition, and results of operations.

Our systems utilize novel and complex technology and such systems may develop or contain undetected defects or errors. We cannot assure you that material performance problems, defects, or errors will not arise, and as we increase the density and integration of our systems, these risks may increase. We generally provide warranties that our systems will meet performance expectations and will be free from defects. The costs incurred in correcting any defects or errors may be substantial and could adversely affect our operating margins. For example, we have experienced a performance issue with respect to certain IFCs used in our C1 systems due to the presence of more than one cell in an IFC chamber. Although we have redesigned such C1 IFCs, we may experience additional unexpected product defects or errors that could affect our ability to adequately address these performance issues.

In manufacturing our products, including our systems, IFCs, and assays, we depend upon third parties for the supply of various components, many of which require a significant degree of technical expertise to produce. In addition, we purchase certain products from third-party suppliers for resale. If our suppliers fail to produce components to specification or provide defective products to us for resale and our quality control tests and procedures fail to detect such errors or defects, or if we or our suppliers use defective materials or workmanship in the manufacturing process, the reliability and performance of our products will be compromised.

If our products contain defects, we may experience:

- a failure to achieve market acceptance or expansion of our product sales;
- loss of customer orders and delay in order fulfillment;
- damage to our brand reputation;
- increased cost of our warranty program due to product repair or replacement;
- product recalls or replacements;
- inability to attract new customers;
- diversion of resources from our manufacturing and research and development departments into our service department; and
- legal claims against us, including product liability claims, which could be costly and time consuming to defend and result in substantial damages.

In addition, certain of our products are marketed for use with products sold by third parties. For example, certain of our systems are marketed as compatible with major next-generation DNA sequencing instruments. If such third-party products are not produced to specification, are produced in accordance with modified specifications, or are defective, they may not be compatible with our products. In such case, the reliability and performance of our products may be compromised.

The occurrence of any one or more of the foregoing could negatively affect our business, financial condition, and results of operations.

Our business depends on research and development spending levels of our customers, a reduction in which could limit our ability to sell our products and adversely affect our business.

We expect that our revenue in the foreseeable future will continue to be derived primarily from sales of our systems, IFCs, assays, and reagents to academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories biopharmaceutical, biotechnology, and agricultural biotechnology (Ag-Bio) companies, and contract research organizations worldwide. Our success will depend upon their demand for and use of our products. Accordingly, the spending policies of these customers could have a significant effect on the demand for our technology. These policies may be based on a wide variety of factors, including concerns regarding any future federal government budget sequestrations, the availability of resources to make purchases, the spending priorities among various types of equipment, policies regarding spending during recessionary periods, and changes in the political climate. In addition, academic, governmental, and other research institutions that fund research and development activities may be subject to stringent budgetary constraints that could result in spending reductions, reduced allocations, or budget cutbacks, which could jeopardize the ability of these customers to purchase our products. Our operating results may fluctuate substantially due to reductions and delays in research and development expenditures by these customers. For example, reductions in capital and operating expenditures by these customers may result in lower than expected sales of our systems, IFCs, assays, and reagents. These reductions and delays may result from factors that are not within our control, such as:

- changes in economic conditions;
- natural disasters;
- changes in government programs that provide funding to research institutions and companies;
- changes in the regulatory environment affecting life science and Ag-Bio companies engaged in research and commercial activities;
- differences in budget cycles across various geographies and industries;
- market-driven pressures on companies to consolidate operations and reduce costs;
- mergers and acquisitions in the life science and Ag-Bio industries; and
- other factors affecting research and development spending.

Any decrease in our customers' budgets or expenditures, or in the size, scope, or frequency of capital or operating expenditures, could materially and adversely affect our operations or financial condition.

If one or more of our manufacturing facilities become unavailable or inoperable, we will be unable to continue manufacturing our instruments, IFCs, assays and/or reagents and, as a result, our business will be harmed until we are able to secure a new facility.

We manufacture our genomics analytical and preparatory instruments and IFCs for commercial sale at our facility in Singapore and our mass cytometry instruments for commercial sale at our facility in Canada. Our assays and reagents for commercial sale have been manufactured at our headquarters in the United States, however, we are consolidating our North American production activities into our Canada facility as part of our on-going efforts related to operational excellence and improving efficiencies. No other manufacturing facilities are currently available to us, particularly facilities of the size and scope of our Singapore and Canada operations. Our facilities and the equipment we use to manufacture our instruments, IFCs, assays, and reagents would be costly to replace and could require substantial lead times to repair or replace. Our facilities may be harmed or rendered inoperable by natural or man-made disasters, which may render it difficult or impossible for us to manufacture our products for some period of time. If any of our facilities become unavailable to us, we cannot provide assurances that we will be able to secure a new manufacturing facility on acceptable terms, if at all. The inability to manufacture our products, combined with our limited inventory of manufactured supplies, may result in the loss of customers or harm our reputation, and we may be unable to reestablish relationships with those customers in the future. Although we possess insurance for damage to our property and the disruption of our business, this insurance may not be sufficient to cover all of our potential losses and may not continue to be available to us on acceptable terms, or at all. If our manufacturing capabilities are impaired, we may not be able to manufacture and ship our products in a timely manner, which would adversely impact our business.

We generate a substantial portion of our revenue internationally and our international business exposes us to business, regulatory, political, operational, financial, and economic risks associated with doing business outside of the United States.

During the years 2018, 2017, and 2016, approximately 57%, 55%, and 49% respectively, of our product and service revenue was generated from sales to customers located outside of the United States. We believe that a significant percentage of our future revenue will continue to come from international sources as we expand our international operations and develop opportunities in other countries. Engaging in international business inherently involves a number of difficulties and risks, including:

- required compliance with existing and changing foreign regulatory requirements and laws that are or may be applicable to our business in the future, such as the European Union's General Data Protection Regulation and other data privacy requirements, labor and employment regulations, anticompetition regulations, the U.K. Bribery Act of 2010 and other anticorruption laws, and the RoHS and WEEE directives, which regulate the use of certain hazardous substances in, and require the collection, reuse, and recycling of waste from, products we manufacture;

- required compliance with U.S. laws such as the Foreign Corrupt Practices Act, and other U.S. federal laws and regulations established by the office of Foreign Asset Control;

- export requirements and import or trade restrictions;

- laws and business practices favoring local companies;

- longer payment cycles and difficulties in enforcing agreements and collecting receivables through certain foreign legal systems

- changes in social, economic, and political conditions or in laws, regulations and policies governing foreign trade, manufacturing, development, and investment both domestically as well as in the other countries and jurisdictions in which we operate and into which we sell our products, including as a result of the 2016 advisory referendum approving the separation of the United Kingdom from the European Union (Brexit);

- potentially adverse tax consequences, tariffs, customs charges, bureaucratic requirements, and other trade barriers;

- difficulties and costs of staffing and managing foreign operations; and

- difficulties protecting or procuring intellectual property rights.

If one or more of these risks occurs, it could require us to dedicate significant resources to remedy, and if we are unsuccessful in finding a solution, our financial results will suffer.

We are subject to fluctuations in the exchange rate of the U.S. Dollar and foreign currencies.

A majority of our product sales are currently denominated in U.S. dollars and fluctuations in the value of the U.S. dollar relative to foreign currencies could decrease demand for our products and adversely impact our financial performance. For example, if the value of the U.S. dollar increases relative to foreign currencies, our products could become more costly to the international consumer and therefore less competitive in international markets, or if the value of the U.S. dollar decreases relative to the Singapore dollar or the Canadian dollar, it would become more costly in U.S. dollars for us to manufacture our products in Singapore and/or in Canada. Additionally, our expenses are generally denominated in the currencies of the countries in which our operations are located, which is primarily in the United States, with a portion of expenses incurred in Singapore and Canada where a significant portion of our manufacturing operations are located. Our results of operations and cash flows are, therefore, subject to fluctuations due to changes in foreign currency exchange rates. The volatility of exchange rates depends on many factors that we cannot forecast with reliable accuracy. We have experienced and will continue to experience fluctuations in our net income or loss as a result of transaction gains or losses related to revaluing certain current asset and current liability balances that are denominated in currencies other than the functional currency of the entities in which they are recorded. Fluctuations in currency exchange rates could have an adverse impact on our financial results in the future.

Any disruption or delay in the shipping or off-loading of our products, whether domestically or internationally, may have an adverse effect on our financial condition and results of operations.

We rely on shipping providers to deliver products to our customers globally. Labor, tariff, or World Trade Organization-related disputes, piracy, physical damage to shipping facilities or equipment caused by severe weather or terrorist incidents, congestion at shipping facilities, inadequate equipment to load, dock, and offload our products, energy-related tie-ups, or other factors could disrupt or delay shipping or off-loading of our products domestically and internationally. Such disruptions or delays may have an adverse effect on our financial condition and results of operations.

We are dependent on single and sole source suppliers for some of the components and materials used in our products, and the loss of any of these suppliers could harm our business.

We rely on single and sole source suppliers for certain components and materials used in our products. Additionally, several of our instruments are assembled at the facilities of contract manufacturers in Singapore. We do not have long term contracts with our suppliers of these components and materials or our assembly service providers. The loss of a single or sole source supplier of any of the following components and/or materials would require significant time and effort to locate and qualify an alternative source of supply, if at all:

- The IFCs used in our microfluidic systems are fabricated using a specialized polymer, and other specialized materials, that are available from a limited number of sources. In the past, we have encountered quality issues that have reduced our manufacturing yield or required the use of additional manufacturing processes.

- The electron multiplier detector included in the Hyperion/Helios systems and certain metal isotopes used with the Hyperion/Helios systems are purchased from sole source suppliers.

- The raw materials for our Delta Gene and SNP Type assays and Access Array target-specific primers are available from a limited number of sources.

Our reliance on single and sole source suppliers and assembly service providers also subjects us to other risks that could harm our business, including the following:

- we may be subject to increased component or assembly costs and
- we may not be able to obtain adequate supply or services in a timely manner or on commercially reasonable terms.

We have in the past experienced quality control and supply problems with some of our suppliers, such as manufacturing errors, and may again experience problems in the future. We may not be able to quickly establish additional or replacement suppliers, particularly for our single source components, or assembly service providers. Any interruption or delay in the supply of components or materials or assembly of our instruments, or our inability to obtain components, materials, or assembly services from alternate sources at acceptable prices in a timely manner, could impair our ability to meet the demand of our customers and cause them to cancel orders or switch to competitive products.

Our future success is dependent upon our ability to expand our customer base and introduce new applications.

Our customer base is primarily composed of academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories, biopharmaceutical, biotechnology, and Ag-Bio companies, and contract research organizations that perform analyses for research and commercial purposes. Our success will depend, in part, upon our ability to increase our market share among these customers, attract additional customers outside of these markets, and market new applications to existing and new customers as we develop such applications. Attracting new customers and introducing new applications require substantial time and expense. For example, it may be difficult to identify, engage, and market to customers who are unfamiliar with the current applications of our systems. Any failure to expand our existing customer base or launch new applications would adversely affect our ability to increase our revenue.

We may not be able to develop new products or enhance the capabilities of our existing systems to keep pace with rapidly changing technology and customer requirements, which could have a material adverse effect on our business, revenue, financial condition, and operating results.

Our success depends on our ability to develop new products and applications for our technology in existing and new markets, while improving the performance and cost-effectiveness of our systems. New technologies, techniques, or products could emerge that might offer better combinations of price and performance than our current or future product lines and systems. Existing markets for our products, including high-throughput genomics, single-cell genomics and mass cytometry, as well as potential markets for our products such as high-throughput DNA sequencing and molecular applications, are characterized by rapid technological change and innovation. It is critical to our success for us to anticipate changes in technology and customer requirements and to successfully introduce new, enhanced, and competitive technology to meet our customers' and prospective customers' needs on a timely and cost-effective basis. Developing and implementing new technologies will require us to incur substantial development costs and we may not have adequate resources available to be able to successfully introduce new applications of, or enhancements to, our systems. We cannot guarantee that we will be able to maintain technological advantages over emerging technologies in the future. While we typically plan improvements to our systems, we may not be able to successfully implement these improvements. If we fail to keep pace with emerging technologies, demand for our systems will not grow and may decline, and our business, revenue, financial condition, and operating results could suffer materially. In addition, if we introduce enhanced systems but fail to manage product transitions effectively, customers may delay or forgo purchases of our systems and our operating results may be adversely affected by product obsolescence and excess inventory. Even if we successfully implement some or all of these planned improvements, we cannot guarantee that our current and potential customers will find our enhanced systems to be an attractive alternative to existing technologies, including our current products.

Our business operations depend upon the continuing efforts of our management team and other skilled and experienced personnel, and if we are unable to retain them or to recruit and train new key executives, scientists, and technical support personnel, we may be unable to achieve our goals.

Our success depends largely on the skills, experience, and performance of key members of our management team and key scientific and technical support personnel. The loss of the services of any key member of our management team or our scientific or technical support staff might significantly delay or prevent the development of our products or achievement of other business objectives by diverting management's attention to transition matters and identification of suitable replacements, if any, and could have a material adverse effect on our business. Our research and product development efforts could also be delayed or curtailed if we are unable to attract, train, and retain highly skilled employees, particularly, senior scientists and engineers. We do not maintain fixed term employment contracts or significant key man life insurance with any of our employees.

Additionally, to expand our research and product development efforts, we need to retain and recruit key scientists skilled in areas such as molecular and cellular biology, assay development, and manufacturing. We also need highly trained technical support personnel with the necessary scientific background and ability to understand our systems at a technical level to effectively support potential new customers and the expanding needs of current customers. Competition for these people is intense and we may face challenges in retaining and recruiting such individuals if, for example, our stock price declines, reducing the retention value of equity awards, or our business or technology is no longer perceived as leading in our field. Because of the complex and technical nature of our systems and the dynamic market in which we compete, any failure to attract and retain a sufficient number of qualified employees could materially harm our ability to develop and commercialize our technology.

Our business growth strategy involves the potential for significant acquisitions, and our operating results and prospects could be harmed if we are unable to integrate future acquisitions successfully.

We may acquire other businesses to improve our product offerings or expand into new markets. Our future acquisition strategy will depend on our ability to identify, negotiate, complete, and integrate acquisitions and, if necessary, to obtain satisfactory debt or equity financing to fund those acquisitions. Mergers and acquisitions are inherently risky, and any transaction we complete may not be successful. Any merger or acquisition we may pursue would involve numerous risks, including but not limited to the following:

- difficulties in integrating and managing the operations, technologies, and products of the companies we acquire;
- diversion of our management's attention from normal daily operation of our business;
- our inability to maintain the key business relationships and the reputations of the businesses we acquire;
- our inability to retain key personnel of the acquired company;
- uncertainty of entry into markets in which we have limited or no prior experience and in which competitors have stronger market positions;
- our dependence on unfamiliar affiliates and customers of the companies we acquire;
- insufficient revenue to offset our increased expenses associated with acquisitions;
- our responsibility for the liabilities of the businesses we acquire, including those which we may not anticipate; and
- our inability to maintain internal standards, controls, procedures, and policies.

We may be unable to secure the equity or debt funding necessary to finance future acquisitions on terms that are acceptable to us. If we finance acquisitions by issuing equity or convertible debt securities, our existing stockholders will likely experience dilution, and if we finance future acquisitions with debt funding, we will incur interest expense and may have to comply with financial covenants and secure that debt obligation with our assets.

Security breaches, loss of data, cyberattacks, and other information technology failures could disrupt our operations, damage our reputation, and adversely affect our business, operations, and financial results.

We are dependent upon our data and information technology systems for the effective operation of our business and for the secure maintenance and storage of confidential data relating to our business and third-party businesses. Our information technology systems may be damaged, disrupted or shut down due to attacks by experienced programmers or hackers who may be able to penetrate our security controls and deploy computer viruses, cyberattacks, phishing schemes, or other malicious software programs, or due to employee error or malfeasance, power outages, hardware failures, telecommunication or utility failures, catastrophes or other unforeseen events, and our system redundancy and other disaster recovery planning may be ineffective or inadequate in preventing or responding to any of these circumstances. Any such compromise of our information technology systems could result in the unauthorized publication of our confidential business or proprietary information and unauthorized release of customer, supplier or employee data, any of which could expose us to a risk of legal claims or proceedings, liability under privacy or other laws, disruption of our operations and damage to our reputation, which could divert our management's attention from the operation of our business and materially and adversely affect our business, revenues and competitive position. In addition, our liability insurance may not be sufficient in type or amount to cover us against claims related to security breaches, cyberattacks and other related breaches. The cost and operational consequences of implementing further data protection measures, either as a response to specific breaches or as a result of evolving risks, could be significant. In addition, our inability to use or access our information systems at critical points in time could adversely affect the timely and efficient operation of our business. Any delayed sales, significant costs or lost customers resulting from these technology failures could adversely affect our business, operations, and financial results.

We have implemented security controls to protect our information technology infrastructure but, despite our efforts, we are not fully insulated from technology disruptions that could adversely impact us. For example, in early March 2019, we experienced a ransomware attack that infiltrated and encrypted certain of our information technology systems, including systems containing critical business data. Immediately following the attack, actions were taken to recover the compromised systems and we believe we were able to restore their operation without significant loss of business data. Based on the nature of the attack and its impact on our systems, we do not believe confidential data was lost or disclosed, but we are continuing to monitor the situation. If confidential data is later determined to have been released in the course of this event, it is possible that we could be the subject of actions by governmental authorities or claims from persons alleging they suffered damages from such a release. As of the date of this filing, we estimate the costs associated with the intrusion to be approximately $1.5 million; and are seeking to recover these costs under an applicable insurance policy. Although we believe we have now contained the disruption, we anticipate additional work and expense in the future as we continue to respond to the attack and further enhance our security processes and initiatives.

In addition to risks affecting our own systems, we could also be negatively impacted by a data breach or cyber incident happening to a third party's network and affecting us. Third parties with which we conduct business have access to certain portions of our sensitive data, including information pertaining to our customers and employees. In the event that these third parties do not adequately safeguard our data, security breaches could result and negatively impact our business, operations, and financial results.

Our efficiency and cost-savings initiatives could be disruptive to our operations and adversely affect our results of operations and financial condition, and we may not realize some or all of the anticipated benefits of these initiatives in the time frame anticipated or at all.

Since 2017, we have been implementing efficiency and cost-savings initiatives intended to stabilize our business operations and return to growth. These efficiency initiatives have included targeted workforce reductions, optimizing our facilities, and reducing excess space. Further actions such as these may be required on an ongoing basis to optimize our organization. For example, we may need to decrease or defer capital expenditures and development activities or implement further operating expense reduction measures. The implementation of these efficiency and cost-savings initiatives could impair our ability to invest in developing, marketing and selling new and existing products, be disruptive to our operations, make it difficult to attract or retain employees, result in higher than anticipated charges, divert the attention of management, result in a loss of accumulated knowledge, impact our customer and supplier relationships, and otherwise adversely affect our results of operations and financial condition. In addition, our ability to complete our efficiency and cost-savings initiatives and achieve the anticipated benefits within the expected time frame is subject to estimates and assumptions and may vary materially from our expectations, including as a result of factors that are beyond our control. Furthermore, our efforts to grow our business and become profitable may not be successful.

To use our products, our Biomark, EP1, and Helios/CyTOF 2 systems in particular, customers typically need to purchase specialized reagents. Any interruption in the availability of these reagents for use in our products could limit our ability to market our products.

Our products, our Biomark, EP1, and Helios systems in particular, must be used in conjunction with one or more reagents designed to produce or facilitate the particular biological or chemical reaction desired by the user. Many of these reagents are highly specialized and available to the user only from a single supplier or a limited number of suppliers. Although we sell reagents for use with certain of our products, our customers may purchase these reagents directly from third-party suppliers, and we have no control over the supply of those materials. In addition, our products are designed to work with these reagents as they are currently formulated. We have no control over the formulation of reagents sold by third-party suppliers, and the performance of our products might be adversely affected if the formulation of these reagents is changed. If one or more of these reagents were to become unavailable or were reformulated, our ability to market and sell our products could be materially and adversely affected.

In addition, the use of a reagent for a particular process may be covered by one or more patents relating to the reagent itself, the use of the reagent for the particular process, the performance of that process, or the equipment required to perform the process. Typically, reagent suppliers, who are either the patent holders or their authorized licensees, sell the reagents along with a license or covenant not to sue with respect to such patents. The license accompanying the sale of a reagent often purports to restrict the purposes for which the reagent may be used. If a patent holder or authorized licensee were to assert against us or our customers that the license or covenant relating to a reagent precluded its use with our systems, our ability to sell and market our products could be materially and adversely affected. For example, our Biomark system involves real-time quantitative polymerase chain reaction (qPCR) technology. Leading suppliers of reagents for real-time qPCR reactions include Life Technologies Corporation (now part of Thermo Fisher Scientific) and Roche Diagnostics Corporation, who are our direct competitors, and their licensees. These real-time qPCR reagents are typically sold pursuant to limited licenses or covenants not to sue with respect to patents held by these companies. We do not have any contractual supply agreements for these real-time qPCR reagents, and we cannot assure you that these reagents will continue to be available to our customers for use with our systems, or that these patent holders will not seek to enforce their patents against us, our customers, or suppliers.

If we seek to be regulated as a medical device manufacturer by the U.S. Food and Drug Administration and foreign regulatory authorities, and seek approval and/or clearance for our products, the regulatory approval process would take significant time and expense and could fail to result in FDA clearance or approval for the intended uses we believe are commercially attractive. If our products were successfully approved and/or cleared, we would be subject to ongoing and extensive regulatory requirements, which would increase our costs and divert resources away from other projects. If we obtained FDA clearance or approval and we failed to comply with these requirements, our business and financial condition could be adversely impacted.

Our products are currently labeled, promoted and sold to academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories, contract research organizations, and biopharmaceutical, biotechnology, and Ag-Bio companies “for research use only” (RUO), and are not designed, or intended to be used, for clinical diagnostic tests or as medical devices as currently marketed. Before we can begin to label and market our products for use as, or in the performance of, clinical diagnostics in the United States, thereby subjecting them to FDA regulation as medical devices, we would be required to obtain premarket 510(k) clearance or premarket approval from the FDA, unless an exception applies.

We may in the future register with the FDA as a medical device manufacturer and list some of our products with the FDA pursuant to an FDA Class I listing for general purpose laboratory equipment. While this regulatory classification is exempt from certain FDA requirements, such as the need to submit a premarket notification commonly known as a 510(k), and some of the requirements of the FDA's Quality System Regulations, or QSRs, we would be subject to ongoing FDA "general controls," which include compliance with FDA regulations for labeling, inspections by the FDA, complaint evaluation, corrections and removals reporting, promotional restrictions, reporting adverse events or malfunctions for our products, and general prohibitions against misbranding and adulteration.

In addition, we may in the future submit 510(k) premarket notifications to the FDA to obtain FDA clearance of certain of our products on a selected basis. It is possible, in the event we elect to submit 510(k) applications for certain of our products, that the FDA would take the position that a more burdensome premarket application, such as a premarket approval application or a de novo application is required for some of our products. If such applications were required, greater time and investment would be required to obtain FDA approval. Even if the FDA agreed that a 510(k) was appropriate, FDA clearance can be expensive and time consuming. It generally takes a significant amount of time to prepare a 510(k), including conducting appropriate testing on our products, and several months to years for the FDA to review a submission. Notwithstanding the effort and expense, FDA clearance or approval could be denied for some or all of our products. Even if we were to seek and obtain regulatory approval or clearance, it may not be for the intended uses we believe are important or commercially attractive.

If we sought and received regulatory clearance or approval for certain of our products, we would be subject to ongoing FDA obligations and continued regulatory oversight and review, including the general controls listed above and the FDA's QSRs for our development and manufacturing operations. In addition, we would be required to obtain a new 510(k) clearance before we could introduce subsequent modifications or improvements to such products. We could also be subject to additional FDA post-marketing obligations for such products, any or all of which would increase our costs and divert resources away from other projects. If we sought and received regulatory clearance or approval and are not able to maintain regulatory compliance with applicable laws, we could be prohibited from marketing our products for use as, or in the performance of, clinical diagnostics and/or could be subject to enforcement actions, including warning letters and adverse publicity, fines, injunctions, and civil penalties; recall or seizure of products; operating restrictions; and criminal prosecution.

In addition, we could decide to seek similar regulatory clearance or approval for certain of our products in countries outside of the United States. Sales of such products outside the United States will likely be subject to foreign regulatory requirements, which can vary greatly from country to country. As a result, the time required to obtain clearances or approvals outside the United States may differ from that required to obtain FDA clearance or approval and we may not be able to obtain foreign regulatory approvals on a timely basis or at all. Clearance or approval by the FDA does not ensure approval by regulatory authorities in other countries, and approval by one foreign regulatory authority does not ensure approval by regulatory authorities in other countries or by the FDA. In Europe, we would need to comply with the Medical Device Directive 93/42 EEC and/or the In Vitro Diagnostics Directive 98/79/EC, which are required to market medical devices in the European Union. These directives have been replaced by Medical Device Regulation 2017/745 and In Vitro Diagnostic Regulation 2017/746, with official entry into force in May 26, 2017 and date of applications of May 26, 2020 and May 26, 2022 respectively. This will increase the difficulty of regulatory approvals in Europe in the future. In addition, the FDA regulates exports of medical devices. Failure to comply with these regulatory requirements or obtain and maintain required approvals, clearances and certifications could impair our ability to commercialize our products for diagnostic use outside of the United States.

Our products could become subject to regulation as medical devices by the FDA or other regulatory agencies before we have obtained regulatory clearance or approval to market our products for diagnostic purposes, which would adversely impact our ability to market and sell our products and harm our business.

As products that are currently labeled, promoted and intended "for research use only" (RUO), our products are not currently subject to regulation as medical devices by the FDA or comparable agencies of other countries. However, the FDA or comparable agencies of other countries could disagree with our conclusion that our products are currently intended for research use only or deem our current sales, marketing and promotional efforts as being inconsistent with research use only products. For example, our customers may independently elect to use our research use only labeled products in their own laboratory developed tests (LDTs) for clinical diagnostic use. The FDA has historically exercised enforcement discretion in not enforcing the medical device regulations against laboratories offering LDTs. However, on October 3, 2014, the FDA issued two draft guidance documents that set forth the FDA's proposed risk-based framework for regulating LDTs, which are designed, manufactured, and used within a single laboratory. The draft guidance documents provide the anticipated details through which the FDA would propose to establish an LDT oversight framework, including premarket review for higher-risk LDTs, such as those that have the same intended use as FDA-approved or cleared companion diagnostic tests currently on the market. In January 2017, the FDA announced that it would not issue final guidance on the oversight of LDTs and LDT manufacturers, but would seek further public discussion on an appropriate oversight approach, and give Congress an opportunity to develop a legislative solution. Any future legislative or administrative rule making or oversight of LDTs and LDT manufacturers, if and when finalized, may impact the sales of our products and how customers use our products, and may require us to change our business model in order to maintain compliance with these laws. We cannot predict how these various efforts will be resolved, how Congress or the FDA will regulate LDTs in the future, or how that regulatory system will impact our business.

Additionally, on November 25, 2013, the FDA issued Final Guidance "Distribution of In Vitro Diagnostic Products Labeled for Research Use Only." The guidance emphasizes that the FDA will review the totality of the circumstances when it comes to evaluating whether equipment and testing components are properly labeled as RUO. The final guidance states that merely including a labeling statement that the product is for research purposes only will not necessarily render the device exempt from the FDA's clearance, approval, and other regulatory requirements if the circumstances surrounding the distribution, marketing and promotional practices indicate that the manufacturer knows its products are, or intends for its products to be, used for clinical diagnostic purposes. These circumstances may include written or verbal sales and marketing claims or links to articles regarding a product's performance in clinical applications and a manufacturer's provision of technical support for clinical applications.

If the FDA modifies its approach to our products labeled and intended as RUO, or otherwise determines our products or related applications should be subject to additional regulation as in vitro diagnostic devices based upon customers' use of our products for clinical diagnostic or therapeutic purposes, before we have obtained regulatory clearance or approval to market our products for diagnostic purposes, our ability to market and sell our products could be impeded and our business, prospects, results of operations and financial condition may be adversely affected. In addition, if the FDA determines that our products labeled as RUO were intended, based on a review of the totality of circumstances, for use in clinical investigation or diagnosis, those products could be considered misbranded or adulterated under the Federal Food, Drug, and Cosmetic Act and subject to recall and/or other enforcement action.

Compliance or the failure to comply with current and future regulations affecting our products and business operations worldwide, such as environmental regulations enacted in the European Union, could cause us significant expense and adversely impact our business.

We are subject to many federal, state, local, and foreign regulations relating to various aspects of our business operations. Governmental entities at all levels are continuously enacting new regulations, and it is difficult to identify all applicable regulations and anticipate how such regulations will be implemented and enforced. We continue to evaluate the necessary steps for compliance with applicable regulations. To comply with applicable regulations, we have and will continue to incur significant expense and allocate valuable internal resources to manage compliance-related issues. In addition, such regulations could restrict our ability to expand or equip our facilities, or could require us to acquire costly equipment or to incur other significant expenses to comply with the regulations. For example, the Restriction on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive, or RoHS, and the Waste Electrical and Electronic Equipment Directive, or WEEE, enacted in the European Union, regulate the use of certain hazardous substances in, and require the collection, reuse, and recycling of waste from, products we manufacture. Certain of our products sold in these countries are subject to WEEE and RoHS. These and similar regulations that have been or are in the process of being enacted in other countries may require us to redesign our products, use different types of materials in certain components, or source alternative components to ensure compliance with applicable standards, and may reduce the availability of parts and components used in our products by negatively impacting our suppliers' ability to source parts and components in a timely and cost-effective manner.

Any such redesigns, required use of alternative materials, or limited availability of parts and components used in our products may detrimentally impact the performance of our products, add greater testing lead times for product introductions, reduce our product margins, or limit the markets for our products, and if we fail to comply with any present and future regulations, we could be subject to future fines, penalties, and restrictions, such as the suspension of manufacturing of our products or a prohibition on the sale of products we manufacture. Any of the foregoing could adversely affect our business, financial condition, or results of operations.

If we fail to maintain effective internal control over financial reporting in the future, the accuracy and timing of our financial reporting may be impaired, which could adversely affect our business and our stock price.

The Sarbanes-Oxley Act requires, among other things, that we maintain effective internal control over financial reporting and disclosure controls and procedures. In particular, we must perform system and process evaluation and testing of our internal control over financial reporting to allow management to report on the effectiveness of our internal control over financial reporting, as required by Section 404 of the Sarbanes-Oxley Act. Our testing may reveal deficiencies in our internal control over financial reporting that are deemed to be material weaknesses.

Our compliance with Section 404 requires that we incur substantial accounting expense and expend significant management time on compliance-related issues. We currently do not have an internal audit group, and we continue to evaluate our need for additional accounting and financial staff with appropriate public company experience and technical accounting knowledge. Moreover, if we do not comply with the requirements of Section 404, or if we or our independent registered public accounting firm identify deficiencies in our internal control over financial reporting that are deemed to be material weaknesses, the market price of our stock could decline and we could be subject to sanctions or investigations by the Nasdaq Global Select Market (Nasdaq), the SEC, or other regulatory authorities, which would require additional financial and management resources.

Impairment of our goodwill or other intangible assets could materially and adversely affect our business, operating results, and financial condition.

As of December 31, 2018, we had approximately $165.9 million of goodwill and net intangible assets, including approximately $104.1 million of goodwill and $61.8 million of net intangible assets. These assets represent a significant portion of the assets recorded on our consolidated balance sheet and relate primarily to our acquisition of DVS Sciences, Inc., or DVS, in February 2014. In addition, if in the future we acquire additional businesses, technologies, or other intangible assets, a substantial portion of the value of such assets may be recorded as goodwill or intangible assets.

The carrying amounts of goodwill and intangible assets are affected whenever events or changes in circumstances indicate that their carrying amounts may not be recoverable. We review goodwill and indefinite lived intangible assets for impairment at least annually and more frequently under certain circumstances. Other intangible assets that are deemed to have finite useful lives will continue to be amortized over their useful lives but must be reviewed for impairment when events or changes in circumstances indicate that the carrying amount of these assets may not be recoverable. Events or changes in circumstances that could affect the likelihood that we will be required to recognize an impairment charge include declines in our stock price or market capitalization, declines in our market share or revenues, an increase in our losses, rapid changes in technology, failure to achieve the benefits of capacity increases and utilization, significant litigation arising out of an acquisition, or other matters. In particular, these or other adverse events or changes in circumstances may affect the estimated undiscounted future operating cash flows expected to be derived from our goodwill and intangible assets. Any impairment charges could have a material adverse effect on our operating results and net asset value in the quarter in which we recognize the impairment charge. We cannot provide assurances that we will not in the future be required to recognize impairment charges.

Our future capital needs are uncertain and we may need to raise additional funds in the future, which may cause dilution to stockholders or may be upon terms that are not favorable to us.

We believe that our existing cash and cash equivalents and availability under the Revolving Credit Facility will be sufficient to meet our anticipated cash requirements for at least the next 18 months. We have continued to experience losses and, if that trend continues, we may need to seek additional sources of financing. In addition, we may need to raise substantial additional capital for various purposes, including:

- expanding the commercialization of our products;
- funding our operations;
- furthering our research and development; and
- acquiring other businesses or assets and licensing technologies.

Our future funding requirements will depend on many factors, including:

- market acceptance of our products;
- the cost of our research and development activities;
- the cost of filing and prosecuting patent applications;
- the cost of defending any litigation including intellectual property, employment, contractual or other litigation;
- the cost and timing of regulatory clearances or approvals, if any;
- the cost and timing of establishing additional sales, marketing, and distribution capabilities;
- the cost and timing of establishing additional technical support capabilities;
- fluctuations in cash demands (e.g., due to interest payments or payouts under existing cash compensation plans);
- sales variability through the year-end timing of related cash collections:
- the effectiveness of our recent efficiency and cost-savings initiatives;
- the effect of competing technological and market developments; and
- the extent to which we acquire or invest in businesses, products, and technologies, although we currently have no commitments or agreements relating to any of these types of transactions.

To the extent we draw on our $15.0 million revolving senior credit facility (the “2018 Facility”) or otherwise incur additional indebtedness, the risks described above could increase. Further, if we increase our indebtedness, our actual cash requirements in the future may be greater than expected. Our cash flow from operations may not be sufficient to repay all of the outstanding debt as it becomes due, and we cannot assure you that we will be able to obtain additional funds on acceptable terms, or at all. If we raise additional funds by issuing equity securities, our stockholders may experience dilution. Debt financing in addition to the 2018 Facility, if available, may involve covenants restricting our operations or our ability to incur additional debt. Any additional debt or equity financing that we raise may contain terms that are not favorable to us or our stockholders. If we raise additional funds through collaboration and licensing arrangements with third parties, it may be necessary to relinquish some rights to our technologies or our products, or grant licenses on terms that are not favorable to us. If we do not have or are unable to raise adequate funds, we may have to liquidate some or all of our assets, delay development or commercialization of our products, or license to third parties the rights to commercialize products or technologies that we would otherwise seek to commercialize. We also may have to reduce marketing, customer support, research and development, or other resources devoted to our products, or cease operations. Any of these factors could harm our operating results.

If we fail to comply with the covenants and other obligations under our credit facility, the lenders may be able to accelerate amounts owed under the facilities and may foreclose upon the assets securing our obligations.

In August 2018, we entered into the Revolving Credit Facility. The Revolving Credit Facility provides for secured revolving loans in an aggregate amount of up to $15.0 million. The Revolving Credit Facility is secured by substantially all of our assets, other than intellectual property. The Revolving Credit Facility contains customary affirmative and negative covenants which, unless waived by the bank, limit our ability to, among other things, incur additional indebtedness, grant liens, make investments, repurchase stock, pay dividends, transfer assets, enter into affiliate transactions, undergo a change of control, or engage in merger and acquisition activity, including merging or consolidating with a third party. If we fail to comply with the covenants and our other obligations under the 2018 Facility, the lenders would be able to accelerate the required repayment of amounts due under the 2018 Credit Agreement and, if they are not repaid, could foreclose upon the assets securing our obligations under the 2018 Facility.

We are subject to risks related to taxation in multiple jurisdictions and if taxing authorities disagree with our interpretations of existing tax laws or regulations, our effective income tax rate could be adversely affected and we could have additional tax liability.

We are subject to income taxes in both the United States and certain foreign jurisdictions. Significant judgments based on interpretations of existing tax laws or regulations are required in determining the provision for income taxes. For example, we have made certain interpretations of existing tax laws or regulations based upon the operations of our business internationally and we have implemented intercompany agreements based upon these interpretations and related transfer pricing analyses. If the U.S. Internal Revenue Service or other taxing authorities disagree with the positions, our effective income tax rate could be adversely affected and we could have additional tax liability, including interest and penalties. We recently completed a review of our European corporate structure and tax positions and, based upon our existing business operations, we restructured our European intercompany transactions, which increased our income tax liability. From time to time, we may review our corporate structure and tax positions in other international jurisdictions and such review may result in additional changes to how we structure our international business operations, which may adversely impact our effective income tax rate. Our effective income tax rate could also be adversely affected by changes in the mix of earnings in tax jurisdictions with different statutory tax rates, changes in the valuation of deferred tax assets and liabilities, changes in existing tax laws or tax rates, changes in the level of non-deductible expenses (including share-based compensation), changes in our future levels of research and development spending, mergers and acquisitions, or the result of examinations by various tax authorities. Legislation commonly referred to as the 2017 Tax Cuts and Jobs Act was enacted in the United States on December 22, 2017 and introduced a number of changes to U.S. federal income tax, the consequences to us of which have not yet been fully determined and which could have material impact on the value of our deferred tax assets, could result in significant one-time charges in the current or future taxable years, and could increase our future U.S. tax expense. Payment of additional amounts as a result of changes in applicable tax law or upon final adjudication of any disputes could have a material impact on our results of operations and financial position.

Our ability to use net operating loss carryforwards to offset future taxable income for U.S. federal income tax purposes and other tax benefits may be limited.

Section 382 of the Internal Revenue Code of 1986, as amended, referred to as the “Code,” imposes an annual limitation on the amount of taxable income that may be offset if a corporation experiences an “ownership change” as defined in Section 382 of the Code. An ownership change occurs when a company’s “five-percent shareholders” (as defined in Section 382 of the Code) collectively increase their ownership in the company by more than 50 percentage points (by value) over a rolling three-year period. Additionally, various states have similar limitations on the use of state net operating losses, referred to as our NOLs, following an ownership change.

If we experience an ownership change, our ability to use our NOLs, any loss or deduction attributable to a “net unrealized built-in loss” and other tax attributes, which we refer to as tax benefits, could be substantially limited, and the timing of the usage of the tax benefits could be substantially delayed, which could significantly impair the value of the tax benefits. There is no assurance that we will be able to fully utilize the tax benefits and we could be required to record an additional valuation allowance related to the amount of the tax benefits that may not be realized, which could adversely impact our results of operations.

We believe that these tax benefits are a valuable asset for us. However, legislation commonly known as the 2017 Tax Cuts and Jobs Act includes a decrease in the U.S. federal corporate income tax rate from 35% to 21%, and our tax benefits were revalued at the newly enacted rate. We do not expect this to have a material impact on our financial statements because we currently maintain a full valuation allowance on our U.S. deferred tax assets; however, this reduction in the U.S. federal corporate income tax rate results in a corresponding reduction in the value of our tax benefits. On November 21, 2016, our board of directors approved a tax benefit preservation plan, or Tax Benefit Preservation Plan, in an effort to protect our tax benefits during the effective period of the tax benefit preservation plan. Our board of directors elected to let the Tax Benefit Preservation Plan expire in August 2017 based on its determination, in consultation with our management and tax advisors, that our NOLs were not at material risk of limitation based on an ownership change pursuant to Section 382. Our board of directors will continue to monitor our NOLs, however, and could elect to adopt a similar plan if it believes a potential risk exists that our NOLs could be limited. Any future tax benefit preservation plan could make it more difficult for a third party to acquire, or could discourage a third party from acquiring, us or a large block of our common stock.

Adverse conditions in the global economy and disruption of financial markets may significantly harm our revenue, profitability, and results of operations.

The global credit and financial markets have in recent years experienced volatility and disruptions, including diminished liquidity and credit availability, increased concerns about inflation and deflation, and the downgrade of U.S. debt and exposure risks on other sovereign debts, decreased consumer confidence, lower economic growth, volatile energy costs, increased unemployment rates, and uncertainty about economic stability. In addition, certain geopolitical events, including the prolonged shutdown of the United States government and the ongoing negotiation of the United Kingdom's withdrawal from the European Union, have caused significant economic, market, political and regulatory uncertainty in some of our markets. Volatility and disruption of financial markets could limit our customers' ability to obtain adequate financing or credit to purchase and pay for our products in a timely manner or to maintain operations, which could result in a decrease in sales volume that could harm our results of operations. General concerns about the fundamental soundness of domestic and international economies may also cause our customers to reduce their purchases. Changes in governmental banking, monetary, and fiscal policies to address liquidity and increase credit availability may not be effective. Significant government investment and allocation of resources to assist the economic recovery of sectors which do not include our customers may reduce the resources available for government grants and related funding for life science, Ag-Bio, and clinical research and development. Continuation or further deterioration of these financial and macroeconomic conditions could significantly harm our sales, profitability, and results of operations.

If we are unable to expand our direct sales and marketing force or distribution capabilities to adequately address our customers' needs, our business may be adversely affected.

We may not be able to market, sell, and, distribute our products effectively enough to support our planned growth. We sell our products primarily through our own sales force and through distributors in certain territories. Our future sales will depend in large part on our ability to continue to develop and substantially expand our direct sales force and to increase the scope of our marketing efforts. Our products are technically complex and used for highly specialized applications. As a result, we believe it is necessary to continue to develop a direct sales force that includes people with specific scientific backgrounds and expertise, and a marketing group with technical sophistication. Competition for such employees is intense. In addition, we have experienced significant changes in our sales organization in recent quarters due to reorganizations and changes in leadership. We may not be able to attract and retain personnel or be able to build an efficient and effective sales and marketing force, which would negatively impact sales of our products and reduce our revenue and profitability.

In addition, we may continue to enlist one or more sales representatives and distributors to assist with sales, distribution, and customer support globally or in certain regions of the world. If we do seek to enter into such arrangements, we may not be successful in attracting desirable sales representatives and distributors, or we may not be able to enter into such arrangements on favorable terms. If our sales and marketing efforts, or those of any third-party sales representatives and distributors, are not successful, our technologies and products may not gain market acceptance, which would materially and adversely impact our business operations.

If we seek to implement a company-wide implementation of an enterprise resource planning, or ERP, system, such implementation could adversely affect our business and results of operations or the effectiveness of internal control over financial reporting.

We have considered implementing a company-wide ERP system to handle the business and financial processes within our operations and corporate functions. ERP implementations are complex and time-consuming projects that involve substantial expenditures on system software and implementation activities that can continue for several years. ERP implementations also require transformation of business and financial processes in order to reap the benefits of the ERP system. If we decide to implement a company-wide ERP system, our business and results of operations could be adversely affected if we experience operating problems and/or cost overruns during the ERP implementation process, or if the ERP system and the associated process changes do not give rise to the benefits that we expect. If we do not effectively implement the ERP system as planned or if the system does not operate as intended, our business, results of operations, and internal controls over financial reporting could be adversely affected.

Changes in accounting principles, or interpretations thereof, could have a significant impact on our financial position and results of operations.

We prepare our consolidated financial statements in accordance with accounting principles generally accepted in the United States of America, referred to as U.S. GAAP. These principles are subject to interpretation by the SEC and various bodies formed to interpret and create appropriate accounting principles. A change in these principles can have a significant effect on our reported results and may even retroactively affect previously reported transactions. Additionally, the adoption of new or revised accounting principles may require that we make significant changes to our systems, processes and controls.

For example, the U.S.-based Financial Accounting Standards Board, referred to as FASB, is currently working together with the International Accounting Standards Board, referred to IASB, on several projects to further align accounting principles and facilitate more comparable financial reporting between companies who are required to follow U.S. GAAP under SEC regulations and those who are required to follow International Financial Reporting Standards outside of the United States. These efforts by the FASB and IASB may result in different accounting principles under U.S. GAAP that may result in materially different financial results for us in areas including, but not limited to, principles for recognizing revenue and lease accounting. Additionally, significant changes to U.S. GAAP resulting from the FASB's and IASB's efforts may require that we change how we process, analyze and report financial information and that we change financial reporting controls. Additionally, the FASB issued new guidance (ASU 2014-09) *Revenue from Contracts with Customers (Topic 606)* which supersedes nearly all existing U.S. GAAP revenue recognition guidance. The new guidance was effective for our fiscal year 2018. We adopted ASU 2014-09 in the first quarter of 2018 using the modified retrospective method. Under the modified retrospective method, periods prior to the adoption of ASU 2014-09 are not restated and the cumulative effect of initially applying the new standard is reflected in the opening balance of retained earnings as of January 1, 2018. To date, the adoption has not had a material impact on our consolidated financial statements. Additional disclosures are required for significant differences between the reported results under the new standard and those that would have been reported under the legacy standard, which required us to make certain changes to our business processes and controls to support revenue recognition and disclosure under the new standard.

The FASB also issued Accounting Standards Update (ASU) 2016-02, *Leases (Topic 842)*. The core principle is that lessees should recognize the assets and liabilities arising from leases on the balance sheet. Under the new standard, lessees will be required to recognize lease assets and liabilities for all leases, with certain exceptions, on their balance sheets. We will adopt ASU 2016-02 as of January 1, 2019. We continue to evaluate the initial cumulative effect of the new standard as well as on our ongoing financial reporting. We continue to identify the appropriate changes to our business processes, systems, and controls to support the new lease standards and the required disclosures under the new standard.

It is not clear if or when these potential changes in accounting principles may become effective, whether we have the proper systems and controls in place to accommodate such changes and the impact that any such changes may have on our financial position and results of operations.

We have a significant amount of outstanding indebtedness, and our financial condition and results of operations could be adversely affected if we do not efficiently manage our liabilities.

We have significant outstanding convertible debt, and may be required to repay, refinance or restructure a portion of such debt before 2021. As of December 31, 2018, we had outstanding $150.00 million aggregate principal amount of our 2018 Notes and $51.3 million aggregate principal amount of our 2014 Notes. Subsequent to December 31, 2018, all of the 2018 Notes have since been converted into shares of our common stock pursuant to conversion notices received from the holders of such 2018 Notes and in connection with the Issuer's Conversion Option and no 2018 Notes remain outstanding. Please see the section entitled "Recent Developments" in Part II, Item 7 of this Form 10-K for more information on the conversion of the 2018 Notes.

The 2014 Notes will mature on February 1, 2034, unless earlier converted, redeemed, or repurchased in accordance with the terms of the 2014 Notes. Holders of the 2014 Notes may require us to repurchase all or a portion of their 2014 Notes on each of February 6, 2021, February 6, 2024, and February 6, 2029 at a repurchase price in cash equal to 100% of the principal amount of the Notes plus accrued and unpaid interest. If we undergo a fundamental change, as defined in the terms of each of the applicable series of Notes, holders of the 2014 Notes may require us to repurchase the 2014 Notes in whole or in part for cash at a repurchase price equal to 100% of the principal amount of the 2014 Notes plus accrued and unpaid interest. If we refinance the debt owed under the 2014 Notes, we may issue additional convertible notes or other debt, which could include additional company obligations and represent more dilution to existing stockholders and noteholders.

This significant amount of debt has important risks to us and our investors, including:

- requiring a portion of our cash flow from operations to make interest payments on this debt;
- increasing our vulnerability to general adverse economic and industry conditions;
- reducing the cash flow available to fund capital expenditures and other corporate purposes and to grow our business;
- limiting our flexibility in planning for, or reacting to, changes in our business and the industry; and
- limiting our ability to borrow additional funds as needed or take advantage of business opportunities as they arise.

In addition, to the extent we draw on our Revolving Credit Facility or otherwise incur additional indebtedness, the risks described above could increase. Further, if we increase our indebtedness, our actual cash requirements in the future may be greater than expected. Our cash flow from operations may not be sufficient to repay all of the outstanding debt as it becomes due, and we may not be able to borrow money, sell assets or otherwise raise funds on acceptable terms, or at all, to refinance our debt.

Risks Related to Intellectual Property

Our ability to protect our intellectual property and proprietary technology through patents and other means is uncertain.

Our commercial success depends in part on our ability to protect our intellectual property and proprietary technologies. We rely on patent protection, where appropriate and available, as well as a combination of copyright, trade secret, and trademark laws, and nondisclosure, confidentiality, and other contractual restrictions to protect our proprietary technology. However, these legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep any competitive advantage. We apply for patents covering our products and technologies and uses thereof, as we deem appropriate. However, we may fail to apply for patents on important products and technologies in a timely fashion or at all. Our pending U.S. and foreign patent applications may not issue as patents or may not issue in a form that will be sufficient to protect our proprietary technology and gain or keep our competitive advantage. Any patents we have obtained or do obtain may be subject to re-examination, reissue, opposition, or other administrative proceeding, or may be challenged in litigation, and such challenges could result in a determination that the patent is invalid or unenforceable. In addition, competitors may be able to design alternative methods or devices that avoid infringement of our patents. Both the patent application process and the process of managing patent disputes can be time consuming and expensive.

Furthermore, the laws of some foreign countries may not protect our intellectual property rights to the same extent as do the laws of the United States, and many companies have encountered significant problems in protecting and defending such rights in foreign jurisdictions. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business. Changes in either the patent laws or in interpretations of patent laws in the United States or other countries may diminish the value of our intellectual property. We cannot predict the breadth of claims that may be allowed or enforced in our patents or in third-party patents. For example:

- We might not have been the first to make the inventions covered by each of our pending patent applications;
- We might not have been the first to file patent applications for these inventions;
- The patents of others may have an adverse effect on our business; and
- Others may independently develop similar or alternative products and technologies or duplicate any of our products and technologies.

To the extent our intellectual property, including licensed intellectual property, offers inadequate protection, or is found to be invalid or unenforceable, our competitive position and our business could be adversely affected.

We may be involved in lawsuits to protect or enforce our patents and proprietary rights, to determine the scope, coverage and validity of others' proprietary rights, or to defend against third party claims of intellectual property infringement, any of which could be time-intensive and costly and may adversely impact our business or stock price.

Litigation may be necessary for us to enforce our patent and proprietary rights, determine the scope, coverage, and validity of others' proprietary rights, and/or defend against third party claims of intellectual property infringement against us as well as against our suppliers, distributors, customers, and other entities with whom we do business. Litigation could result in substantial legal fees and could adversely affect the scope of our patent protection. The outcome of any litigation or other proceeding is inherently uncertain and might not be favorable to us, and we might not be able to obtain licenses to technology that we require. Even if such licenses are obtainable, they may not be available at a reasonable cost. We could therefore incur substantial costs related to royalty payments for licenses obtained from third parties, which could negatively affect our product margins or financial position. Further, we could encounter delays in product introductions, or interruptions in product sales, as we develop alternative methods or products.

As we move into new markets and applications for our products, incumbent participants in such markets may assert their patents and other proprietary rights against us as a means of impeding our entry into such markets or as a means to extract substantial license and royalty payments from us. Our commercial success may depend in part on our non-infringement of the patents or proprietary rights of third parties. Numerous significant intellectual property issues have been litigated, and will likely continue to be litigated, between existing and new participants in our existing and targeted markets. For example, some of our products provide for the testing and analysis of genetic material, and patent rights relating to genetic materials remain a developing area of patent law. A recent U.S. Supreme Court decision held, among other things, that claims to isolated genomic DNA occurring in nature are not patent eligible, while claims relating to synthetic DNA may be patent eligible. We expect the ruling will result in additional litigation in our industry. In addition, third parties may assert that we are employing their proprietary technology without authorization, and if they are successful in making such claims, we may be forced to enter into license agreements, pay additional royalties or license fees, or enter into settlements that include monetary obligations or restrictions on our business.

Our customers have been sued for various claims of intellectual property infringement in the past, and we expect that our customers will be involved in additional litigation in the future. In particular, our customers may become subject to lawsuits claiming that their use of our products infringes third-party patent rights, and we could become subject to claims that we contributed to or induced our customer's infringement. In addition, our agreements with some of our suppliers, distributors, customers, and other entities with whom we do business may require us to defend or indemnify these parties to the extent they become involved in infringement claims against us, including the claims described above. We could also voluntarily agree to defend or indemnify third parties in instances where we are not obligated to do so if we determine it would be important to our business relationships. If we are required or agree to defend or indemnify any of these third parties in connection with any infringement claims, we could incur significant costs and expenses that could adversely affect our business, operating results, or financial condition.

We may be subject to damages resulting from claims that we or our employees have wrongfully used or disclosed alleged trade secrets of our employees' former employers or other institutions or third parties with whom such employees may have been previously affiliated.

Many of our employees were previously employed at universities or other life science or Ag-Bio companies, including our competitors or potential competitors. In the future, we may become subject to claims that our employees, or we, have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers or other third parties or institutions with whom our employees may have been previously affiliated. Litigation may be necessary to defend against these claims. For example, we were a defendant in litigation brought against us and one of our non-executive employees by Thermo Fisher Scientific Inc. (Thermo) alleging, among other claims, misappropriation of proprietary information and breach of contractual and fiduciary obligations. While we resolved our dispute with Thermo in July 2017, if we fail in defending against similar claims brought in the future we could be subject to injunctive relief against us. A loss of key research personnel work product could hamper or prevent our ability to commercialize certain potential products or a loss of or inability to hire key marketing, sales or research and development personnel could adversely affect our future product development, sales and revenues, any of which could severely harm our business. Even if we are successful in defending against any similar claims brought in the future, litigation could result in substantial costs and be a distraction to management.

We depend on certain technologies that are licensed to us. We do not control these technologies and any loss of our rights to them could prevent us from selling our products, which would have an adverse effect on our business.

We rely on licenses in order to be able to use various proprietary technologies that are material to our business, including our core IFC, multi-layer soft lithography, and mass cytometry technologies. In some cases, we do not control the prosecution, maintenance, or filing of the patents to which we hold licenses, or the enforcement of these patents against third parties. Additionally, our business and product development plans anticipate and may substantially depend on future in-license agreements with additional third parties, some of which are currently in the early discussion phase. For example, Fluidigm Canada Inc., or Fluidigm Canada, an Ontario corporation and wholly-owned subsidiary of Fluidigm Sciences, was party to an interim license agreement, now expired, with Nodality, Inc., or Nodality, under which Nodality granted Fluidigm Canada a worldwide, non-exclusive, research use only, royalty bearing license to certain cytometric reagents, instruments, and other products. While we were able to secure a license under a new license agreement with Nodality, we cannot provide assurances that we will always be able to obtain suitable license rights to technologies or intellectual property of other third parties on acceptable terms, if at all.

In-licensed intellectual property rights that are fundamental to the business being operated present numerous risks and limitations. For example, all or a portion of the license rights granted may be limited for research use only, and in the event we attempt to expand into diagnostic applications, we would be required to negotiate additional rights, which may not be available to us on commercially reasonable terms, if at all.

Our rights to use the technology we license are also subject to the negotiation and continuation of those licenses. Certain of our licenses contain provisions that allow the licensor to terminate the license upon specific conditions. Our rights under the licenses are subject to our continued compliance with the terms of the license, including the payment of royalties due under the license. Because of the complexity of our products and the patents we have licensed, determining the scope of the license and related royalty obligation can be difficult and can lead to disputes between us and the licensor. An unfavorable resolution of such a dispute could lead to an increase in the royalties payable pursuant to the license. If a licensor believed we were not paying the royalties due under the license or were otherwise not in compliance with the terms of the license, the licensor might attempt to revoke the license. If such an attempt were successful and the license is terminated, we might be barred from marketing, producing, and selling some or all of our products, which would have an adverse effect on our business. Potential disputes between us and one of our existing licensors concerning the terms or conditions of the applicable license agreement could result, among other risks, in substantial management distraction; increased expenses associated with litigation or efforts to resolve disputes; substantial customer uncertainty concerning the direction of our product lines; potential infringement claims against us and/or our customers, which could include efforts by a licensor to enjoin sales of our products; customer requests for indemnification by us; and, in the event of an adverse determination, our inability to operate our business as currently operated. Termination of material license agreements could prevent us from manufacturing and selling our products unless we can negotiate new license terms or develop or acquire alternative intellectual property rights that cover or enable similar functionality. Any of these factors would be expected to have a material adverse effect on our business, operating results, and financial condition and could result in a substantial decline in our stock price.

We are subject to certain manufacturing restrictions related to licensed technologies that were developed with the financial assistance of U.S. governmental grants.

We are subject to certain U.S. government regulations because we have licensed technologies that were developed with U.S. government grants. In accordance with these regulations, these licenses provide that products embodying the technologies are subject to domestic manufacturing requirements. If this domestic manufacturing requirement is not met, the government agency that funded the relevant grant is entitled to exercise specified rights, referred to as "march-in rights," which if exercised would allow the government agency to require the licensors or us to grant a non-exclusive, partially exclusive, or exclusive license in any field of use to a third party designated by such agency. All of our microfluidic systems revenue is dependent upon the availability of our IFCs, which incorporate technology developed with U.S. government grants. Our genomics instruments, including microfluidic systems, and IFCs are manufactured at our facility in Singapore. The federal regulations allow the funding government agency to grant, at the request of the licensors of such technology, a waiver of the domestic manufacturing requirement. Waivers may be requested prior to any government notification. We have assisted the licensors of these technologies with the analysis of the domestic manufacturing requirement, and, in December 2008, the sole licensor subject to the requirement applied for a waiver of the domestic manufacturing requirement with respect to the relevant patents licensed to us by this licensor. In July 2009, the funding government agency granted the requested waiver of the domestic manufacturing requirement for a three-year period commencing in July 2009. In June 2012, the licensor requested a continued waiver of the domestic manufacturing requirement with respect to the relevant patents, but the government agency has not yet taken any action in response to this request. If the government agency does not grant the requested waiver or the government fails to grant additional waivers of such requirement that may be sought in the future, then the U.S. government could exercise its march-in rights with respect to the relevant patents licensed to us. In addition, the license agreement under which the relevant patents are licensed to us contains provisions that obligate us to comply with this domestic manufacturing requirement. We are not currently manufacturing instruments and IFCs in the United States that incorporate the relevant licensed technology. If our lack of compliance with this provision constituted a material breach of the license agreement, the license of the relevant patents could be terminated or we could be compelled to relocate our manufacturing of microfluidic systems and IFCs to the United States to avoid or cure a material breach of the license agreement. Any of the exercise of march-in rights, the termination of our license of the relevant patents or the relocation of our manufacturing of microfluidic systems and IFCs to the United States could materially adversely affect our business, operations and financial condition.

We are subject to certain obligations and restrictions relating to technologies developed in cooperation with Canadian government agencies.

Some of our Canadian research and development is funded in part through government grants and by government agencies. The intellectual property developed through these projects is subject to rights and restrictions in favor of government agencies and Canadians generally. In most cases the government agency retains the right to use intellectual property developed through the project for non-commercial purposes and to publish the results of research conducted in connection with the project. This may increase the risk of public disclosure of information relating to our intellectual property, including confidential information, and may reduce its competitive advantage in commercializing intellectual property developed through these projects. In certain projects, we have also agreed to use commercially reasonable efforts to commercialize intellectual property in Canada, or more specifically in the province of Ontario, for the economic benefit of Canada and the province of Ontario. These restrictions will limit our choice of business and manufacturing locations, business partners and corporate structure and may, in certain circumstances, restrict our ability to achieve maximum profitability and cost efficiency from the intellectual property generated by these projects. In one instance, a dispute with the applicable government funded entity may require mediation, which could lead to unanticipated delays in our commercialization efforts to that project. One of our Canadian government funded projects is also subject to certain limited “march-in” rights in favor of the government of the Province of Ontario, under which we may be required to grant a license to our intellectual property, including background intellectual property developed outside the scope of the project, to a responsible applicant on reasonable terms in circumstances where the government determines that such a license is necessary in order to alleviate emergency or extraordinary health or safety needs or for public use. In addition, we must provide reasonable assistance to the government in obtaining similar licenses from third parties required in connection with the use of its intellectual property. Instances in which the government of the Province of Ontario has exercised similar “march-in” rights are rare; however, the exercise of such rights could materially adversely affect our business, operations and financial condition.

Risks Related to Our Common Stock

Our stock price may fluctuate significantly, particularly if holders of substantial amounts of our stock attempt to sell, and holders may have difficulty selling their shares based on current trading volumes of our stock. In addition, numerous other factors could result in substantial volatility in the trading price of our stock.

Our stock is currently traded on Nasdaq, but we can provide no assurance that we will be able to maintain an active trading market on Nasdaq or any other exchange in the future. The trading volume of our stock tends to be low relative to our total outstanding shares, and we have several stockholders who hold substantial blocks of our stock. As of December 31, 2018, we had 49,338,473 shares of common stock outstanding, and stockholders holding at least 5% of our stock, individually or with affiliated persons or entities, collectively beneficially owned or controlled approximately 46.6% of such shares and one stockholder beneficially owned 25.3% of our outstanding common stock. Sales of large numbers of shares by any of our large stockholders could adversely affect our trading price, particularly given our relatively small historic trading volumes. If stockholders holding shares of our common stock sell, indicate an intention to sell, or if it is perceived that they will sell, substantial amounts of their common stock in the public market, the trading price of our common stock could decline. Moreover, if there is no active trading market or if the volume of trading is limited, holders of our common stock may have difficulty selling their shares. In addition, the concentration of ownership of our outstanding common stock (approximately 46.6% held by our top three stockholders) means that a relatively small number of stockholders have significant control over the outcomes of stockholder voting.

In addition, the trading price of our common stock may be highly volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control. These factors include:

- actual or anticipated quarterly variation in our results of operations or the results of our competitors;
- announcements or communications by us or our competitors relating to, among other things, new commercial products, technological advances, significant contracts, commercial relationships, capital commitments, acquisitions or sales of businesses, and/or misperceptions in or speculation by the market regarding such announcements or communications;

- issuance of new or changed securities analysts' reports or recommendations for our stock;
- developments or disputes concerning our intellectual property or other proprietary rights;
- commencement of, or our involvement in, litigation;
- market conditions in the life science, Ag-Bio, and CRO sectors;
- failure to complete significant sales;
- manufacturing disruptions that could occur if we were unable to successfully expand our production in our current or an alternative facility;
- any future sales of our common stock or other securities in connection with raising additional capital or otherwise;
- any major change to the composition of our board of directors or management; and
- general economic conditions and slow or negative growth of our markets.

The stock market in general, and market prices for the securities of technology-based companies like ours in particular, have from time to time experienced volatility that often has been unrelated to the operating performance of the underlying companies. These broad market and industry fluctuations may adversely affect the market price of our common stock regardless of our operating performance. In several recent situations where the market price of a stock has been volatile, holders of that stock have instituted securities class action litigation against the company that issued the stock. If any of our stockholders were to bring a lawsuit against us, the defense and disposition of the lawsuit could be costly and divert the time and attention of our management and harm our operating results.

If securities or industry analysts publish unfavorable research about our business or cease to cover our business, our stock price and/or trading volume could decline.

The trading market for our common stock may rely, in part, on the research and reports that equity research analysts publish about us and our business. We do not have any control of the analysts or the content and opinions included in their reports. The price of our stock could decline if one or more equity research analysts downgrade our stock or issue other unfavorable commentary or research. If one or more equity research analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which in turn could cause our stock price or trading volume to decline.

Anti-takeover provisions in our charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management and limit the market price of our common stock.

Provisions in our certificate of incorporation and bylaws may have the effect of delaying or preventing a change of control or changes in our management, including provisions that:

- authorize our board of directors to issue, without further action by the stockholders, up to 10,000,000 shares of undesignated preferred stock;
- require that any action to be taken by our stockholders be effected at a duly called annual or special meeting and not by written consent;
- specify that special meetings of our stockholders can be called only by our board of directors, the chairman of the board, the chief executive officer or the president;
- establish an advance notice procedure for stockholder approvals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors;
- establish that our board of directors is divided into three classes, Class I, Class II, and Class III, with each class serving staggered three-year terms;
- provide that our directors may be removed only for cause;

- provide that vacancies on our board of directors may be filled only by a majority of directors then in office, even though less than a quorum;
- specify that no stockholder is permitted to cumulate votes at any election of directors; and
- require a super-majority of votes to amend certain of the above-mentioned provisions.

These provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, which is responsible for appointing the members of our management. In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us.

We have never paid cash dividends on our capital stock, and we do not anticipate paying any cash dividends in the foreseeable future.

We have paid no cash dividends on any of our classes of capital stock to date and currently intend to retain our future earnings to fund the development and growth of our business. In addition, we cannot pay any cash dividends on any of our classes of common stock without approval from the lender under our 2018 Credit Facility, and may become subject to covenants under future debt arrangements that place restrictions on our ability to pay dividends. As a result, capital appreciation, if any, of our common stock will be stockholders' sole source of gain for the foreseeable future.

Risks Related to Our Outstanding Convertible Notes

Our outstanding convertible notes are effectively subordinated to our secured debt and any liabilities of our subsidiaries.

Our outstanding 2014 Notes rank:

- senior in right of payment to any of our indebtedness that is expressly subordinated in right of payment to the 2014 Notes;
- equal in right of payment to all of our liabilities that are not so subordinated;
- effectively junior in right of payment to any of our secured indebtedness, including, but not limited to, any indebtedness under the Revolving Credit Facility, to the extent of the value of the assets securing such indebtedness; and
- structurally junior to all indebtedness and other liabilities (including trade payables) of our subsidiaries.

In February 2014, we completed the offering of our 2014 Notes with an aggregate outstanding principal amount of $201.3 million. In March 2018, we completed an exchange of $150.0 million in aggregate principal amount of our 2014 Notes for $150.0 million in aggregate principal amount of our 2018 Notes, leaving approximately $51.3 million in aggregate principal amount of 2014 Notes outstanding. Subsequent to December 31, 2018, all of the 2018 Notes have since been converted into shares of our common stock pursuant to conversion notices received from the holders of such 2018 Notes and in connection with the Issuer's Conversion Option and no 2018 Notes remain outstanding. Please see the section entitled "Recent Developments" in Part II, Item 7 of this Form 10-K for more information on the conversion of the 2018 Notes. In the event of our bankruptcy, liquidation, reorganization, or other winding up, our assets that secure debt ranks senior in right of payment to 2014 Notes will be available to pay obligations on the 2014 Notes only after the secured debt, including but not limited to, any indebtedness under the Revolving Credit Facility, has been repaid in full from these assets, and the assets of our subsidiaries will be available to pay obligations on the 2014 Notes only after all claims senior to the 2014 Notes have been repaid in full. There may not be sufficient assets remaining to pay amounts due on any or all of the 2014 Notes then outstanding. The indenture governing the 2014 Notes does not prohibit us from incurring additional senior debt or secured debt, nor does it prohibit our subsidiaries from incurring additional liabilities.

The 2014 Notes are our obligations only and some of our operations are conducted through, and a portion of our consolidated assets are held by, our subsidiaries.

The 2014 Notes are our obligations exclusively and are not guaranteed by any of our operating subsidiaries. A portion of our consolidated assets is held by our subsidiaries. Accordingly, our ability to service our debt, including the 2014 Notes, depends in part on the results of operations of our subsidiaries and upon the ability of such subsidiaries to provide us with cash, whether in the form of dividends, loans, or otherwise, to pay amounts due on our obligations, including the 2014 Notes. Our subsidiaries are separate and distinct legal entities and have no obligation, contingent or otherwise, to make payments on the 2014 Notes or to make any funds available for that purpose. In addition, dividends, loans, or other distributions to us from such subsidiaries may be subject to contractual and other restrictions and are subject to other business and tax considerations.

Recent and future regulatory actions and other events may adversely affect the trading price and liquidity of the 2014 Notes.

We expect that many investors in, and potential purchasers of, the 2014 Notes will employ, or seek to employ, a convertible arbitrage strategy with respect to the 2014 Notes. Investors would typically implement such a strategy by selling short the common stock underlying the 2014 Notes and dynamically adjusting their short position while continuing to hold the 2014 Notes. Investors may also implement this type of strategy by entering into swaps on our common stock in lieu of or in addition to short selling the common stock. As a result, any specific rules regulating equity swaps or short selling of securities or other governmental action that interferes with the ability of market participants to effect short sales or equity swaps with respect to our common stock could adversely affect the ability of investors in, or potential purchasers of, the 2014 Notes to conduct the convertible arbitrage strategy that we believe they will employ, or seek to employ, with respect to the 2014 Notes. This could, in turn, adversely affect the trading price and liquidity of the 2014 Notes.

The SEC and other regulatory and self-regulatory authorities have implemented various rules and taken certain actions, and may in the future adopt additional rules and take other actions, that may impact those engaging in short selling activity involving equity securities (including our common stock). Such rules and actions include Rule 201 of SEC Regulation SHO, the adoption by the Financial Industry Regulatory Authority, Inc. and the national securities exchanges of a "Limit Up-Limit Down" program, the imposition of market-wide circuit breakers that halt trading of securities for certain periods following specific market declines, and the implementation of certain regulatory reforms required by the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. Although the direction and magnitude of the effect that Regulation SHO, FINRA, securities exchange rule changes, and implementation of the Dodd-Frank Act may have on the trading price and the liquidity of the 2014 Notes will depend on a variety of factors, many of which cannot be determined at the date of this report, past regulatory actions (such as certain emergency orders issued by the SEC in 2008 prohibiting short sales of stock of certain financial services companies) have had a significant impact on the trading prices and liquidity of convertible debt instruments. Any governmental or regulatory action that restricts the ability of investors in, or potential purchasers of, the 2014 Notes to effect short sales of our common stock, borrow our common stock, or enter into swaps on our common stock or increases the costs of implementing an arbitrage strategy could adversely affect the trading price and the liquidity of the 2014 Notes.

Volatility in the market price and trading volume of our common stock could adversely impact the trading price of the 2014 Notes.

The stock market in recent years has experienced significant price and volume fluctuations that have often been unrelated to the operating performance of companies. The market price of our common stock could fluctuate significantly for many reasons, including in response to the risks described in this report, or for reasons unrelated to our operations, such as reports by industry analysts, investor perceptions or negative announcements by our customers, competitors or suppliers regarding their own performance, as well as industry conditions and general financial, economic and political instability. The market price of our common stock could also decline as a result of sales of a large number of shares of our common stock in the market, particularly sales by our directors, executive officers, employees, and significant stockholders, and the perception that these sales could occur may also depress the market price of our common stock. A decrease in the market price of our common stock would likely adversely impact the trading price of the 2014 Notes. The market price of our common stock could also be affected by possible sales of our common stock by investors who view the 2014 Notes as a more attractive means of equity participation in us and by hedging or arbitrage trading activity that we expect to develop involving our common stock. This trading activity could, in turn, affect the trading price of the 2014 Notes.

We have incurred additional debt and may still incur substantially more debt or take other actions which would intensify the risks discussed above.

We are not restricted under the terms of the indenture governing the 2014 Notes from incurring additional debt, securing existing or future debt, recapitalizing our debt, or taking a number of other actions that are not limited by the terms of the indenture governing the 2014 Notes that could have the effect of diminishing our ability to make payments on the 2014 Notes when due. Any failure by us or any of our significant subsidiaries to make any payment at maturity of indebtedness for borrowed money in excess of $15.0 million or the acceleration of any such indebtedness in excess of $15.0 million would, subject to the terms of the indenture governing the 2014 Notes, constitute a default under the indenture. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay the 2014 Notes when required.

In August 2018, we entered into the Revolving Credit Facility with Silicon Valley Bank, which matures on August 2, 2020. Amounts drawn under the Revolving Credit Facility will be used for working capital and general corporate purposes. While we currently have no outstanding debt under the Revolving Credit Facility, we may incur up to $15.0 million of secured debt pursuant to the Revolving Credit Facility. See Note 6 to the Consolidated Financial Statements included in this Form 10-K for more information about the Revolving Credit Facility.

We may not have the ability to raise the funds necessary to repurchase the 2014 Notes upon specified dates or upon a fundamental change, and our future debt may contain limitations on our ability to repurchase the 2014 Notes.

Holders of the 2014 Notes have the right to require us to repurchase all or a portion of their 2014 Notes on certain dates or upon the occurrence of a fundamental change at a repurchase price equal to, for the 2014 Notes, 100% of the principal amount of the 2014 Notes to be repurchased plus accrued and unpaid interest, if any. We may not have enough available cash or be able to obtain financing at the time we are required to make repurchases of 2014 Notes surrendered therefor.

In addition, our ability to repurchase the 2014 Notes may be limited by law, regulatory authority, or agreements governing our future indebtedness. Our failure to repurchase the 2014 Notes at a time when the repurchase is required by the indenture would constitute a default under the indenture. A default under the indenture or the fundamental change itself could also lead to a default under agreements governing our future indebtedness. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay the indebtedness and repurchase the 2014 Notes when required.

Holders of 2014 Notes are not entitled to any rights with respect to our common stock, but they are subject to all changes made with respect to them to the extent our conversion obligation includes shares of our common stock.

Holders of 2014 Notes are not entitled to any rights with respect to our common stock (including, without limitation, voting rights and rights to receive any dividends or other distributions on our common stock) prior to the conversion date with respect to any 2014 Notes they surrender for conversion, but they are subject to all changes affecting our common stock. For example, if an amendment is proposed to our certificate of incorporation or bylaws requiring stockholder approval and the record date for determining the stockholders of record entitled to vote on the amendment occurs prior to the conversion date with respect to any 2014 Notes surrendered for conversion, then the holder surrendering such 2014 Notes will not be entitled to vote on the amendment, although such holder will nevertheless be subject to any changes affecting our common stock.

We have made only limited covenants in the indenture governing the 2014 Notes, and these limited covenants may not protect a noteholder's investment.

The indenture governing the 2014 Notes does not:

- require us to maintain any financial ratios or specific levels of net worth, revenues, income, cash flows, or liquidity and, accordingly, does not protect holders of the 2014 Notes in the event that we experience adverse changes in our financial condition or results of operations;
- limit our subsidiaries' ability to guarantee or incur indebtedness that would rank structurally senior to the 2014 Notes;
- limit our ability to incur additional indebtedness, including secured indebtedness;
- restrict our subsidiaries' ability to issue securities that would be senior to our equity interests in our subsidiaries and therefore would be structurally senior to the 2014 Notes;
- restrict our ability to repurchase our securities;
- restrict our ability to pledge our assets or those of our subsidiaries; or
- restrict our ability to make investments or pay dividends or make other payments in respect of our common stock or our other indebtedness.

Furthermore, the indenture governing the 2014 Notes contains only limited protections in the event of a change of control. We could engage in many types of transactions, such as acquisitions, refinancings, or certain recapitalizations, that could substantially affect our capital structure and the value of the 2014 Notes and our common stock but may not constitute a "fundamental change" that permits holders to require us to repurchase their 2014 Notes or a "make-whole fundamental change" that permits holders to convert their 2014 Notes at an increased conversion rate. For these reasons, the limited covenants in the indenture governing the 2014 Notes may not protect a noteholder's investment in the 2014 Notes.

The increase in the conversion rate for 2014 Notes converted in connection with a make-whole fundamental change or provisional redemption may not adequately compensate noteholders for any lost value of the 2014 Notes as a result of such transaction or redemption.

If (i) a make-whole fundamental change occurs prior to February 6, 2021, or (ii) upon our issuance of a notice of provisional redemption, under certain circumstances, we will increase the conversion rate by a number of additional shares of our common stock for the 2014 Notes converted in connection with such events. The increase in the conversion rate for the 2014 Notes converted in connection with such events may not adequately compensate noteholders for any lost value of the 2014 Notes as a result of such transaction or redemption. In addition, if the price of our common stock in the transaction is greater than $180.00 per share or less than $39.96 per share (in each case, subject to adjustment), no additional shares will be added to the conversion rate for the 2014 Notes. Moreover, in no event will the conversion rate per $1,000 principal amount of 2014 Notes as a result of this adjustment exceed 25.0250 shares of common stock, subject to adjustment.

Our obligation to increase the conversion rate for 2014 Notes converted in connection with such events could be considered a penalty, in which case the enforceability thereof would be subject to general principles of reasonableness and equitable remedies.

The conversion rate of the 2014 Notes may not be adjusted for all dilutive events.

The conversion rate of the 2014 Notes is subject to adjustment for certain events, including, but not limited to, the issuance of certain stock dividends on our common stock, the issuance of certain rights or warrants, subdivisions, combinations, distributions of capital stock, indebtedness, or assets, cash dividends and certain issuer tender or exchange offers. However, the conversion rate will not be adjusted for other events, such as a third-party tender or exchange offer or an issuance of common stock for cash, that may adversely affect the trading price of the 2014 Notes or our common stock. An event that adversely affects the value of the 2014 Notes may occur, and that event may not result in an adjustment to the conversion rate.

Some significant restructuring transactions may not constitute a fundamental change, in which case we would not be obligated to offer to repurchase the 2014 Notes.

Upon the occurrence of a fundamental change, a holder of 2014 Notes has the right to require us to repurchase the 2014 Notes. However, the fundamental change provisions will not afford protection to holders of 2014 Notes in the event of other transactions that could adversely affect the 2014 Notes. For example, transactions such as leveraged recapitalizations, refinancings, restructurings, or acquisitions initiated by us may not constitute a fundamental change requiring us to repurchase the 2014 Notes. In the event of any such transaction, the holders would not have the right to require us to repurchase the 2014 Notes, even though each of these transactions could increase the amount of our indebtedness, or otherwise adversely affect our capital structure or any credit ratings, thereby adversely affecting the holders of 2014 Notes.

In addition, absent the occurrence of a fundamental change or a make-whole fundamental change as described under changes in the composition of our board of directors will not provide holders with the right to require us to repurchase the 2014 Notes or to an increase in the conversion rate upon conversion.

We cannot assure noteholders that an active trading market will develop or be maintained for the 2014 Notes.

We do not intend to apply to list our outstanding 2014 Notes on any securities exchange or to arrange for quotation on any automated dealer quotation system. In addition, the liquidity of the trading market in the 2014 Notes and the market price quoted for the 2014 Notes may be adversely affected by changes in the overall market for this type of security and by changes in our financial performance or prospects or in the prospects for companies in our industry generally. As a result, we cannot assure noteholders that an active trading market will develop or be maintained for the 2014 Notes. If an active trading market does not develop or is not maintained, the market price and liquidity of the 2014 Notes may be adversely affected. In that case, noteholders may not be able to sell the 2014 Notes at a particular time or at a favorable price.

Any adverse rating of the 2014 Notes may cause their trading price to fall.

We do not intend to seek a rating on the 2014 Notes. However, if a rating service were to rate the 2014 Notes and if such rating service were to lower its rating on the 2014 Notes below the rating initially assigned to the 2014 Notes or otherwise announces its intention to put the 2014 Notes on credit watch, the trading price of the 2014 Notes could decline.

Holders of 2014 Notes may be subject to tax if we make or fail to make certain adjustments to the conversion rate of the 2014 Notes even though they do not receive a corresponding cash distribution.

The conversion rate of the 2014 Notes is subject to adjustment in certain circumstances, including the payment of cash dividends. If the conversion rate is adjusted as a result of a distribution that is taxable to our common stockholders, such as a cash dividend, a noteholder may be deemed to have received a dividend subject to U.S. federal income tax without the receipt of any cash. In addition, a failure to adjust (or to adjust adequately) the conversion rate after an event that increases a noteholder's proportionate interest in us could be treated as a deemed taxable dividend to you. If a make-whole fundamental change occurs prior to February 6, 2021 or upon our issuance of a notice of provisional redemption, under some circumstances, we will increase the conversion rate for the 2014 Notes converted in connection with the make-whole fundamental change or provisional redemption. Such increase may also be treated as a distribution subject to U.S. federal income tax as a dividend. For a non-U.S. holder, any deemed dividend would be subject to U.S. federal withholding tax at a 30% rate, or such lower rate as may be specified by an applicable treaty, which may be set off against subsequent payments on the 2014 Notes.

Any conversions of the 2014 Notes will dilute the ownership interest of our existing stockholders, including holders who had previously converted their notes.

Any conversion of some or all of the 2014 Notes will dilute the ownership interests of our existing stockholders. The initial conversion price under the 2014 Notes is approximately $55.94. As a result, each of the outstanding 2014 Notes is initially convertible into 17.8750 shares of our common stock per $1,000 principal amount. Issuances of shares of common stock upon conversion of our 2014 Notes could depress the market price of our common stock and impair our ability to raise capital through the sale of additional equity securities. In addition, the existence of the 2014 Notes may encourage short selling by market participants because the conversion of the 2014 Notes could depress the price of our common stock.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

We lease approximately 74,100 square feet of office and laboratory space at our headquarters in South San Francisco, California under a lease that expires in April 2020. Additionally, we lease office, laboratory and manufacturing space in Singapore of approximately 50,000 square feet and in Ontario, Canada of approximately 44,500 square feet under leases that expire in June 2022 and March 2026, respectively. As of December 31, 2018, we also leased office space in Japan, China, and France, with various expiration dates through February 2026. In addition, we believe that our properties are in good condition and are adequate and suitable for their purposes.

ITEM 3. LEGAL PROCEEDINGS

In the normal course of business, we are from time to time involved in legal proceedings or potential legal proceedings, including matters involving employment, intellectual property, or others. Although the results of litigation and claims cannot be predicted with certainty, we currently believe that the final outcome of any currently pending matters would not have a material adverse effect on our business, operating results, financial condition, or cash flows. Regardless of the outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources, and other factors.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market for Our Common Stock; Dividends

Our common stock began trading on the Nasdaq Global Select Market under the symbol "FLDM" on February 10, 2011.

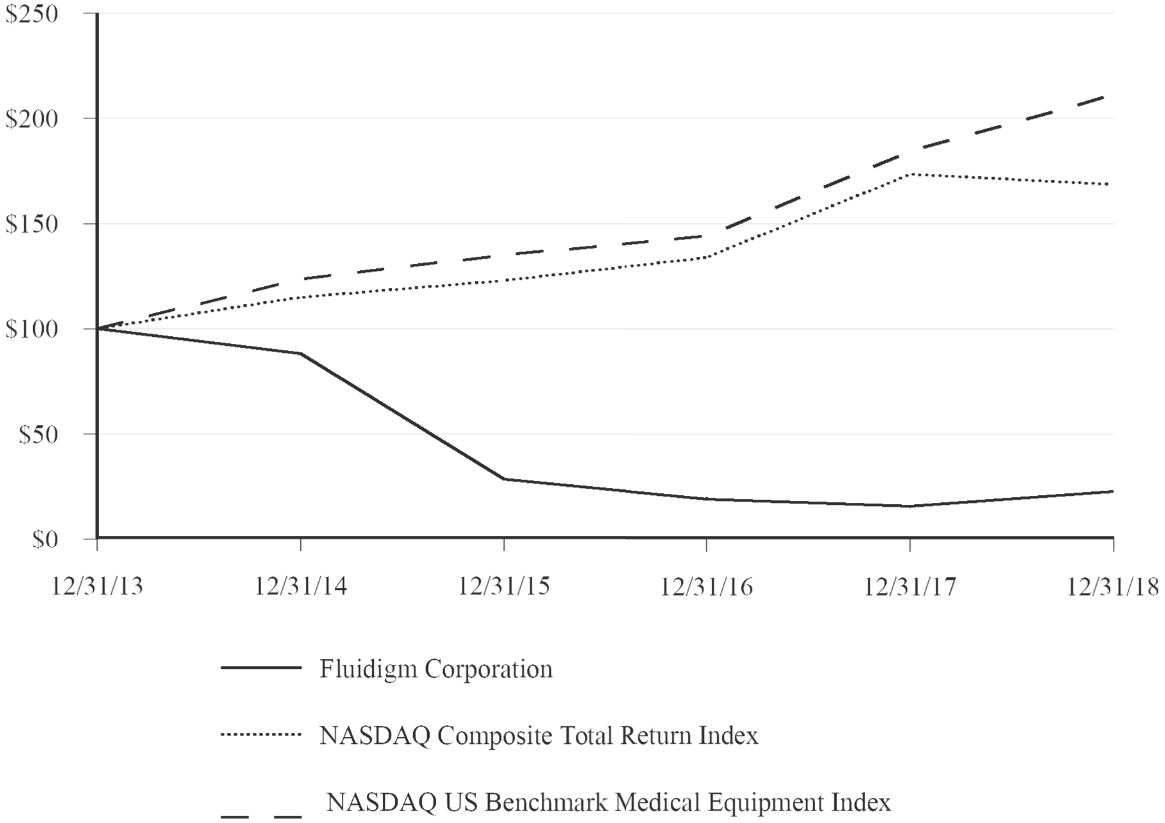
We had 86 stockholders of record as of March 13, 2019; however, because many of our outstanding shares are held by brokers or other institutions on behalf of stockholders, we are unable to estimate the total number of beneficial owners represented by the holders of record.

We have never declared or paid cash dividends on our common stock and do not expect to pay dividends on our common stock for the foreseeable future. Instead, we anticipate that all of our earnings in the foreseeable future will be used for the operation and growth of our business.

Stock Performance Graph

The following performance graph shall not be deemed "soliciting material" or to be "filed" with the Securities and Exchange Commission for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, or otherwise subject to the liabilities under that Section, and shall not be deemed to be incorporated by reference into any filing of Fluidigm Corporation under the Securities Act or the Exchange Act.

The following graph compares, from December 31, 2013 through December 31, 2018, the cumulative total return for our common stock, the Nasdaq Composite Total Return Index, and the Nasdaq US Benchmark Medical Equipment Index, assuming in each case an initial investment of $100 and reinvestment of all dividends. Such returns are based on historical results and are not intended to suggest future performance.



Sales of Unregistered Securities

None.

Issuer Purchases of Equity Securities

We did not repurchase any shares of our common stock during the year ended December 31, 2018.

ITEM 6. SELECTED FINANCIAL DATA

The following selected financial data should be read in conjunction with the consolidated financial statements and related notes thereto appearing elsewhere in this Form 10-K. We have derived the consolidated statement of operations data for the years ended December 31, 2018, 2017, and 2016, and consolidated balance sheet data as of December 31, 2018, and December 31, 2017 from audited consolidated financial statements included elsewhere in this Form 10-K. The consolidated statement of operations data for the years ended December 31, 2015, and 2014, and the consolidated balance sheet data as of December 31, 2016, December 31, 2015, and December 31, 2014 were derived from audited consolidated financial statements that are not included in this Form 10-K.

	2018	2017	2016	2015	2014
			(in thousands, except per share amounts)		
Consolidated Statement of Operations Data:					
Total revenue	$112,964	$101,937	$104,446	$114,712	$116,456
Loss from operations	(48,164)	(58,360)	(73,190)	(50,155)	(51,836)
Net loss	(59,013)	(60,535)	(75,985)	(53,315)	(52,830)
Net loss per share, basic and diluted	(1.49)	(1.84)	(2.62)	(1.86)	(1.90)

	2018	2017	2016	2015	2014
			(in thousands)		
Consolidated Balance Sheet Data:					
Cash, cash equivalents, and short and long-term investments	$ 95,401	$ 63,136	$ 59,430	$101,465	$142,800
Working capital[1]	100,988	71,565	76,334	123,433	133,440
Total assets[2]	303,647	287,351	306,395	370,050	406,506
Total long-term debt[2]	172,058	195,238	194,951	194,673	194,402
Total stockholders' equity	72,116	30,935	53,233	114,901	150,419

[1] Working capital excludes deferred revenue.

[2] $1.0 million and $1.1 million of debt issuance costs for Convertible notes were previously included in Total assets reclassified to Total long-term debt as a deduction in December 31, 2015 and December 31, 2014, respectively.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis should be read together with our consolidated financial statements and the notes to those statements included elsewhere in this Form 10-K. This discussion contains forward-looking statements based on our current expectations, assumptions, estimates and projections about Fluidigm and our industry. These forward-looking statements involve risks and uncertainties. Our actual results could differ materially from those indicated in these forward-looking statements as a result of certain factors, as more fully described in "Risk factors" in Item 1A of this Form 10-K, in this Item 7, and elsewhere in this Form 10-K. Except as may be required by law, we undertake no obligation to update publicly any forward-looking statements for any reason, even if new information becomes available or other events occur in the future.

Overview

Fluidigm is a global company that improves life through comprehensive health insight. Our innovative technologies and multi-omic tools are used by researchers to reveal meaningful insights in health and disease, identify biomarkers to inform decisions and accelerate the development of more effective therapies. We create, manufacture, and market innovative technologies and life science tools, including preparatory and analytical instruments for Mass Cytometry, PCR, Library Prep, Single Cell Genomics, and consumables, including IFCs, assays, and reagents.

Our focus is on the most pressing needs in translational and clinical research, including cancer, immunology and immunotherapy. We use proprietary CyTOF® and microfluidics technologies to develop innovative end-to-end solutions that have the flexibility required to meet the needs of translational research and the robustness to support high-impact clinical research studies. We sell our products to leading academic, government, pharmaceutical, biotechnology and plant and animal research laboratories worldwide.

We distribute our systems through our direct sales force and support organizations located in North America, Europe, and Asia-Pacific, and through distributors or sales agents in several European, Latin American, Middle Eastern, and Asia-Pacific countries. Our manufacturing operations are located in Singapore and Canada. Our facility in Singapore manufactures our genomics instruments, which are assembled by our contract manufacturer located within our in Singapore facility. All of our IFCs for commercial sale and some IFCs for our research and development purposes are also fabricated at our Singapore facility. Our mass cytometry instruments for commercial sale, as well as for internal research and development purposes, are manufactured at our facility in Canada. We also manufacture assays and reagents at our facilities in the United States. We also manufacture assays and reagents at our facilities in the United States. As part of our on-going efforts related to operational excellence and improving efficiencies, we are consolidating our North American production activities into our Canadian facility.

Our total revenue was $113.0 million in 2018, $101.9 million in 2017, and $104.4 million in 2016. We have incurred significant net losses since our inception in 1999 and, as of December 31, 2018, our accumulated deficit was $558.9 million.

At the end of 2016, we began reallocating our resources based on revenue contribution and growth expectations across our target markets, including a reorganization of our sales team and commercial leadership. We implemented certain operational efficiencies and cost-savings initiatives beginning in the first quarter of 2017 intended to align our resources with our product strategy, reduce our operating expenses, and manage our cash flows. In 2017 and 2018, we have grown our revenues, increased gross margins, reduced operating expenses, streamlined our manufacturing operations, and rationalized our headcount and facilities. These activities have resulted in lower net losses, improving from $76.0 million in 2016 to $59.0 million in 2018. We have also strengthened our balance sheet through the issuance of common stock and refinancing our convertible debt. In August 2017, we sold 9.1 million shares of common stock for aggregate net proceeds of approximately $28.8 million; in December 2018, we sold approximately 9.4 million shares of common stock for aggregate net proceeds of $59.1 million. In March 2018, we refinanced $150 million of our convertible debt which effectively extended the maturity of the debt while providing us with additional financing flexibility. These transactions are described in Note 6 and Note 8 of our audited 2018 consolidated financial statements.

Recent Developments

From January 9, 2019 through February 27, 2019, we received notices from holders of the 2018 Notes electing to voluntarily convert approximately $138.1 million in aggregate principal amount pursuant to the terms of the Second Supplemental Indenture dated March 6, 2018, between us and U.S. Bank National Association (Trustee) to the Indenture dated as of February 14, 2014, between us and the Trustee. As a result of such voluntary conversions, we have elected to fully satisfy our conversion obligations by delivering approximately 17.9 million shares of our common stock to such holders and have retired approximately $138.1 million of the 2018 Notes. On February 27, 2019, we notified the Trustee of our intention to exercise our Issuer's Conversion Option pursuant to the terms of the Second Supplemental Indenture with respect to the remaining approximately $11.9 million in aggregate principal amount of 2018 Notes. These bonds were converted into approximately 1.5 million shares of our common stock and the bonds retired in March 2019.

In early March 2019, we experienced a ransomware attack that infiltrated and encrypted certain of our information technology systems, including systems containing critical business data. Immediately following the attack, actions were taken to recover the compromised systems and we believe we were able to restore their operation without significant loss of business data. Based on the nature of the attack and its impact on our systems, we do not believe confidential data was lost or disclosed, but we are continuing to monitor the situation. If confidential data is later determined to have been released in the course of this event, it is possible that we could be the subject of actions by governmental authorities or claims from persons alleging they suffered damages from such a release. As of the date of this filing, we estimate the costs associated with the intrusion to be approximately $1.5 million and are seeking to recover these costs under an applicable insurance policy. Although we believe we have now contained the disruption, we anticipate additional work and expense in the future as we continue to respond to the attack and further enhance our security processes and initiatives.

Critical Accounting Policies, Significant Judgments and Estimates

Our consolidated financial statements and the related notes included elsewhere in this Form 10-K are prepared in accordance with accounting principles generally accepted in the United States. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue, costs, and expenses and related disclosures. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. Changes in accounting estimates may occur from period to period. Accordingly, actual results could differ significantly from the estimates made by our management. We evaluate our estimates and assumptions on an ongoing basis. To the extent that there are material differences between these estimates and actual results, our future financial statement presentation, financial condition, results of operations, and cash flows will be affected.

We believe that the following critical accounting policies involve a greater degree of judgment and complexity than our other accounting policies. Accordingly, these are the policies we believe are the most critical to understanding and evaluating of our audited 2018 consolidated financial statements.

Revenue Recognition

We generate revenue primarily from sales of our products and services. Our product revenue consists of sales of our mass cytometry, high-throughput genomics and single-cell genomics instruments and consumables, including IFCs, assays, and other reagents. Our service revenue consists of post-warranty service contracts, preventive maintenance plans, repairs, installation, training and other specialized product support services. We also receive revenue from our license agreements with third parties. Revenue is reported net of any sales, use and value-added taxes we collect from customers as required by government authorities.

We recognize revenue based on the amount of consideration we expect to receive in exchange for the goods and services we transfer to the customer. Our commercial arrangements typically include multiple distinct products and services, and we allocate revenue to these performance obligations based on their relative standalone selling prices. Standalone selling prices (SSPs) are generally determined using observable data from recent transactions. In cases where sufficient data is not available, we estimate a product's SSP using a cost plus a margin approach or by applying a discount to the product's list price.

Product Revenue

We recognize product revenue at the point in time when control of the goods passes to the customer and we have an enforceable right to payment. This generally occurs either when the product is shipped from one of our facilities or when it arrives at the customer's facility, based on the contractual terms. Customers generally do not have a unilateral right to return products after delivery. Invoices are generally issued at shipment and become due in 30 to 60 days.

Service Revenue

We recognize revenue from repairs, installation, training and other specialized product support services at the point in time the work is completed. Installation and training services are generally billed in advance of service. Repairs and other services are generally billed at the point the work is completed.

Revenue associated with instrument service contracts is recognized on a straight-line basis over the life of the agreement, which is generally one to three years. We believe this approach is appropriate for service contracts because we provide services on demand throughout the term of the agreement. Invoices are generally issued in advance of service on a monthly, quarterly, annual or multi-year basis. Payments made in advance of service are reported on our consolidated balance sheet as deferred revenue.

Contract Costs

Incremental sales commission costs incurred to obtain instrument service contracts are capitalized and amortized to selling, general and administrative expense over the life of the contract, which is generally one to three years. As a practical expedient, we expense sales commissions associated with product support services that are delivered in less than one year as they are incurred. Sales commissions associated with the sale of products are expensed as they are incurred.

Product Warranties

We generally provide a one-year warranty on our instruments. We accrue for estimated warranty obligations at the time of product shipment. We periodically review our warranty liability and record adjustments based on the terms of warranties provided to customers, and historical and anticipated warranty claim experience. This expense is recorded as a component of cost of product revenue in the consolidated statements of operations.

Significant Judgments

Applying the revenue recognition practices discussed above often requires significant judgment. Judgment is required when identifying performance obligations, estimating SSP and allocating purchase consideration in multi-element arrangements and estimating the future amount of our warranty obligations. Significant judgment is also required when interpreting commercial terms and determining when control of goods and services passes to the customer. Any material changes created by errors in judgment could have a material effect on our operating results and overall financial condition.

Goodwill, Intangible Assets and Other Long-Lived Assets

Goodwill, which has an indefinite useful life, represents the excess of cost over fair value of net assets acquired. Our intangible assets include developed technology, patents and licenses. The cost of identifiable intangible assets with finite lives is generally amortized on a straight-line basis over the assets' respective estimated useful lives.

Goodwill and intangible assets with indefinite lives are not subject to amortization, but are tested for impairment on an annual basis during the fourth quarter or whenever events or changes in circumstances indicate the carrying amount of these assets may not be recoverable. We first conduct an assessment of qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than its carrying amount. If we determine that it is more likely than not that the fair value of our reporting unit is less than its carrying amount, we then conduct a two-step test for impairment of goodwill. In the first step, we compare the fair value of our reporting unit to its carrying value. If the fair value of our reporting unit exceeds its carrying value, goodwill is not considered impaired and no further analysis is required. If the carrying value of the reporting unit exceeds its fair value, then the second step of the impairment test must be performed in order to determine the implied fair value of the goodwill. If the carrying value of the goodwill exceeds its implied fair value, then an impairment loss equal to the difference would be recorded.

We evaluate our long-lived assets, including finite-lived intangibles, for indicators of possible impairment when events or changes in circumstances indicate the carrying amount of an asset may not be recoverable. If any indicators of impairment exist, we assess the recoverability of the affected long-lived assets by determining whether the carrying value of the asset can be recovered through undiscounted future operating cash flows. If impairment is indicated, we estimate the asset's fair value using future discounted cash flows associated with the use of the asset and adjust the carrying value of the asset accordingly. We did not recognize any impairment of long-lived assets for any of the periods presented herein.

Convertible Notes

In February 2014, we closed an underwritten public offering $201.3 million aggregate principal amount of our 2.75% Senior Convertible Notes due 2034 (2014 Notes). In March 2018, we entered into separate privately negotiated transactions with certain holders of our 2014 Notes to exchange $150.0 million in aggregate principal amount of the 2014 Notes for our new 2.75% Exchange Convertible Senior Notes due 2034 (2018 Notes). Following the exchange, approximately $51.3 million in aggregate principal amount of the 2014 Notes remained outstanding in addition to $150.0 million in aggregate principal amount of the 2018 Notes.

As the 2018 Notes are convertible, at our election, into cash, shares of our common stock, or a combination of cash and shares of our common stock, we accounted for the 2018 Notes under the cash conversion guidance in ASC 470, whereby the embedded conversion option in the 2018 Notes was separated and accounted for in equity. The embedded conversion option value was calculated as the difference between (i) the total fair value of the 2018 Notes and (ii) the fair value of a similar debt instrument excluding the embedded conversion option. We determined an embedded conversion option value of $29.3 million, which was recorded in additional paid-in-capital and reduced the carrying value of the 2018 Notes. The resulting discount on the 2018 Notes will be amortized over the expected term of the 2018 Notes, using the effective interest method through the first note holder put date of February 6, 2023.

For both the 2014 Notes and 2018 Notes, offering-related costs, including underwriting costs, were capitalized as debt issuance costs, recorded as an offset to the carrying value of the related Notes, and are amortized over the expected term of the related Notes using the effective interest method.

Stock-Based Compensation

Our board of directors sets the terms, conditions, and restrictions related to our Employee Stock Purchase Plan (ESPP) and the grant of stock options, Restricted Share Units (RSUs) and performance-based awards under our various stock-based plans. Our board of directors determines the number of awards to grant and sets the vesting criteria. For performance-based share awards, our board of directors sets the performance objectives and other vesting provisions in determining the number of shares or value of performance units and performance shares that will be paid out. Such payout will be a function of the extent to which performance objectives or other vesting provisions have been achieved.

We recognize compensation costs for all stock-based awards, including stock options, RSUs, and stock purchased under our ESPP, based on the grant date fair value of the award. We recognize stock-based compensation expense on a straight-line basis over the requisite service periods for non-performance-based awards. For performance-based stock awards, stock-based compensation expense is recognized over the requisite service period when the achievement of each individual performance goal becomes probable.

Stock-based compensation cost for restricted stock units granted to employees is measured based on the closing fair market value of our common stock on the date of grant. The fair value of options and stock purchases under ESPP on the grant date is estimated using the Black-Scholes option-pricing model, which requires the use of certain subjective assumptions, including expected term, volatility, risk-free interest rate and the fair value of our common stock. These assumptions generally require significant judgment. We determine the expected volatility based on our historical stock price volatility generally commensurate with the estimated expected term of the stock awards. The expected term of an award is based on historical forfeiture experience, exercise activity, and the terms and conditions of the stock awards. The risk-free interest rate is based on the U.S. Treasury yield in effect at the time of grant for zero coupon U.S. Treasury notes with maturities approximately equal to each grant's expected term. We account for forfeitures as they occur.

Income Taxes

We use the asset and liability method to account for income taxes. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Significant management judgment is required in determining our provision for income taxes, our deferred tax assets and liabilities, and any valuation allowance recorded against our deferred tax assets. Our provision for income taxes generally consists of tax expense/benefit related to current period earnings/losses.

As part of the process of preparing our consolidated financial statements, we continuously monitor the circumstances impacting the expected realization of our deferred tax assets for each jurisdiction. We consider all available evidence, including historical operating results in each jurisdiction, expectations and risks associated with estimates of future taxable income, and ongoing prudent and feasible tax planning strategies in assessing the need for a valuation allowance. To the extent a deferred tax asset cannot be recognized, a valuation allowance is established to reduce our deferred tax assets to the amount that is more likely than not to be realized. These deferred tax assets primarily consist of net operating loss carryforwards, research and development tax credits, and stock-based compensation. We intend to maintain such valuation allowance until sufficient evidence exists to support its reduction. Our deferred tax liabilities primarily consist of book and tax basis differences in fixed assets and acquired identifiable intangible assets. We make estimates and judgments about our future taxable income that are based on assumptions that are consistent with our plans and estimates. Should the actual amounts differ from our estimates, the amount of our valuation allowance could be materially impacted. Changes in these estimates may result in significant increases or decreases to our tax provision in a period in which such estimates are changed, which in turn would affect net income or loss.

We recognize the financial statement effects of a tax position when it is more likely than not, based on the technical merits, that the position will be sustained upon examination. Any interest and penalties related to uncertain tax positions are reflected in the income tax provision.

The Tax Cuts and Jobs Act (the Tax Act) was enacted in December 2017. The Tax Act introduced a broad range of tax reform measures that significantly changed the federal income tax laws. At December 31, 2017, we recorded the provisional income tax effects of the Tax Act in accordance with ASU No. 2018-05, Income Taxes (Topic 740). Due to our having recorded a full valuation allowance against its U.S. federal and state deferred tax assets, there was no net impact on our tax provision as a result of the remeasurement of U.S. deferred taxes using the relevant tax rate at which we expect them to reverse. The one-time transition tax on post-1986 foreign unremitted earnings did not have a material impact to our effective tax rate as a result of our generating net foreign deficit earnings. In accordance with Staff Accounting Bulletin (SAB No. 118, we completed the accounting related to tax reform in the fourth quarter of 2018 and no material adjustments to the provisional tax expense were required. We continue to monitor supplemental legislation and technical interpretations of the tax law that may cause the final impact from the Tax Act to differ from the amounts previously recorded.

At December 31, 2017, we changed our permanent reinvestment assertion and will not permanently reinvest our foreign earnings outside the United States. The cash generated from some of our foreign subsidiaries may be used domestically to fund operations. Any domestic, foreign withholding tax and state taxes that may be due upon future repatriation of earnings is not expected to be significant.

Inventory Valuation

Inventories are stated at the lower of cost (on a first-in, first-out basis) or net realizable value. Inventory costs include direct materials, direct labor, and normal manufacturing overhead. Finished goods that are used for research and development are expensed as consumed or depreciated over their period of use. We regularly review inventory for excess and obsolete products and components. Provisions for slow-moving, excess, and obsolete inventories are recorded when required to reduce inventory values to their estimated net realizable values based on product life cycle, development plans, product expiration, and quality issues.

Recent Accounting Changes and Accounting Pronouncements

Adoption of New Accounting Guidance

In May 2014, the FASB issued ASU 2014-09 Revenue from Contracts with Customers (Topic 606). Topic 606 and its related amendments supersede Revenue Recognition (Topic 605), issued in June 2010, and provide principles for recognizing revenue for goods and services in a manner consistent with the transfer of control of those goods and services to the customer.

We adopted Topic 606 on January 1, 2018, using the modified retrospective method applied to those contracts with unrecognized revenue on the adoption date. We recognized the effect of applying the new revenue standard by recording a cumulative catch-up adjustment that reduced the accumulated deficit component of stockholders' equity by $0.4 million and increased current assets by $0.2 million and non-current assets by $0.2 million. The adjustment capitalized certain sales commission costs that were incurred to obtain instrument service contracts. Under Topic 605, we accounted for these incremental contract acquisition costs by recognizing them as expense at the point the contract was awarded. Under Topic 606, the costs are capitalized and amortized to expense over the life of the contract, which is generally one to three years. The comparative information for periods prior to January 1, 2018, has not been restated and continues to be reported in accordance with Topic 605.

The following table summarizes the cumulative effect of adopting Topic 606 on amounts previously reported in our consolidated balance sheet at December 31, 2017 (in thousands):

	Balance at December 31, 2017	Topic 606 Transition Adjustments	Balance at January 1, 2018
Prepaid expenses and other current assets	$ 1,528	$153	$ 1,681
Total current assets	$ 94,801	$153	$ 94,954
Other non-current assets	$ 7,541	$205	$ 7,746
Total assets	$ 287,351	$358	$ 287,709
Accumulated deficit	$(500,196)	$358	$(499,838)
Total stockholders' equity	$ 30,935	$358	$ 31,293
Total liabilities and stockholders' equity	$ 287,351	$358	$ 287,709

The following table summarizes the impacts on our consolidated statement of operations of adopting Topic 606 compared to Topic 605 for the twelve months ended December 31, 2018 (in thousands):

	Twelve Months Ended December 31, 2018		
	As Reported	Balance Without Adoption of Topic 606	Effect of Change
Selling, general and administrative	$ 79,783	$ 79,859	$(76)
Total costs and expenses	$161,128	$161,204	$(76)
Loss from operations	$ (48,164)	$ (48,240)	$ 76
Loss before income taxes	$ (61,420)	$ (61,496)	$ 76
Net loss	$ (59,013)	$ (59,089)	$ 76

The following table summarizes the impacts on our consolidated balance sheet of adopting Topic 606 compared to Topic 605 at December 31, 2018 (in thousands):

	December 31, 2018		
	As Reported	Balance Without Adoption of Topic 606	Effect of Change
Prepaid expenses and other current assets	$ 2,051	$ 1,884	$167
Total current assets	$127,106	$126,939	$167
Other non-current assets	$ 6,208	$ 5,941	$267
Total assets	$303,647	$303,213	$434
Stockholders' equity	$ 72,116	$ 71,682	$434
Total liabilities and stockholders' equity	$303,647	$303,213	$434

In March 2018, the FASB issued ASU No. 2018-05, Income Taxes (Topic 740): Amendments to SEC Paragraphs Pursuant to SEC Staff Accounting Bulletin No. 118. This ASU allows SEC reporting companies to record provisional amounts in earnings for the year ended December 31, 2017, due to the complexities involved in accounting for the enactment of the Tax Act. We recognized the estimated income tax effects of the Tax Act in its 2017 Consolidated Financial Statements in accordance with SEC Staff Accounting Bulletin No. 118. In accordance with SAB No. 118, we completed the accounting related to tax reform in the fourth quarter of 2018 and no material adjustments to the provisional tax expense were required. Refer to Note 10 of the consolidated financial statements in the Form 10-K for the fiscal year ended December 31, 2018 for further information regarding the provisional amounts recorded by the Company.

In August 2016, the FASB issued ASU 2016-15 Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments. The ASU addresses eight specific cash flow issues and their presentation within the statement of cash flows. We adopted this ASU in the first quarter of 2018. The adoption of this ASU did not have a material impact on our consolidated financial statements.

In November 2016, the FASB issued ASU 2016-18 Statement of Cash Flows (Topic 230): Restricted Cash, a consensus of the FASB's Emerging Issues Task Force, which amended the presentation of restricted cash within the statement of cash flows. The new guidance requires restricted cash be included within cash and cash equivalents on the statement of cash flows. We adopted this ASU in the first quarter of 2018. The adoption of this ASU did not have a material impact on our consolidated financial statements.

Recent Accounting Pronouncements

In August 2018, the FASB issued ASU 2018-15 Intangibles — Goodwill and Other — Internal-Use Software (Subtopic 350-40) which establishes new guidance on the accounting for costs incurred to implement a cloud computing arrangement that is considered a service arrangement. The new guidance requires the capitalization of such costs, aligning it with the accounting for costs associated with developing or obtaining internal-use software. The new guidance is effective for fiscal years beginning after December 15, 2019. We are currently evaluating the impact of adoption on its consolidated financial statements.

In February 2016, the FASB established Topic 842, Leases, by issuing Accounting Standards Update (ASU) No. 2016-02, which requires lessees to recognize leases on-balance sheet and disclose key information about leasing arrangements. Topic 842 was subsequently amended by ASU No. 2018-01, Land Easement Practical Expedient for Transition to Topic 842; ASU No. 2018-10, Codification Improvements to Topic 842, Leases; and ASU No. 2018-11, Targeted Improvements. The new standard establishes a right-of-use (ROU) model that requires a lessee to recognize a ROU asset and lease liability on the balance sheet for all leases with a term longer than 12 months. Leases will be classified as finance or operating; the classification will impact the expense recognition in the income statement.

A Modified Retrospective Transition approach is required, applying the new standard to all leases existing at the date of initial application. An entity may choose to use either (1) its effective date or (2) the beginning of the earliest comparative period presented in the financial statements as its date of initial application. We expect to adopt the new standard on January 1, 2019 and use the effective date as our date of initial application. Consequently, financial information will not be updated, and the disclosures required under the new standard will not be provided for dates and periods before January 1, 2019. For dates and periods prior to January 1, 2019, the original disclosures under ASC 840 will be disclosed.

The new standard provides several optional practical expedients upon transition. We expect to elect the 'package of practical expedients', which permits us not to reassess under the new standard our prior conclusions about lease identification, lease classification, and initial direct costs. We do not expect to elect the use-of-hindsight or the practical expedient pertaining to land easements; the latter not being applicable to us.

We expect that this standard will have a material effect on our financial statements. While we continue to assess all the effects of adoption, we currently believe the most significant effects relate to the recognition of new ROU assets and lease liabilities on our balance sheet for our building, vehicle and equipment leases. On adoption, we currently expect to recognize $8.0 million to $11.0 million of additional operating liabilities, based on the present value of the remaining fixed rental payments under current leasing standards for existing operating leases, with corresponding ROU assets of approximately $6.0 million to $9.0 million. The difference between the initial lease liability and right of use asset is attributable to deferred rent. We do not expect any impact on retained earnings from the adoption of ASC 842.

The new standard also provides certain accounting elections for an entity's ongoing accounting. We currently expect to elect the short-term lease recognition exemption for all leases that qualify. This means, for those leases that qualify, we will not recognize ROU assets or lease liabilities. We also currently expect to elect to not separate lease and nonlease components for our building leases and to take a portfolio approach for our vehicle leases by country.

In January 2017, the FASB issued ASU 2017-04, Intangibles — Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. The ASU eliminates the requirement for an entity to calculate the implied fair value of goodwill to measure a goodwill impairment charge. Instead, an entity performs its annual, or interim, goodwill impairment testing by comparing the fair value of a reporting unit with its carrying amount and recording an impairment charge for the amount by which the carrying amount exceeds the fair value. The ASU will be effective for annual and interim goodwill impairment testing performed for our fiscal year beginning January 1, 2020, with early adoption permitted. We are currently evaluating the effect that the updated standard will have on our consolidated financial statements.

Results of Operations

The following table presents our historical consolidated statements of operations data for the years ended December 31, 2018, 2017, and 2016, and as a percentage of total revenue for the respective years (in thousands):

	Year Ended December 31,					
	2018		2017		2016	
Revenue:						
Total revenue	$112,964	100%	$101,937	100%	$104,446	100%
Cost of sales:						
Cost of product revenue	44,861	39	45,039	44	41,110	39
Cost of service revenue	6,454	6	4,916	5	4,899	5
Total cost of sales	51,315	45	49,955	49	46,009	44
Gross profit	61,649	55%	51,982	51%	58,437	56%
Operating expenses:						
Research and development	30,030	27	30,826	30	38,415	37
Selling, general and administrative	79,783	71	79,516	78	93,212	89
Total operating expenses	109,813	98	110,342	108	131,627	126
Loss from operations	(48,164)	(43)	(58,360)	(57)	(73,190)	(70)
Interest expense	(13,893)	(12)	(5,824)	(6)	(5,820)	(6)
Other income (expense), net	637	1	385	1	(1,167)	(1)
Loss before income taxes	(61,420)	(54)	(63,799)	(62)	(80,177)	(77)
Benefit from income taxes	2,407	2	3,264	3	4,192	4
Net loss	$ (59,013)	(52)%	$ (60,535)	(59)%	$ (75,985)	(73)%

Revenue

We generate revenue primarily from sales of our products and services, and license agreements. Our product revenue consists of sales of instruments and consumables. Consumable revenues are largely driven by the size of our installed base of instruments and the annual level of pull-through per instrument. Service revenue is linked to our sales of instruments as our service revenue consists of post-warranty service contracts, preventive maintenance plans, instrument parts, installation and training. Our license revenue is generated primarily in the United States and relates to licensing our technology to third-parties.

We sell our instruments to leading academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories, and biopharmaceutical, biotechnology, contract research organizations, and Ag-Bio companies. No single customer represented more than 10% of our total revenue for 2018, 2017, or 2016. Revenue from our five largest customers was 17%, 14% and 15% of total revenue in 2018, 2017, and 2016, respectively.

The following table presents our revenue by source for the years ended December 31, 2018, 2017, and 2016, and as a percentage of total revenue for the respective years (in thousands):

	Year Ended December 31,						Change	
	2018		2017		2016		2018	2017
Revenue:								
Instruments	$ 45,491	40%	$ 42,505	42%	$ 46,834	45%	7%	(9)%
Consumables	48,159	43	41,894	41	42,169	40	15%	(1)%
Product revenue	93,650	83%	84,399	83%	89,003	85%	11%	(5)%
Service revenue	19,314	17	17,348	17	15,205	15	11%	14%
License revenue	—	—	190	—	238	—	(100)%	(20)%
Total revenue	$112,964	100%	$101,937	100%	$104,446	100%	11%	(2)%

The following table presents our total revenue by geographic area of our customers and as a percentage of total revenue for each year presented (in thousands):

	Year Ended December 31,						Change	
	2018		2017		2016		2018	2017
Americas	$ 51,172	46%	$ 49,290	48%	$ 56,229	54%	4%	(12)%
EMEA	36,617	32	32,642	32	29,739	28	12%	10%
Asia-Pacific	25,175	22	20,005	20	18,478	18	26%	8%
Total revenue	$112,964	100%	$101,937	100%	$104,446	100%	11%	(2)%

The Americas revenue includes revenue generated in the United States of $48.1 million, $45.8 million, and $52.6 million for 2018, 2017 and 2016, respectively.

Total Revenue

Total revenue increased by $11.0 million or 11%, to $113.0 million for 2018 compared to $101.9 million for 2017, primarily due to increased sales of our mass cytometry instruments and related service revenues, mass cytometry consumables, and microfluidics consumables. Revenue grew in 2018 compared to the prior year across all regions for both products and services. The significant growth in the Asia-Pacific region primarily reflects mass cytometry instrument and consumables growth in Japan and China. Changes in foreign currency exchange rates had a minimal impact on revenue in 2018.

Total revenue decreased by $2.5 million, or 2%, to $101.9 million for 2017 compared to $104.4 million for 2016. The revenue decrease was predominantly in the United States, partially offset by increases in Europe and Asia-Pacific. The decrease in the United States was mainly attributable to lower instrument sales, particularly our single-cell systems, partially offset by an increase in service revenue. The increases in Europe and Asia-Pacific were primarily driven by higher mass cytometry product sales, partially offset by a decrease in sales of our single-cell products.

Product Revenue

Product revenue increased by $9.3 million, or 11%, to $93.7 million for 2018 from $84.4 million in 2017. Instrument sales increased $3.0 million, or 7% in 2018 compared to 2017, due to higher mass cytometry instrument sales in the Americas and Asia-Pacific from higher unit volumes and average selling prices, partially offset by softer microfluidic instrument sales in both regions. Instrument sales in EMEA declined in 2018 compared to 2017, with softer mass cytometry instrument sales partially offset by higher microfluidic instrument sales.

Consumables sales increased $6.3 million, or 15% in 2018 compared to 2017, due to unit volume growth in both mass cytometry and microfluidic consumables, which comprise the bulk of our microfluidics business. Asia-Pacific and EMEA experienced strong growth in both mass cytometry and microfluidics consumables year-over-year. Total consumables sales in the Americas were essentially flat in 2018 versus 2017, with growth in mass cytometry offset by declines in microfluidics.

Product revenue decreased by $4.6 million, or 5%, to $84.4 million for 2017 compared to $89.0 million for 2016. Instrument revenue decreased by $4.3 million, or 9%, to $42.5 million for 2017 compared to 2016, predominately due to lower unit sales of our microfluidics instruments and particularly our C1 systems, partially offset by higher unit sales of our mass cytometry instruments. Consumables revenue decreased by $0.3 million, or 1%, to $41.9 million for 2017 compared to 2016, largely attributable to decreased unit sales of single-cell consumables and lower average selling prices for most consumables, partially offset by increased unit sales of mass cytometry reagents.

We expect the average selling prices of our products to fluctuate over time based on market conditions, product mix, and currency fluctuations.

Service Revenue

Service revenue increased by $2.0 million, or 11%, to $19.3 million for 2018 compared to 2017. Service revenue increased by $2.1 million, or 14%, to $17.3 million for 2017 compared to 2016. The increases in both 2018 and 2017 were primarily due to an increase in instruments under post-warranty service contracts as a result of growth in mass cytometry instruments. Revenue from post-warranty service contracts generally lags changes our instrument revenue by one year.

Cost of Product and Service Revenue

Cost of product revenue includes manufacturing costs incurred in the production process, including component materials, labor and overhead, installation, packaging, and delivery costs. In addition, cost of product revenue includes amortization of developed technology and intangibles, royalty costs for licensed technologies included in our products, warranty, provisions for slow-moving and obsolete inventory, and stock-based compensation expense. Cost of service revenue includes direct labor hours, overhead and instrument parts. While margins vary between product and service offerings, in general, instruments have the lowest profit margin, while margins on consumables tend to be higher than instrument margins. Service margins tend to be between the instrument and consumable margins.

The following table presents our cost of product and service revenue, total cost of sales, product and service margin, and gross margin for each year presented (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Cost of product revenue	$44,861	$45,039	$41,110
Cost of service revenue	6,454	4,916	4,899
Total cost of sales	$51,315	$49,955	$46,009
Product margin	52.1%	46.6%	53.8%
Service margin	66.6%	71.7%	67.8%
Gross margin	54.6%	51.0%	55.9%

Product margin increased 5.5 percentage points in 2018 compared to 2017. The year-over-year increase in product margin was due to favorable manufacturing capacity utilization and product mix, coupled with the impact of fixed amortization on a higher revenue base in 2018.

Product margin decreased 7.0 percentage points in 2017 compared to 2016, primarily driven by increased microfluidic unit product costs from lower production volumes, higher excess and obsolete inventory expense and, to a lesser extent, lower average selling prices across most of the products, and the impact of fixed amortization on a lower revenue base in 2017. Favorable product mix partially offsets these negative factors.

Service margin decreased 5.1 percentage points during 2018 compared to 2017. Service margin decreased primarily due to product mix, with a greater percentage of service revenue coming from servicing mass cytometry products than microfluidics products. Service costs tend to be higher for mass cytometry instruments compared to microfluidic instruments as the servicing is more labor-intensive.

Service margin increased 3.9 percentage points during 2017 compared to 2016, mainly due to lower labor costs driven by product mix.

Operating Expenses

The following table presents our operating expenses for each year presented (in thousands):

	Year Ended December 31,			2018 vs. 2017 change	2017 vs. 2016 change
	2018	2017	2016		
Research and development	$ 30,030	$ 30,826	$ 38,415	(3)%	(20)%
Selling, general and administrative	79,783	79,516	93,212	—%	(15)%
Total operating expenses	$109,813	$110,342	$131,627	—%	(16)%

Research and Development

Research and development expense consists primarily of personnel and independent contractor costs, prototype and material expenses and other allocated facilities, and information technology expenses. We have made substantial investments in research and development since our inception. Our research and development efforts have focused primarily on enhancing our technologies and supporting development and commercialization of new and existing products and services.

Research and development expense decreased by $0.8 million, or 3%, to $30.0 million for 2018 compared to $30.8 million for 2017, as a result of the lower severance and employee-related expenses.

Research and development expense decreased by $7.6 million, or 20%, to $30.8 million for 2017. The decrease in research and development expense for 2017 was primarily attributable to our cost-savings initiatives, which included headcount and compensation savings of $3.6 million. In addition, product materials and supplies costs decreased by $3.1 million mainly due to fewer projects in 2017 driven by our strategic realignment and focus.

We believe that our continued investment in research and development is essential to our long-term competitive position and that these expenses may increase in future periods.

Selling, General and Administrative

Selling, general and administrative expense consists primarily of personnel costs for our sales, marketing and administrative employees, facilities, depreciation and professional services, such as legal and accounting services.

Selling, general and administrative expense increased by $0.3 million, or 0%, to $79.8 million for 2018 compared to $79.5 million for 2017. The increase in 2018 was primarily due to higher headcount-related costs.

Selling, general and administrative expense decreased by $13.7 million or 15% to $79.5 million for 2017 compared to $93.2 million for 2016. This decrease for 2017 was primarily due to our cost-savings initiatives, which included infrastructure and facilities savings of $3.4 million. In addition, we had lower net legal expenses of $6.2 million mainly attributable to settlements in 2017 of previously pending litigations, a decrease in outside services of $1.5 million, a decrease in travel expenses of $1.2 million and a decrease in recruiting costs of $1.1 million.

Interest Expense and Other Income (Expense), Net

The following table presents these items for each year presented (in thousands):

	Year Ended December 31,			2018 vs. 2017 change	2017 vs. 2016 change
	2018	2017	2016		
Interest expense	$(13,893)	$(5,824)	$(5,820)	(139)%	—%
Other income (expense), net	637	385	(1,167)	(65)%	133%
Total	$(13,256)	$(5,439)	$(6,987)	(144)%	22%

As noted above in Critical Accounting Policies, in March 2018, we entered into privately negotiated transactions with certain holders of our 2014 Notes to exchange $150.0 million in aggregate principal amount of the 2014 Notes for $150.0 million in aggregate principal amount of our new 2.75% Exchange Convertible Senior Notes due 2034. As the 2018 Notes are convertible, at our election, into cash, shares of our common stock, or a combination of cash and shares of our common stock. we accounted for the 2018 Notes under the cash conversion guidance in ASC 470. Because of this conversion option, along with a redemption premium, the net effective interest rate for the 2018 Notes is higher than the 2014 Notes. The effective interest rate on the 2014 Notes and the 2018 Notes is approximately 3.0% and 12.3%, respectively. The majority of the difference in effective interest rates is due to non-cash amortization of debt discounts. With the higher effective interest rate, interest expense increased in 2018 as compared to 2017 and 2016.

Other income, net, of $0.6 million for 2018 is primarily attributable to $0.6 million of interest income. Other income, net, of $0.4 million for 2017 includes $0.3 million of interest income. Other expense, net, of $1.2 million for 2016 was mainly associated with losses of $1.5 million from revaluation of certain foreign currency denominated assets and liabilities, partially offset by $0.3 million of interest income.

Benefit from Income Taxes

We recorded a tax benefit of $2.4 million, or an effective tax rate benefit of 3.9%, for the year ended December 31, 2018. The tax benefit was principally due to the amortization of our acquisition-related deferred tax liability, partially offset by net income tax expense from our foreign operations and unrecognized tax benefits.

We recorded a tax benefit of $3.3 million, or an effective tax rate benefit of 5.1%, for the year ended December 31, 2017. This tax benefit was primarily attributable to amortization of our acquisition-related deferred tax liability.

We recorded a tax benefit of $4.2 million, or an effective tax rate benefit of 5.2% for the year ended December 31, 2016. The tax benefit was principally due to the amortization of our acquisition-related deferred tax liability, partially offset by net income tax expense from our foreign operations and unrecognized tax benefits.

Liquidity and Capital Resources

Sources of Liquidity

As of December 31, 2018, our principal sources of liquidity consisted of $95.4 million of cash and cash equivalents.

The following table presents our cash flow summary for each year presented (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Cash flow summary:			
Net cash used in operating activities	$(25,201)	$(24,098)	$(39,138)
Net cash provided by investing activities	4,719	17,658	45,102
Net cash provided by financing activities	57,660	28,997	116
Net increase in cash and cash equivalents	37,345	23,011	5,928

Net Cash Used in Operating Activities

We derive cash flows from operations primarily from cash collected from the sale of our products and services, and license agreements. Our cash flows from operating activities are also significantly influenced by our use of cash for operating expenses and working capital to support the business. We have historically experienced negative cash flows from operating activities as we have expanded our business and built our infrastructure domestically and internationally.

Net cash used in operating activities in 2018 was $25.2 million and consisted of net loss of $59.0 million less non-cash adjustments of $36.3 million, and a net increase in assets and liabilities of $2.5 million. Non-cash items primarily included amortization of developed technology of $11.2 million, stock-based compensation expense of $11.0 million, amortization of debt discounts and issuance costs of $8.4 million and depreciation and amortization of $5.4 million. The net increase in assets and liabilities was primarily due to lower accrued liabilities for retention bonuses, which were paid in November 2018 in the form of stock.

Net cash used in operating activities in 2017 was $24.1 million and consisted of net loss of $60.5 million less non-cash adjustments of $27.2 million, and a net reduction in assets and liabilities of $9.2 million. Non-cash items primarily included amortization of developed technology of $11.2 million, stock-based compensation expense of $9.1 million, and depreciation and amortization of $7.4 million. The net change in assets and liabilities was primarily driven by a decrease in inventory, an increase in deferred revenue, an increase in other liabilities and a decrease in prepaid expenses and other current assets.

Net cash used in operating activities in 2016 was $39.1 million and consisted of net loss of $76.0 million less non-cash adjustments of $32.1 million, and a net decrease in assets and liabilities of $4.7 million. Non-cash items primarily included stock-based compensation expense of $13.9 million, amortization of developed technology of $11.2 million, and depreciation and amortization of $6.7 million. The net change in assets and liabilities was primarily driven by a decrease in accounts receivable, offset by an increase in inventory and a decrease in accounts payable.

Net Cash Provided by Investing Activities

Our primary investing activities consist of purchases, sales, and maturities of our short-term investments and to a much lesser extent, capital expenditures for manufacturing, laboratory, computer equipment and software to support our infrastructure and work force. We expect to continue to incur costs for capital expenditures for demonstration units and loaner equipment to support our sales and service efforts, and computer equipment and software to support our business operations. However, we may choose to decrease or defer certain capital expenditures and development activities, while further optimizing our organization.

Net cash provided by investing activities in 2018 was $4.7 million, which included proceeds from sales and maturities of investments of $6.5 million, offset by purchases of investments of $1.5 million and capital expenditures of $0.4 million to support our commercial and manufacturing operations.

Net cash provided by investing activities in 2017 was $17.7 million, which included proceeds from sales and maturities of investments of $25.6 million, offset by purchases of investments of $6.3 million and capital expenditures of $1.6 million to support our commercial and manufacturing operations.

Net cash provided by investing activities in 2016 was $45.1 million, which included proceeds from sales and maturities of investments of $86.4 million and proceeds from the sale of investment in Verinata of $2.3 million, offset by purchases of investments of $38.6 million and capital expenditures of $5.1 million to support our commercial and manufacturing operations.

Net Cash Provided by Financing Activities

We generated cash from financing activities of $57.7 million during 2018. Approximately $59.5 million was generated from a public offering of our common stock. The remainder reflects the proceeds from stock option exercises and ESPP purchases, offset by debt and equity issuance costs and payments of taxes for the net settlement of equity awards. We generated cash from financing activities of $29.0 million during 2017, primarily due to a public equity offering. In 2016, we generated cash of $0.1 million, primarily from proceeds received in connection with the exercise of options for our common stock.

Capital Resources

At December 31, 2018 and December 31, 2017, our working capital, excluding deferred revenues, was $101.0 million and $71.6 million, respectively, including cash and cash equivalents of $95.4 million and $58.1 million, respectively, and short-term investments of $0.0 million and $5.1 million, respectively.

In February 2014, we closed an underwritten public offering of $201.3 million in aggregate principal amount of our 2.75% Senior Convertible Notes due 2034 (2014 Notes). In March 2018, we entered into privately negotiated transactions with certain holders of our 2014 Notes to exchange $150.0 million in aggregate principal amount of the 2014 Notes for $150.0 million in aggregate principal amount of our new 2.75% Exchange Convertible Senior Notes due 2034 (2018 Notes). Following the exchange transactions, approximately $51.3 million in aggregate principal amount of 2014 Notes remained outstanding. Our board of directors determined that the private exchange transactions were in our best interest and in the best interest of our stockholders following substantial review with management and our financial advisors concerning the amount of our outstanding indebtedness relative to the market capitalization of our common stock and, in particular, obligations under the indenture for the 2014 Notes that could require us to repurchase the 2014 Notes beginning in 2021 at a repurchase price equal to the aggregate principal amount of the 2014 Notes (approximately $201.3 million prior to the exchange). The principal differences between the 2014 Notes and the 2018 Notes are the following:

- The date on which we may be first required to repurchase the 2018 Notes has been extended to February 2023, compared to February 2021 under the 2014 Notes. In addition, while the applicable cash repurchase price for the 2014 Notes is 100% of the outstanding principal amount, the cash repurchase price for the 2018 Notes is based on a formula that would result in the 2018 Notes being redeemed for up to an amount equal to 120% of the original principal amount, plus, in each case, accrued and unpaid interest.

- The initial conversion price under the 2018 Notes is approximately $7.88, as compared to approximately $55.94 under the 2014 Notes. As a result, each of the outstanding 2018 Notes is initially convertible into 126.9438 shares of our common stock per $1,000 principal amount, while the 2014 Notes are initially convertible into 17.8750 shares of our common stock per $1,000 principal amount.

- Under the supplemental indenture for the 2018 Notes, we may at any time cause the then-outstanding 2018 Notes to be converted into shares of our common stock at the then-applicable 2018 Note conversion price if the volume weighted average price of our common stock is at least 110% of the applicable 2018 Note conversion price on each applicable trading day over a period specified in the supplement indenture for the 2018 Notes. Under the indenture for the 2014 Notes, we may only redeem the 2014 Notes for cash under certain circumstances during the period from February 6, 2018, through February 6, 2021.

- Under certain circumstances such as a "fundamental change" (as defined in the applicable indenture) that occurs prior to (i) February 6, 2021, in the case of the 2014 Notes and (ii) February 6, 2023, in the case of the 2018 Notes, holders of the Notes are entitled to a "make-whole" premium that will result in an increase in the applicable conversion rate. Under the terms of the 2018 Notes (but not the 2014 Notes), holders will be entitled to receive additional shares reflecting the economic equivalent of approximately two years of additional coupon payments, subject to certain limitations, in connection with a voluntary conversion by the noteholder prior to our exercise of our early conversion option.

The foregoing summaries of the 2014 Notes, the 2018 Notes, and the exchange transactions completed in March 2018 are not complete and are qualified in their entirety by the applicable indentures, forms of global notes, and other agreements and documents filed with the Securities and Exchange Commission with respect to the 2018 Notes and the exchange, and investors should refer to the text of the Second Supplemental Indenture, dated March 6, 2018, between Fluidigm Corporation and U.S. Bank National

Association and the Form of Global Note included in the Second Supplemental Indenture, which are incorporated by reference as Exhibits 4.6 and 4.7, respectively, in our Annual Report on Form 10-K for the year ended December 31, 2017. With respect to the 2014 Notes, of which approximately $51.3 million in aggregate principal amount remains outstanding, investors should refer to the text of the Indenture, dated as of February 4, 2014, by and between Fluidigm Corporation and U.S. Bank National Association, the First Supplemental Indenture, dated as of February 4, 2014, by and between Fluidigm Corporation and U.S. Bank National Association, and the Form of Global Note included in the First Supplemental Indenture which are incorporated by reference as Exhibits 4.2, 4.3 and 4.4, respectively, in our Annual Report on Form 10-K for the year ended December 31, 2017.

On August 2, 2018, we entered into a Revolving Credit Facility with Silicon Valley Bank, which matures on August 2, 2020. Amounts drawn under the Revolving Credit Facility will be used for working capital and general corporate purposes. As of December 31, 2018, total availability under the Revolving Credit Facility was $12.3 million. We currently have no outstanding debt under the Revolving Credit Facility, and we are in compliance with all the terms and conditions of the loan agreement governing the Revolving Credit Facility. See Note 6 to the Consolidated Financial Statements included in this Form 10-K for more information about the Revolving Credit Facility.

In early 2017, we implemented a retention incentive plan that provided for payment of cash bonuses in January 2019 to plan participants who were employees at the time the plan was implemented and who remained with Fluidigm through January 1, 2019. In September 2018, certain plan participants were permitted to elect to surrender their right to receive all or a portion of the cash bonus in exchange for fully vested restricted stock units issued under our 2011 Equity Incentive Plan. Among other reasons, our compensation committee adopted the exchange program to encourage employee stock ownership and to effectively manage cash resources. Participants opted to exchange approximately $2.4 million of cash bonus payments for approximately 380,000 fully vested RSUs issued in November 2018. The cash bonus payments payable in January 2019 for plan participants that remain employed with Fluidigm through January 1, 2019 is approximately $3.3 million.

We believe our existing cash, cash equivalents, and investments will be sufficient to meet our working capital and capital expenditure needs for at least the next 18 months. However, we may experience lower than expected cash generated from operating activities or greater than expected capital expenditures, cost of revenue, or operating expenses, and we may need to raise additional capital to fund our operations, further our research and development activities, or acquire or invest in a business. Our future funding requirements will depend on many factors, including market acceptance of our products, the cost of our research and development activities, the cost of filing and prosecuting patent applications, the cost associated with litigation or disputes relating to intellectual property rights or otherwise, the cost and timing of regulatory clearances or approvals, if any, the cost and timing of establishing additional sales, marketing, and distribution capabilities, the cost and timing of establishing additional technical support capabilities, and the effect of competing technological and market developments. In the future, we may acquire businesses or technologies from third parties, and we may decide to raise additional capital through debt or equity financing to the extent we believe this is necessary to successfully complete these acquisitions.

If we require additional funds in the future, we may not be able to obtain such funds on acceptable terms, or at all. If we raise additional funds by issuing equity securities, our stockholders could experience dilution. Debt financing, if available, may involve covenants restricting our operations or our ability to incur additional debt. Any additional debt or equity financing that we raise may contain terms that are not favorable to us or our stockholders. If we do not have, or are not able to obtain, sufficient funds, we may have to delay development or commercialization of our products or license to third parties the rights to commercialize products or technologies that we would otherwise seek to commercialize. We also may have to reduce marketing, customer support, research and development, or other resources devoted to our products.

Off-Balance Sheet Arrangements

Since our inception, we have not had any off-balance sheet arrangements as defined in Item 303(a)(4) of the Securities and Exchange Commission's Regulation S-K.

Contractual Obligations and Commitments

The following summarizes our contractual obligations as of December 31, 2018 (in thousands):

	Payments Due by Period				
	Total	Less than 1 Year	1 – 3 Years	3 – 5 Years	Thereafter
Long term debt obligations	$271,725	$ 5,534	$11,069	$189,074	$66,048
Operating lease obligations, net	9,578	3,664	3,294	1,379	1,241
Purchase obligations	1,596	1,596	—	—	—
Total	$282,899	$10,794	$14,363	$190,453	$67,289

Debt obligations include the principal amount of the Notes and interest payments to be made under the Notes. Although the Notes mature in 2034, they can be converted into cash and shares of our common stock prior to maturity if certain conditions are met. See Note 6 to our consolidated financial statements for additional information regarding the terms of the Notes.

Our operating lease obligations, net of sublease income, relate to leases for our current headquarters and leases for manufacturing and office space for our foreign subsidiaries. Purchase obligations consist of contractual and legally binding commitments to purchase goods and services.

We lease facilities and equipment under non-cancelable lease agreements expiring at various times through 2026. Our lease payments are expensed on a straight-line basis over the life of the leases. Rental expense under operating leases, net of amortization of lease incentive, totaled $5.0 million, $4.7 million, $6.3 million for 2018, 2017, and 2016, respectively.

We have entered into several license and patent agreements. Under these agreements, we pay annual license maintenance fees, non-refundable license issuance fees, and royalties as a percentage of net sales for the sale or sublicense of products using the licensed technology. Future payments related to these license agreements have not been included in the contractual obligations table above as the period of time over which the future license payments will be required to be made, and the amount of such payments, are indeterminable. We do not expect the license payments to be material in any particular year.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. Our market risk exposure is primarily a result of fluctuations in foreign currency exchange rates and interest rates. We do not hold or issue financial instruments for trading purposes.

Foreign Currency Exchange Risk

As we expand internationally our results of operations and cash flows will become increasingly subject to fluctuations due to changes in foreign currency exchange rates. Our revenue is generally denominated in the local currency of the contracting party. Historically, the majority of our revenue has been denominated in U.S. dollars. Our expenses are generally denominated in the currencies in which our operations are located, which is primarily in the United States, with a portion of expenses incurred in Singapore and Canada where our manufacturing facilities are located. Our results of operations and cash flows are, therefore, subject to fluctuations due to changes in foreign currency exchange rates. The volatility of exchange rates depends on many factors that we cannot forecast with reliable accuracy. We have experienced and will continue to experience fluctuations in our net income or loss as a result of transaction gains or losses related to revaluing certain current asset and current liability balances that are denominated in currencies other than the functional currency of the entities in which they are recorded. For the years ended December 31, 2018 and 2017, we experienced foreign currency losses of $0.0 million and $0.1 million, respectively. To date, we have not entered into any foreign currency hedging contracts although we may do so in the future. As our international operations grow, we will continue to reassess our approach to manage our risk relating to fluctuations in currency rates. If foreign currency exchange rates had changed by 10% during the periods presented, it would not have had a material impact on our financial position or results of operations.

Interest Rate Sensitivity

We had cash and cash equivalents of $95.4 million at December 31, 2018. These amounts were held primarily in cash on deposit with banks and money market funds which are short-term. We had no investments at December 31, 2018. Cash and cash equivalents and investments are held for working capital purposes. We believe that we do not have any material exposure to changes in the fair value of our money market portfolio as a result of changes in interest rates. Declines in interest rates, however, will reduce future investment income. If overall interest rates had decreased by 10% during the periods presented, our interest income would not have been materially affected.

Fair Value of Financial Instruments

We do not have material exposure to market risk with respect to investments. We do not use derivative financial instruments for speculative or trading purposes. We may adopt specific hedging strategies in the future.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and
Stockholders of Fluidigm Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Fluidigm Corporation and its subsidiaries (the "Company") as of December 31, 2018 and 2017, and the related consolidated statements of operations, of comprehensive loss, of stockholders' equity, and of cash flows for each of the three years in the period ended December 31, 2018, including the related notes and financial statement schedule listed in the accompanying index (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control — Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control — Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2018.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers LLP

San Jose, California
March 18, 2019

We have served as the Company's auditor since 2015.

FLUIDIGM CORPORATION

CONSOLIDATED BALANCE SHEETS
(In thousands, except per share amounts)

	December 31,	
	2018	**2017**
ASSETS		
Current assets:		
Cash and cash equivalents	$ 95,401	$ 58,056
Short-term investments	—	5,080
Accounts receivable (net of allowances of $126 and $391, at December 31, 2018 and 2017, respectively)	16,651	15,049
Inventories	13,003	15,088
Prepaid expenses and other current assets	2,051	1,528
Total current assets	127,106	94,801
Property and equipment, net	8,825	12,301
Other non-current assets	6,208	7,541
Developed technology, net	57,400	68,600
Goodwill	104,108	104,108
Total assets	$ 303,647	$ 287,351
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 4,027	$ 4,211
Accrued compensation and related benefits	14,470	10,535
Other accrued liabilities	7,621	8,490
Deferred revenue, current	11,464	10,238
Total current liabilities	37,582	33,474
Convertible notes, net	172,058	195,238
Deferred tax liability	13,714	16,919
Deferred revenue, non-current	6,327	4,960
Other non-current liabilities	1,850	5,825
Total liabilities	231,531	256,416
Commitments and contingencies		
Stockholders' equity:		
Preferred stock, $0.001 par value, 10,000 shares authorized, no shares issued and outstanding at either December 31, 2018 or 2017	—	—
Common stock: $0.001 par value, 200,000 shares authorized at December 31, 2018 and 2017; 49,338 and 38,787 shares issued and outstanding at December 31, 2018 and 2017, respectively	49	39
Additional paid-in capital	631,605	531,666
Accumulated other comprehensive loss	(687)	(574)
Accumulated deficit	(558,851)	(500,196)
Total stockholders' equity	72,116	30,935
Total liabilities and stockholders' equity	$ 303,647	$ 287,351

See accompanying notes

FLUIDIGM CORPORATION

CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share amounts)

	Year Ended December 31,		
	2018	2017	2016
Revenue:			
Product revenue	$ 93,650	$ 84,399	$ 89,003
Service revenue	19,314	17,348	15,205
License revenue	—	190	238
Total revenue	112,964	101,937	104,446
Cost of sales:			
Cost of product revenue	44,861	45,039	41,110
Cost of service revenue	6,454	4,916	4,899
Total cost of sales	51,315	49,955	46,009
Gross profit	61,649	51,982	58,437
Operating expenses:			
Research and development	30,030	30,826	38,415
Selling, general and administrative	79,783	79,516	93,212
Total operating expenses	109,813	110,342	131,627
Loss from operations	(48,164)	(58,360)	(73,190)
Interest expense	(13,893)	(5,824)	(5,820)
Other income (expense), net	637	385	(1,167)
Loss before income taxes	(61,420)	(63,799)	(80,177)
Benefit from income taxes	2,407	3,264	4,192
Net loss	(59,013)	(60,535)	(75,985)
Net loss per share, basic and diluted	$ (1.49)	$ (1.84)	$ (2.62)
Shares used in computing net loss per share, basic and diluted	39,652	32,980	29,008

See accompanying notes

FLUIDIGM CORPORATION

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Net loss	$(59,013)	$(60,535)	$(75,985)
Other comprehensive income (loss), net of tax			
Foreign currency translation adjustment	(112)	183	314
Unrealized gain (loss) on available-for-sale securities, net	(1)	3	70
Other comprehensive income (loss)	(113)	186	384
Comprehensive loss	$(59,126)	$(60,349)	$(75,601)

See accompanying notes

FLUIDIGM CORPORATION

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive (Loss)/Income	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2015	28,844	$29	$479,508	$(1,144)	$(363,492)	$114,901
Issuance of restricted stock, net of shares withheld for taxes, and other	307	—	(152)	—	—	(152)
Issuance of common stock from option exercises	57	—	227	—	—	227
Stock-based compensation expense	—	—	13,858	—	—	13,858
Net loss	—	—	—	—	(75,985)	(75,985)
Other comprehensive income	—	—	—	384	—	384
Balance at December 31, 2016	29,208	$29	$493,441	$ (760)	$(439,477)	$ 53,233
At-the-market offering	9,091	9	28,793	—	—	28,802
Issuance of restricted stock, net of shares withheld for taxes, and other	413	1	(166)	—	—	(165)
Issuance of common stock from option exercises	25	—	100	—	—	100
Issuance of common stock under ESPP	50	—	222	—	—	222
Cumulative-effect of new accounting standard for Topic 718 Stock Compensation	—	—	184	—	(184)	—
Stock-based compensation expense	—	—	9,092	—	—	9,092
Net loss	—	—	—	—	(60,535)	(60,535)
Other comprehensive income	—	—	—	186	—	186
Balance at December 31, 2017	38,787	$39	$531,666	$ (574)	$(500,196)	$ 30,935
Market offering	9,373	9	59,084	—	—	59,093
Issuance of restricted stock, net of shares withheld for taxes, and other	886	1	(379)	—	—	(378)
Issuance of common stock from option exercises	40	—	208	—	—	208
Issuance of common stock under ESPP	252	—	1,203	—	—	1,203
Conversion option on convertible debt	—	—	29,357	—	—	29,357
Closing cost related to conversion option on convertible debt	—	—	(557)	—	—	(557)
Cumulative-effect of new accounting standard for Topic 606 Revenue	—	—	—	—	358	358
Stock-based compensation expense	—	—	11,023	—	—	11,023
Net loss	—	—	—	—	(59,013)	(59,013)
Other comprehensive loss	—	—	—	(113)	—	(113)
Balance at December 31, 2018	49,338	$49	$631,605	$ (687)	$(558,851)	$ 72,116

See accompanying notes

FLUIDIGM CORPORATION

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Operating activities			
Net loss	$(59,013)	$(60,535)	$(75,985)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	5,372	7,409	6,738
Stock-based compensation expense	11,023	9,092	13,858
Amortization of developed technology	11,200	11,200	11,200
Amortization of debt discounts, premiums and issuance costs	8,379	287	278
Other non-cash items	175	(890)	(26)
Loss on disposal of property and equipment	141	135	87
Changes in assets and liabilities:			
Accounts receivable	(1,788)	(554)	10,521
Inventories	1,488	4,596	(3,387)
Prepaid expenses and other assets	178	1,583	(457)
Accounts payable	(294)	585	(2,271)
Deferred revenue	2,574	1,636	(274)
Other liabilities	(4,636)	1,358	580
Net cash used in operating activities	(25,201)	(24,098)	(39,138)
Investing activities			
Purchases of investments	(1,450)	(6,276)	(38,594)
Proceeds from sales and maturities of investments	6,541	25,550	86,431
Proceeds from sale of investment in Verinata	—	—	2,330
Purchases of intangible assets	—	(50)	—
Purchases of property and equipment	(372)	(1,566)	(5,065)
Net cash provided by investing activities	4,719	17,658	45,102
Financing activities			
Payment of debt and equity issuance costs	(2,862)	—	—
Net proceeds from issuance of common stock	59,469	28,793	—
Proceeds from exercise of stock options	208	100	227
Proceeds from stock issuance from ESPP	1,203	222	—
Payments for taxes related to net share settlement of equity awards	(358)	(118)	(111)
Net cash provided by financing activities	57,660	28,997	116
Effect of foreign exchange rate fluctuations on cash and cash equivalents	167	454	(152)
Net increase in cash and cash equivalents	37,345	23,011	5,928
Cash and cash equivalents at beginning of period	58,056	35,045	29,117
Cash and cash equivalents at end of period	$ 95,401	$ 58,056	$ 35,045
Supplemental disclosures of cash flow information			
Cash paid for interest	$ 5,534	$ 5,534	$ 5,534
Cash paid for income taxes, net of refunds	$ 321	$ 245	$ 355

See accompanying notes

1. Description of Business

Fluidigm Corporation (we, our, or us) was incorporated in the State of California in May 1999 to commercialize microfluidic technology initially developed at the California Institute of Technology. In July 2007, we were reincorporated in Delaware. Our headquarters are located in South San Francisco, California.

We create, manufacture, and market innovative technologies and life science tools, including preparatory and analytical instruments for Mass Cytometry, PCR, Library Prep, Single Cell Genomics, and consumables, including IFCs, assays, and reagents. Our focus is on the most pressing needs in translational and clinical research, including cancer, immunology and immunotherapy. We use proprietary CyTOF® and microfluidics technologies to develop innovative end-to-end solutions that have the flexibility required to meet the needs of translational research and the robustness to support high-impact clinical research studies. We sell our instruments to leading academic research institutions, translational research and medicine centers, cancer centers, clinical research laboratories, and biopharmaceutical, biotechnology and Ag-Bio companies.

2. Summary of Significant Accounting Policies

Basis of Presentation and Consolidation

The accompanying consolidated financial statements have been prepared in conformity with U.S. generally accepted accounting principles (U.S. GAAP) and include the accounts of our wholly-owned subsidiaries. As of December 31, 2018, we had wholly-owned subsidiaries in Singapore, Canada, the Netherlands, Japan, France, the United Kingdom, China, and Germany. All subsidiaries, except for Singapore, use their local currency as their functional currency. The Singapore subsidiary uses the U.S. dollar as its functional currency. All intercompany transactions and balances have been eliminated in consolidation.

Certain prior period amounts in the consolidated statements of stockholders' equity and consolidated statements of cash flows were reclassified to conform with the current period presentation. These reclassifications were immaterial and did not affect prior period total assets, total liabilities, stockholders' equity, total revenue, total costs and expenses, loss from operations or net loss.

Use of Estimates

The preparation of financial statements in accordance with U.S. GAAP requires management to make estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. We base our estimates on historical experience and on various other assumptions believed to be reasonable, which together form the basis for making judgments about the carrying values of assets and liabilities. Actual results could differ materially from these estimates and could have a material adverse effect on our consolidated financial statements.

Foreign Currency

Assets and liabilities of non-U.S. subsidiaries that use the local currency as their functional currency are translated into U.S. dollars at exchange rates in effect on the balance sheet date. The adjustments resulting from the foreign currency translations are recorded in accumulated other comprehensive loss, a separate component of stockholders' equity. Income and expense accounts are translated at monthly average exchange rates during the year.

Revenue Recognition

We generate revenue primarily from the sale of our products and services. Product revenue is derived from the sale of instruments and consumables, including IFCs, assays and reagents. Service revenue is derived from the sale of instrument service contracts, repairs, installation, training and other specialized product support services. Revenue is reported net of any sales, use and value-added taxes we collect from customers as required by government authorities.

We recognize revenue based on the amount of consideration we expect to receive in exchange for the goods and services we transfer to the customer. Our commercial arrangements typically include multiple distinct products and services, and we allocate revenue to these performance obligations based on their relative standalone selling prices. Standalone selling prices (SSP) are generally determined using observable data from recent transactions. In cases where sufficient data is not available, we estimate a product's SSP using a cost plus a margin approach or by applying a discount to the product's list price.

Product Revenue

We recognize product revenue at the point in time when control of the goods passes to the customer and we have an enforceable right to payment. This generally occurs either when the product is shipped from one of our facilities or when it arrives at the customer's facility, based on the contractual terms. Customers generally do not have a unilateral right to return products after delivery. Invoices are generally issued at shipment and generally become due in 30 to 60 days.

We sometimes perform shipping and handling activities after control of the product passes to the customer. We have made an accounting policy election to account for these activities as product fulfillment activities rather than as separate performance obligations.

Service Revenue

We recognize revenue from repairs, installation, training and other specialized product support services at the point in time the work is completed. Installation and training services are generally billed in advance of service. Repairs and other services are generally billed at the point the work is completed.

Revenue associated with instrument service contracts is recognized on a straight-line basis over the life of the agreement, which is generally one to three years. We believe this time-elapsed approach is appropriate for service contracts because we provide services on demand throughout the term of the agreement. Invoices are generally issued in advance of service on a monthly, quarterly, annual or multi-year basis. Payments made in advance of service are reported on our consolidated balance sheet as deferred revenue.

Contract Costs

Incremental sales commission costs incurred to obtain instrument service contracts are capitalized and amortized to selling, general and administrative expense over the life of the contract, which is generally one to three years. As a practical expedient, we expense sales commissions associated with product support services that are delivered in less than one year as they are incurred. Sales commissions associated with the sale of products are expensed as they are incurred.

Product Warranties

We generally provide a one-year warranty on our instruments. We accrue for estimated warranty obligations at the time of product shipment. We periodically review our warranty liability and record adjustments based on the terms of warranties provided to customers, and historical and anticipated warranty claim experience. This expense is recorded as a component of cost of product revenue in the consolidated statements of operations.

Significant Judgments

Applying the revenue recognition practices discussed above often requires significant judgment. Judgment is required when identifying performance obligations, estimating SSP and allocating purchasing consideration in multi-element arrangements and estimating the future amount of our warranty obligations. Moreover, significant judgment is required when interpreting commercial terms and determining when control of goods and services passes to the customer. Any material changes created by errors in judgment could have a material effect on our operating results and overall financial condition.

Cash and Cash Equivalents

We consider all highly liquid financial instruments with maturities at the time of purchase of three months or less to be cash equivalents. Cash and cash equivalents may consist of cash on deposit with banks, money market funds, and notes from government-sponsored agencies.

Investments

Short-term investments are comprised of notes from government-sponsored agencies. All investments are recorded at estimated fair value. Any unrealized gains and losses from investments are reported in accumulated other comprehensive loss, a separate component of stockholders' equity. We evaluate our investments to assess whether investments with unrealized loss positions are other-than-temporarily impaired. An investment is considered to be other-than-temporarily impaired if the impairment is related to deterioration in credit risk or if it is likely that we will sell the securities before the recovery of their cost basis. No investment has been assessed as other than temporarily impaired, and realized gains and losses were immaterial during the years presented. The cost of securities sold, or the amount reclassified out of accumulated other comprehensive income into earnings is based on the specific-identification method.

Accounts Receivable

Trade accounts receivable are recorded at net invoice value. We review our exposure to accounts receivable and provide allowances of specific amounts if collectability is no longer reasonably assured based on historical experience and specific customer collection issues. We evaluate such allowances on a regular basis and adjust them as needed.

Concentrations of Business and Credit Risk

Financial instruments that potentially subject us to credit risk consist of cash, cash equivalents, investments, and accounts receivable. Our cash, cash equivalents, and investments may consist of deposits held with banks, money market funds, and other highly liquid investments that may at times exceed federally insured limits. Cash equivalents and investments are financial instruments that potentially subject us to concentrations of risk. Under our investment policy, we invest primarily in securities issued by the U.S. government. The goals of our investment policy, in order of priority, are as follows: preserve capital, meet liquidity needs, and optimize returns.

We generally do not require collateral to support credit sales. To reduce credit risk, we perform credit evaluations of our customers. No single customer represented more than 10% of total revenue for 2018, 2017, or 2016, and no single customer represented more than 10% of total accounts receivable at December 31, 2018, 2017, or 2016.

Our products include components that are currently procured from a single source or a limited number of sources. We believe that other vendors would be able to provide similar components; however, the qualification of such vendors may require start-up time. In order to mitigate any adverse impacts from a disruption of supply, we attempt to maintain an adequate supply of critical limited-source components.

Inventories

Inventories are stated at the lower of cost (on a first-in, first-out basis) or net realizable value. Inventory costs include direct materials, direct labor, and normal manufacturing overhead. Finished goods that are used for research and development are expensed as consumed or depreciated over their period of use. Provisions for slow-moving, excess, and obsolete inventories are recorded when required to reduce inventory values to their estimated net realizable values based on product life cycle, development plans, product expiration, and quality issues.

Property and Equipment

Property and equipment, including leasehold improvements, are stated at cost less accumulated depreciation. Accumulated depreciation is calculated using the straight-line method over the estimated useful lives of the assets. Leasehold improvements are amortized using the straight-line method over the estimated useful lives of the assets or the remaining term of the lease, whichever is shorter. The estimated useful lives of our property and equipment are generally as follows: computer equipment and software, three to four years; laboratory and manufacturing equipment, two to five years; and office furniture and fixtures, five years.

Depreciation expense for the years ended December 31, 2018, 2017, and 2016 was $4.2 million, $5.9 million, and $5.1 million, respectively.

Goodwill, Intangible Assets and Other Long-Lived Assets

Goodwill, which has an indefinite useful life, represents the excess of cost over fair value of net assets acquired. Our intangible assets include developed technology, patents and licenses. The cost of identifiable intangible assets with finite lives is generally amortized on a straight-line basis over the assets' respective estimated useful lives.

Goodwill and intangible assets with indefinite lives are not subject to amortization but are tested for impairment on an annual basis during the fourth quarter or whenever events or changes in circumstances indicate the carrying amount of these assets may not be recoverable. We first conduct an assessment of qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than its carrying amount. If we determine that it is more likely than not that the fair value of our reporting unit is less than its carrying amount, we then conduct a two-step test for impairment of goodwill. In the first step, we compare the fair value of our reporting unit to its carrying value. If the fair value of our reporting unit exceeds its carrying value, goodwill is not considered impaired and no further analysis is required. If the carrying value of the reporting unit exceed its fair value, then the second step of the impairment test must be performed in order to determine the implied fair value of the goodwill. If the carrying value of the goodwill exceeds its implied fair value, then an impairment loss equal to the difference would be recorded.

We evaluate our long-lived assets, including finite-lived intangibles, for indicators of possible impairment when events or changes in circumstances indicate the carrying amount of an asset may not be recoverable. If any indicator of impairment exists, we assess the recoverability of the affected long-lived assets by determining whether the carrying value of the asset can be recovered through undiscounted future operating cash flows. If impairment is indicated, we estimate the asset's fair value using future discounted cash flows associated with the use of the asset, and adjust the carrying value of the asset accordingly. We did not recognize any impairment of long-lived assets for any of the periods presented herein.

Convertible Notes

In February 2014, we closed an underwritten public offering $201.3 million aggregate principal amount of our 2.75% Senior Convertible Notes due 2034 (2014 Notes). In March 2018, we entered into separate privately negotiated transactions with certain holders of our 2014 Notes to exchange $150.0 million in aggregate principal amount of the 2014 Notes for our new 2.75% Exchange Convertible Senior Notes due 2034 (2018 Notes). Following the exchange, approximately $51.3 million in aggregate principal amount of the 2014 Notes remained outstanding in addition to $150.0 million in aggregate principal amount of the 2018 Notes.

As the 2018 Notes are convertible, at our election, into cash, shares of our common stock, or a combination of cash and shares of our common stock, we accounted for the 2018 Notes under the cash conversion guidance in ASC 470, whereby the embedded conversion option in the 2018 Notes was separated and accounted for in equity. The embedded conversion option value was calculated as the difference between (i) the total fair value of the 2018 Notes and (ii) the fair value of a similar debt instrument excluding the embedded conversion option. We determined an embedded conversion option value of $29.3 million, which was recorded in additional paid-in-capital and reduced the carrying value of the 2018 Notes. The resulting discount on the 2018 Notes will be amortized over the expected term of the 2018 Notes, using the effective interest method through the first note holder put date, of February 6, 2023.

For both the 2014 Notes and 2018 Notes, offering-related costs, including underwriting costs are capitalized as debt issuance costs, recorded as an offset to the carrying value of the related Notes, and are being be amortized over the expected term of the related Notes using the effective interest method.

Fair Value of Financial Instruments

Our financial instruments consist primarily of cash and cash equivalents, investments, accounts receivable, accounts payable, and convertible notes. Our cash equivalents, investments, accounts receivable, and accounts payable have short maturity or payment periods. Accordingly, their carrying values approximated their fair values at December 31, 2018 and 2017. The convertible notes are presented at their carrying value, with fair value disclosures made in Note 7. As a basis for considering fair value, we follow a three-tier value hierarchy, which prioritizes the inputs used in measuring fair value as follows:

Level I: observable inputs such as quoted prices in active markets;

Level II: inputs other than quoted prices in active markets that are observable either directly or indirectly; and

Level III: unobservable inputs for which there is little or no market data, which requires us to develop our own assumptions.

This hierarchy requires us to use observable market data, when available, and to minimize the use of unobservable inputs when determining fair value. Our cash equivalents, which include money market funds, are classified as Level I because they are valued using quoted market prices. Our investments and convertible notes are generally classified as Level II because their value is based on valuations using significant inputs derived from or corroborated by observable market data. Depending on the security, the income and market approaches are used in the model driven valuations. Inputs of these models include recently executed transaction prices in securities of the issuer or comparable issuers and yield curves.

Research and Development

We recognize research and development expenses in the period incurred. Research and development expenses consist of personnel costs, independent contractor costs, prototype and materials expenses, allocated facilities and information technology expenses, and related overhead expenses.

Advertising Costs

We expense advertising costs as incurred. We incurred advertising costs of $2.2 million, $1.8 million and $2.3 million during 2018, 2017, and 2016, respectively.

Income Taxes

We use the asset and liability method to account for income taxes. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to temporary differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Valuation allowances are provided when the expected realization of deferred tax assets does not meet a “more likely than not” criterion. We make estimates and judgments about our future taxable income that are based on assumptions that are consistent with our plans and estimates. Should the actual amounts differ from our estimates, the amount of our valuation allowance could be materially impacted. Changes in these estimates may result in significant increases or decreases to our tax provision in a period in which such estimates are changed, which in turn would affect net income or loss.

We recognize the financial statement effects of a tax position when it is more likely than not, based on the technical merits, that the position will be sustained upon examination. Any interest and penalties related to uncertain tax positions are reflected in the income tax provision.

Stock-Based Compensation

We account for stock options and restricted stock units granted to employees and directors and stock purchases under ESPP based on the fair value of the awards. We recognize stock-based compensation expense on a straight-line basis over the requisite service periods for non-performance-based awards. For performance-based stock awards, stock-based compensation expense is recognized over the requisite service period when the achievement of each individual performance goal becomes probable.

Comprehensive Loss

Comprehensive loss is comprised of net loss and other comprehensive income (loss). Other comprehensive income (loss) consists of unrealized gains and losses on our investments and foreign currency translation adjustments. Total comprehensive loss for all periods presented has been disclosed in the consolidated statements of comprehensive loss.

The components of accumulated other comprehensive loss, net of tax, for the years ended December 31, 2018, 2017, and 2016 are as follows (in thousands):

	Foreign Currency Translation Adjustment	Unrealized Gain (Loss) on Investments	Accumulated Other Comprehensive Income (Loss)
Ending balance at December 31, 2016	$(758)	$ (2)	$(760)
Change during the year	183	3	186
Ending balance at December 31, 2017	$(575)	$ 1	$(574)
Change during the year	(112)	(1)	(113)
Ending balance at December 31, 2018	$(687)	$—	$(687)

Immaterial amounts of unrealized gains and losses have been reclassified into the consolidated statement of operations for the years ended December 31, 2018, 2017 and 2016.

Net Loss per Share

Our basic and diluted net loss per share is calculated by dividing net loss by the weighted-average number of shares of common stock outstanding for the period. Restricted stock units and options to purchase our common stock are considered to be potentially dilutive common shares but have been excluded from the calculation of diluted net loss per share as their effect is anti-dilutive for all periods presented.

The following potentially dilutive common shares were excluded from the computations of diluted net loss per share for the periods presented because including them would have been anti-dilutive (in thousands):

	December 31,		
	2018	2017	2016
Stock options, restricted stock units and performance awards	4,354	3,501	4,622
2018 Convertible Notes	19,035	—	—
2018 Convertible Notes potential make-whole shares	757	—	—
2014 Convertible Notes	916	3,598	3,598
Total	25,062	7,099	8,220

Recent Accounting Changes and Accounting Pronouncements

Adoption of New Accounting Guidance

In May 2014, the FASB issued ASU 2014-09 Revenue from Contracts with Customers (Topic 606). Topic 606 and its related amendments supersede Revenue Recognition (Topic 605), issued in June 2010, and provide principles for recognizing revenue for goods and services in a manner consistent with the transfer of control of those goods and services to the customer.

We adopted Topic 606 on January 1, 2018, using the modified retrospective method applied to those contracts with unrecognized revenue on the adoption date. We recognized the effect of applying the new revenue standard by recording a cumulative catch-up adjustment that reduced the accumulated deficit component of stockholders' equity by $0.4 million and increased current assets by $0.2 million and non-current assets by $0.2 million. The adjustment capitalized certain sales commission costs that were incurred to obtain instrument service contracts. Under Topic 605, we accounted for these incremental contract acquisition costs by recognizing them as expense at the point the contract was awarded. Under Topic 606, the costs are capitalized and amortized to expense over the life of the contract, which is generally one to three years. The comparative information for periods prior to January 1, 2018, has not been restated and continues to be reported in accordance with Topic 605.

The following table summarizes the cumulative effect of adopting Topic 606 on amounts previously reported in our consolidated balance sheet at December 31, 2017 (in thousands):

	Balance at December 31, 2017	Topic 606 Transition Adjustments	Balance at January 1, 2018
Prepaid expenses and other current assets	$ 1,528	$153	$ 1,681
Total current assets	$ 94,801	$153	$ 94,954
Other non-current assets	$ 7,541	$205	$ 7,746
Total assets	$ 287,351	$358	$ 287,709
Accumulated deficit	$(500,196)	$358	$(499,838)
Total stockholders' equity	$ 30,935	$358	$ 31,293
Total liabilities and stockholders' equity	$ 287,351	$358	$ 287,709

The following table summarizes the impacts on our consolidated statements of operations of adopting Topic 606 compared to Topic 605 for the twelve months ended December 31, 2018 (in thousands):

	Twelve Months Ended December 31, 2018		
	As Reported	Balance Without Adoption of Topic 606	Effect of Change
Selling, general and administrative	$ 79,783	$ 79,859	$(76)
Total costs and expenses	$161,128	$161,204	$(76)
Loss from operations	$ (48,164)	$ (48,240)	$ 76
Loss before income taxes	$ (61,420)	$ (61,496)	$ 76
Net loss	$ (59,013)	$ (59,089)	$ 76

The following table summarizes the impacts on our consolidated balance sheets of adopting Topic 606 compared to Topic 605 at December 31, 2018 (in thousands):

	December 31, 2018		
	As Reported	Balance Without Adoption of Topic 606	Effect of Change
Prepaid expenses and other current assets	$ 2,051	$ 1,884	$167
Total current assets	$127,106	$126,939	$167
Other non-current assets	$ 6,208	$ 5,941	$267
Total assets	$303,647	$303,213	$434
Stockholders' equity	$ 72,116	$ 71,682	$434
Total liabilities and stockholders' equity	$303,647	$303,213	$434

In March 2018, the FASB issued ASU No. 2018-05, Income Taxes (Topic 740): Amendments to SEC Paragraphs Pursuant to SEC Staff Accounting Bulletin No. 118. This ASU allows SEC reporting companies to record provisional amounts in earnings for the year ended December 31, 2017, due to the complexities involved in accounting for the enactment of the Tax Act. We recognized the estimated income tax effects of the Tax Act in its 2017 Consolidated Financial Statements in accordance with SEC Staff Accounting Bulletin No. 118 ("SAB No. 118"). In accordance with SAB No. 118, we completed the accounting related to tax reform in the fourth quarter of 2018 and no material adjustments to the provisional tax expense was required. Refer to Note 10 for further information regarding the provisional amounts recorded by the Company.

In February 2018, the FASB issued ASU 2018-02 Income Statement — Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income. This ASU amends the reporting of comprehensive income to allow a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Tax Cuts and Jobs Act (the Tax Act). The Tax Act was enacted in December 2017 and reduced the U.S federal corporate income tax rate and made other changes to U.S. federal tax law. ASU 2018-02 is effective for our fiscal year beginning January 1, 2019, and early adoption is permitted. This standard did not have a material effect on our consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15 Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments. The ASU addresses eight specific cash flow issues and their presentation within the statement of cash flows. We adopted this ASU in the first quarter of 2018. The adoption of this ASU did not have a material impact on our consolidated financial statements.

In November 2016, the FASB issued ASU 2016-18 Statement of Cash Flows (Topic 230): Restricted Cash, a consensus of the FASB's Emerging Issues Task Force, amending the presentation of restricted cash within the statement of cash flows. The new guidance requires that restricted cash be included within cash and cash equivalents on the statement of cash flows. We adopted this ASU in the first quarter of 2018. The adoption of this ASU did not have a material impact on our consolidated financial statements.

Recent Accounting Pronouncements

In August 2018, the FASB issued ASU 2018-15 Intangibles — Goodwill and Other — Internal-Use Software (Subtopic 350-40) which establishes new guidance on the accounting for costs incurred to implement a cloud computing arrangement that is considered a service arrangement. The new guidance requires the capitalization of such costs, aligning it with the accounting for costs associated with developing or obtaining internal-use software. The new guidance is effective for fiscal years beginning after December 15, 2019. We are currently evaluating the impact of adoption on our consolidated financial statements.

In February 2016, the FASB established Topic 842, Leases, by issuing Accounting Standards Update (ASU) No. 2016-02, which requires lessees to recognize leases on-balance sheet and disclose key information about leasing arrangements. Topic 842 was subsequently amended by ASU No. 2018-01, Land Easement Practical Expedient for Transition to Topic 842; ASU No. 2018-10, Codification Improvements to Topic 842, Leases; and ASU No. 2018-11, Targeted Improvements. The new standard establishes a right-of-use ("ROU") model that requires a lessee to recognize a ROU asset and lease liability on the balance sheet for all leases with a term longer than 12 months. Leases will be classified as finance or operating; the classification will impact the expense recognition in the income statement.

Modified Retrospective Transition approach is required, applying the new standard to all leases existing at the date of initial application. An entity may choose to use either (1) its effective date or (2) the beginning of the earliest comparative period presented in the financial statements as its date of initial application. We expect to adopt the new standard on January 1, 2019 and use the effective date as our date of initial application. Consequently, financial information will not be updated, and the disclosures required under the new standard will not be provided for dates and periods before January 1, 2019. For dates and periods prior to January 1, 2019, the original disclosures under ASC 840 will be disclosed.

The new standard provides several optional practical expedients in transition. We expect to elect the 'package of practical expedients', which permits us not to reassess under the new standard our prior conclusions about lease identification, lease classification and initial direct costs. We do not expect to elect the use-of-hindsight or the practical expedient pertaining to land easements; the latter not being applicable to us.

We expect that this standard will have a material effect on our financial statements. While we continue to assess all the effects of adoption, we currently believe the most significant effects relate to the recognition of new ROU assets and lease liabilities on our balance sheet for our building, vehicle and equipment leases.

On adoption, we currently expect to recognize $8.0 million to $11.0 million of additional operating liabilities, based on the present value of the remaining fixed rental payments under current leasing standards for existing operating leases, with corresponding ROU assets of approximately $6.0 million to

$9.0 million. The difference between the initial lease liability and right of use asset is attributable to deferred rent. We do not expect any impact on retained earnings from the adoption of ASC 842.

The new standard also provides certain accounting elections for an entity's ongoing accounting. We currently expect to elect the short-term lease recognition exemption for all leases that qualify. This means, for those leases that qualify, we will not recognize ROU assets or lease liabilities. We also currently expect to elect to not separate lease and nonlease components for our building leases and to take a portfolio approach for our vehicles leases by country.

In January 2017, the FASB issued ASU 2017-04, Intangibles — Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. The ASU eliminates the requirement for an entity to calculate the implied fair value of goodwill to measure a goodwill impairment charge. Instead, an entity performs its annual, or interim, goodwill impairment testing by comparing the fair value of a reporting unit with its carrying amount and recording an impairment charge for the amount by which the carrying amount exceeds the fair value. The ASU will be effective for annual and interim goodwill impairment testing performed for our fiscal year beginning January 1, 2020, with early adoption permitted. We are currently evaluating the effect that the updated standard will have on our consolidated financial statements.

3. Revenue

Disaggregation of Revenue

The following table presents our revenue for the year ended December 31, 2018, 2017, and 2016, respectively, based on geographic area and by products and services (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Geographic Markets:			
Americas	$ 51,172	$ 49,290	$ 56,229
EMEA	36,617	32,642	29,739
Asia-Pacific	25,175	20,005	18,478
Total	$112,964	$101,937	$104,446

	Year Ended December 31,		
	2018	2017	2016
Products and Services:			
Instruments	$ 45,491	$ 42,505	$ 46,834
Consumables	48,159	41,894	42,169
Product revenue	93,650	84,399	89,003
Services	19,314	17,348	15,205
License	—	190	238
Total	$112,964	$101,937	$104,446

Performance Obligations

We reported $15.2 million of deferred revenue on our December 31, 2017 consolidated balance sheet. During the twelve months ended December 31, 2018, $9.1 million of the opening balance was recognized as revenue and $11.7 million of net additional advance payments were received from customers, primarily associated with instrument service contracts. At December 31, 2018, we reported $17.8 million of deferred revenue.

The following table summarizes the expected timing of revenue recognition for unfulfilled performance obligations associated with instrument service contracts that were partially completed at December 31, 2018 (in thousands):

Fiscal Year	Expected Revenue[1]
2019	$10,037
2020	5,149
2021	2,525
Thereafter	1,436
Total	$19,147

[1] Expected revenue includes both billed amounts included in deferred revenue and unbilled amounts that are not reflected in our consolidated financial statements and are subject to change if our customers decide to cancel or modify their contracts. Purchase orders for instrument service contracts can generally be canceled before the service period begins without penalty.

We apply the practical expedient that permits us to not disclose information about unsatisfied performance obligations for service contracts with an expected term of one year or less.

Contract Costs

We reported $0.4 million of capitalized commission costs from instrument service contracts at December 31, 2018 in the consolidated balance sheet.

4. Goodwill and Intangible Assets, net

In connection with our acquisition of DVS in February 2014, we recognized goodwill of $104.1 million. Intangible assets include developed technology related to the DVS acquisition and other intangible assets included in Other non-current assets.

Developed Technology, Patents and Licenses

Developed technology as a result of the DVS acquisition, and patents and licenses, were as follows (in thousands):

	December 31, 2018			
	Gross Amount	Accumulated Amortization	Net	Weighted-Average Amortization Period
Developed technology	$112,000	$(54,600)	$57,400	10.0 years
Patents and licenses	$ 11,274	$ (6,861)	$ 4,413	7.8 years

	December 31, 2017			
	Gross Amount	Accumulated Amortization	Net	Weighted-Average Amortization Period
Developed technology	$112,000	$(43,400)	$68,600	10.0 years
Patents and licenses	$ 11,274	$ (5,721)	$ 5,553	7.8 years

Total amortization expense for the years ended December 31, 2018, December 31, 2017, and December 31, 2016 was $12.3 million, $12.4 million and $12.4 million, respectively.

Based on the carrying value of intangible assets, net, as of December 31, 2018, the annual amortization expense is expected to be as follows (in thousands):

Fiscal Year	Developed Technology Amortization Expense	Patents and Licenses Amortization Expense	Total
2019	$11,200	$1,046	$12,246
2020	11,200	1,046	12,246
2021	11,200	888	12,088
2022	11,200	815	12,015
2023	11,200	610	11,810
Thereafter	1,400	8	1,408
Total	$57,400	$4,413	$61,813

5. Balance Sheet Details

Cash and Cash Equivalents

Cash and cash equivalents consisted of the following as of December 31, 2018 and 2017 (in thousands):

	December 31,	
	2018	2017
Cash and cash equivalents:		
Cash	$17,685	$20,129
Money market funds	77,716	16,142
U.S. Government and agency securities	—	21,785
Total	$95,401	$58,056

Inventories

Inventories consisted of the following as of December 31, 2018 and 2017 (in thousands):

	December 31,	
	2018	2017
Inventories:		
Raw materials	$ 5,996	$ 7,566
Work-in-process	650	929
Finished goods	6,357	6,593
Total inventories, net	$13,003	$15,088

Property and Equipment, net

Property and equipment consisted of the following as of December 31, 2018 and 2017 (in thousands):

	December 31,	
	2018	2017
Property and equipment:		
Computer equipment and software	$ 4,201	$ 4,179
Laboratory and manufacturing equipment	18,780	20,069
Leasehold improvements	7,173	7,799
Office furniture and fixtures	1,506	1,892
Property and equipment, gross	31,660	33,939
Less accumulated depreciation and amortization	(22,855)	(21,646)
Construction-in-progress	20	8
Property and equipment, net	$ 8,825	$ 12,301

Product Warranties

Activity for our warranty accrual for the years ended December 31, 2018 and 2017, which are included in other accrued liabilities, is summarized below (in thousands):

	Year Ended December 31,	
	2018	2017
Beginning balance	$ 699	$ 1,023
Accrual for current period warranties	1,573	695
Warranty costs incurred	(1,409)	(1,019)
Ending balance	$ 863	$ 699

6. Convertible Notes and Credit Facility

2014 Senior Convertible Notes (2014 Notes)

On February 4, 2014, we closed an underwritten public offering of $201.3 million aggregate principal amount of our 2.75% Senior Convertible Notes due 2034 (2014 Notes) pursuant to an underwriting agreement, dated January 29, 2014. The 2014 Notes accrue interest at a rate of 2.75% per year, payable semi-annually in arrears on February 1 and August 1 of each year. The 2014 Notes will mature on February 1, 2034, unless earlier converted, redeemed, or repurchased in accordance with the terms of the 2014 Notes.

The initial conversion rate of the 2014 Notes is 17.8750 shares of our common stock, par value $0.001 per share, per $1,000 principal amount of 2014 Notes (which is equivalent to an initial conversion price of approximately $55.94 per share). The conversion rate will be subject to adjustment upon the occurrence of certain specified events including upon conversion in connection with a fundamental change, as defined in the indenture governing the 2014 Notes or, subject to certain conditions, redemption of the 2014 Notes by us.

Holders may surrender their 2014 Notes for conversion at any time prior to the stated maturity date. On or after February 6, 2018, and prior to February 6, 2021, we may redeem any or all of the 2014 Notes in cash if the closing price of our common stock exceeds 130% of the conversion price for a specified number of days, and on or after February 6, 2021, we may redeem any or all of the 2014 Notes in cash without any such condition. The redemption price of the 2014 Notes will equal 100% of the principal amount of the 2014 Notes plus accrued and unpaid interest. Holders may require us to repurchase all or a portion of their 2014 Notes on each of February 6, 2021, February 6, 2024, and February 6, 2029, at a repurchase price in cash equal to 100% of the principal amount of the 2014 Notes plus accrued and unpaid interest. If we undergo a fundamental change, as defined in the terms of the 2014 Notes, holders may require us to repurchase the 2014 Notes in whole or in part for cash at a repurchase price equal to 100% of the principal amount of the 2014 Notes plus accrued and unpaid interest.

In February 2014, we received $195.2 million, net of underwriting discounts, from the issuance of the 2014 Notes and incurred approximately $1.1 million in offering-related expenses. The underwriting discount of $6.0 million and the debt issuance costs of $1.1 million were recorded as offsets to the proceeds. The underwriting discount and offering-related expenses are being amortized to interest expense using the effective-interest rate method.

2018 Senior Convertible Notes (2018 Notes)

In March 2018, we entered into separate privately negotiated transactions with certain holders of our 2014 Notes to exchange $150.0 million in aggregate principal amount of the 2014 Notes for new convertible notes (2018 Notes). As of the closing of the 2018 Notes on March 12, 2018, the estimated fair value was $145.5 million. The difference between the $150.0 million aggregate principal amount of the 2018 Notes and its fair value will be amortized over the expected term of the 2018 Notes using the effective interest method through the first note holder put date of February 6, 2023.

We accounted for the exchange transaction as an extinguishment of debt due to the significance of the change in value of the embedded conversion option, resulting in a $0.1 million gain. The gain on extinguishment of debt was calculated as the difference between the reacquisition price (i.e., the fair value of the principal amount of 2018 Notes) and the net carrying value of the 2014 Notes exchanged net of unamortized debt discount and debt issuance cost write-offs.

The 2018 Notes accrue interest at a rate of 2.75%, payable semi-annually in arrears on February 1 and August 1 of each year. The 2018 Notes will mature on February 1, 2034, unless earlier converted, redeemed, or repurchased in accordance with the terms of the indenture governing the 2018 Notes. The initial conversion rate of the 2018 Notes is 126.9438 shares of our common stock, par value $0.001 per share, per $1,000 principal amount of the 2018 Notes (which is equivalent to an initial conversion price of approximately $7.88 per share). The conversion rate will be subject to adjustment upon the occurrence of certain specified events. Those certain specified events include Holders who convert their 2018 Notes voluntarily prior to our exercise of the Issuer's Conversion Option or in connection with a make-whole fundamental change prior to February 6, 2023, are entitled, under certain circumstances, to a make-whole premium in the form of an increase in the conversion rate determined by reference to a make-whole table set forth in the indenture governing the 2018 Notes. Any time prior to the maturity of the 2018 Notes, we may convert the 2018 Notes, in whole but not in part, into cash, shares of our common stock, or combination thereof, if the closing price of our common stock equals or exceeds 110% of the conversion price then in effect for a specified number of days (Issuer's Conversion Option). On or after February 6, 2022, we may elect to redeem all or any portion of the 2018 Notes at a redemption price equal to 100% of the accreted principal amount of the 2018 Notes on the redemption date of the 2018 Notes, plus accrued and unpaid interest.

Holders of the 2018 Notes have the right, at their option, to require us to purchase all or a portion of the 2018 Notes (i) on February 6, 2023, February 6, 2026, and February 6, 2029, or (ii) in the event of a fundamental change, as defined in the indenture governing the 2018 Notes, in each case, at a repurchase price equal to 100% of the accreted principal amount (i.e., up to 120% of the outstanding principal amount) of the 2018 Notes on the fundamental change repurchase date, plus accrued and unpaid interest.

Offering-related costs for the 2018 Notes were approximately $2.8 million. Offering-related costs of $2.2 million were capitalized as debt issuance costs, recorded as an offset to the carrying value of the 2018 Notes, and are being be amortized over the expected term of the 2018 Notes using the effective interest method through the first note holder put date of February 6, 2023. Offering-related costs of $0.6 million were accounted for as equity issuance costs, recorded as an offset to additional paid-in capital, and are not subject to amortization. Offering-related costs were allocated between debt and equity in the same proportion as the allocation of the 2018 Notes between debt and equity.

The carrying values of the components of the 2014 Notes and 2018 Notes are as follows (in thousands):

	December 31, 2018	December 31, 2017
2.75% 2014 Notes due 2034		
Principal amount	$ 51,250	$201,250
Unamortized debt discount	(1,232)	(5,087)
Unamortized debt issuance cost	(224)	(925)
	$ 49,794	$195,238
2.75% 2018 Notes due 2034		
Principal amount	$149,999	$ —
Premium accretion	3,755	—
Unamortized debt discount	(29,558)	—
Unamortized debt issuance cost	(1,932)	—
	$122,264	$ —
	$172,058	$195,238

2018 Revolving Credit Facility

On August 2, 2018, we entered into a revolving credit facility with Silicon Valley Bank (Revolving Credit Facility) in an aggregate principal amount of up to the lesser of (i) $15.0 million (Maximum Amount) or (ii) the sum of (a) 85% of our eligible receivables and (b) 50% of our eligible inventory, in each case, subject to certain limitations (Borrowing Base), provided that the amount of eligible inventory that may be counted towards the Borrowing Base shall be subject to a cap as set forth in the Revolving Credit Facility. Subject to the level of this borrowing base, we may make and repay borrowings from time to time until the maturity of the revolving credit facility. The borrowing base as of December 31, 2018 under the revolving credit facility was $12.3 million. There were no borrowings outstanding under the Revolving Credit Facility at December 31, 2018.

The Revolving Credit Facility matures on August 2, 2020, and is collateralized by substantially all our property, other than intellectual property. Outstanding loans under the Revolving Credit Facility will bear interest, at the greater of (i) prime rate plus 0.50% or (ii) 5.50%. Interest on any outstanding loans is due and payable monthly and the principal balance is due at maturity though loans can be prepaid at any time without penalty. In addition, we pay a quarterly unused revolving line facility fee of 0.75% per annum on the average unused facility.

Subject to certain exceptions, we must pay a prepayment fee equal to (i) 2.00% of the Maximum Amount if it prepays all advances and terminates the Loan Agreement prior to August 2, 2019, or (ii) 1.00% of the Maximum Amount if it prepays all advances and terminates the Loan Agreement on or after August 2, 2019, and prior to the maturity date.

We incurred approximately $335,000 of debt issuance costs in connection with the facility, including $225,000 in commitment fees. Half of the commitment fee was paid at the inception of the facility with the remainder due on the earliest of (i) August 2, 2019, (ii) the date on which we terminate the agreement or (iii) the occurrence and continuance of an event of default. Debt issuance costs were capitalized and are being amortized to interest expense over the life of the Revolving Credit Facility.

The Revolving Credit Facility contains customary affirmative and negative covenants which, unless waived by the bank, limit our ability to, among other things, incur additional indebtedness, grant liens, make investments, repurchase stock, pay dividends, transfer assets, enter into affiliate transactions, undergo a change of control, or engage in merger and acquisition activity, including merging or consolidating with a third party. The Revolving Credit Facility also contains customary events of default, subject to customary cure periods for certain defaults, that include, among other things, non-payment defaults, covenant defaults, material judgment defaults, bankruptcy and insolvency defaults, cross-defaults to certain other material indebtedness, and defaults due to inaccuracy of representation and warranties. Upon an event of default, the lender may declare all or a portion of the outstanding obligations payable by us to be immediately due and payable and exercise other rights and remedies provided for under the Revolving Credit Facility. During the existence of an event of default, interest on the obligations under the Revolving Credit Facility could be increased to 5.0% above the otherwise applicable rate of interest.

We were in compliance with all the terms and conditions of the Revolving Credit Facility at December 31, 2018.

7. Fair Value of Financial Instruments

The following tables summarize our cash and available-for-sale securities that were measured at fair value by significant investment category within the fair value hierarchy (in thousands):

	December 31, 2018					
	Carrying Amount	Gross Unrealized Gain	Gross Unrealized Loss	Fair Value	Cash and Cash Equivalents	Short-Term Marketable Securities
Assets:						
Cash	$17,685	$ —	$ —	$17,685	$17,685	$ —
Available-for-sale:						
Level I:						
Money market funds	77,716	—	—	77,716	77,716	—
U.S. treasury securities	—	—	—	—	—	—
Level II:						
U.S. government and agency securities	—	—	—	—	—	—
Total	$95,401	$ —	$ —	$95,401	$95,401	$ —

	December 31, 2017					
	Carrying Amount	Gross Unrealized Gain	Gross Unrealized Loss	Fair Value	Cash and Cash Equivalents	Short-Term Marketable Securities
Assets:						
Cash	$20,129	$ —	$ —	$20,129	$20,129	$ —
Available-for-sale:						
Level I:						
Money market funds	16,142	—	—	16,142	16,142	—
U.S. treasury securities	497	—	—	497	—	497
Level II:						
U.S. government and agency securities	26,369	—	(1)	26,368	21,785	4,583
Total	$63,137	$ —	$ (1)	$63,136	$58,056	$5,080

There were no transfers between Level I and Level II measurements during the year ended December 31, 2018, and there were no changes in the valuation techniques used.

Based on an evaluation of securities that were in a loss position, we did not recognize any other-than-temporary impairment charges for the years ended December 31, 2018, 2017, and 2016. None of our investments have been in a continuous loss position for more than 12 months. We concluded that the declines in market value of our available-for-sale securities investment portfolio were temporary in nature and did not consider any of our investments to be other-than-temporarily impaired.

Convertible Notes

The estimated fair value of the 2014 and 2018 Notes is based on a market approach and represents a Level II valuation. When determining the estimated fair value of our long-term debt, we used a commonly accepted valuation methodology and market-based risk measurements that are indirectly observable, such as credit risk.

The following table summarizes the par value, carrying value and the estimated fair value of the 2014 and 2018 Notes at December 31, 2018 and 2017, respectively (in thousands):

	December 31, 2018			December 31, 2017		
	Par Value	Carrying Value	Fair Value	Par Value	Carrying Value	Fair Value
2014 Notes	$ 51,250	$ 49,794	$ 43,665	$201,250	$195,238	$166,162
2018 Notes	149,999	122,264	171,843	—	—	—
Total	$201,249	$172,058	$215,508	$201,250	$195,238	$166,162

8. Shareholders' Equity

Tax Benefit Preservation Plan

On August 1, 2017, the Tax Benefit Preservation Plan (Tax Plan) dated as of November 21, 2016 expired and all of the preferred share purchase rights distributed to the holders of our common stock pursuant to the Tax Plan expired.

2018 Market Offering

On December 14, 2018, we closed on our previously announced underwritten public offering of 9,372,500 shares our common stock, $0.001 par value. The common stock was sold at a price to the public of $6.75 per share, for aggregate gross proceeds of approximately $63.3 million, from our existing shelf registration statement. Net proceeds from the offering were approximately $59.1 million after deducting underwriting discounts and commissions of $3.8 million and the $0.4 million of estimated expenses of the offering. We intend to use the net proceeds of the offering for general corporate purposes, including working capital, capital expenditures and continued research and development with respect to products and technologies, and to fund possible investments in or acquisitions of complementary businesses, products, or technologies.

2017 At-the-Market Offering

On August 10, 2017, we sold 9,090,909 shares of our common stock, $0.001 par value per share, pursuant to an earlier Sales Agreement, for aggregate gross proceeds of $30.0 million. Our aggregate net proceeds were approximately $28.8 million, after deducting related expenses, including commissions of approximately $0.7 million and issuance costs of approximately $0.5 million. These sales fully exhausted the shares that were available for sale under the Sales Agreement.

At December 31, 2018, we had reserved shares of common stock for future issuance under equity compensation plans as follows:

	Securities To Be Issued Upon Exercise Of Options	Securities To Be Issued Upon Release Of Restricted Stock and Performance Share Units	Number Of Remaining Securities Available For Future Issuance
		(in 000's)	
2009 Equity Incentive Plan	43	—	—
2011 Equity Incentive Plan	2,064	1,631	2,022
DVS Sciences Inc. 2010 Equity Incentive Plan	38	—	—
2017 Inducement Award Plan	240	338	1,422
2017 Employee Stock Purchase Plan		—	698
	2,385	1,969	4,142

9. Stock-Based Plans

Our board of directors sets the terms, conditions, and restrictions related to our ESPP and the grant of stock options, RSUs and performance-based awards under our various stock-based plans. Our board of directors determines the number of awards to grant and also sets vesting criteria.

In general, RSUs vest on a quarterly basis over a period of four years from the date of grant at a rate of 25% on the first anniversary of the grant date and ratably each quarter over the remaining 12 quarters, subject to the employees' continued employment.

Incentive stock options and non-statutory stock options granted under the 2011 Plan have a term of no more than ten years from the date of grant and an exercise price of at least 100% of the fair market value of the underlying common stock on the date of grant. If a participant owns stock representing more than 10% of the voting power of all classes of our stock on the grant date, an incentive stock option awarded to the participant will have a term of no more than five years from the date of grant and an exercise price of at least 110% of the fair market value of the underlying common stock on the date of grant. Generally, options vest at a rate of either 25% on the first anniversary of the option grant date and ratably each month over the remaining period of 36 months, or ratably each month over 48 months. We may grant options with different vesting terms from time to time.

For performance-based share awards, our board of directors sets the performance objectives and other vesting provisions in determining the number of shares or value of performance units and performance shares that will be paid out. Such payout will be a function of the extent to which performance objectives or other vesting provisions have been achieved.

2011 Equity Incentive Plan

On January 28, 2011, our board of directors adopted the 2011 Equity Incentive Plan (the 2011 Plan) under which incentive stock options, non-statutory stock options, restricted stock units (RSUs), stock appreciation rights, performance units, and performance shares may be granted to our employees, directors, and consultants.

2009 Equity Incentive Plan and 1999 Stock Option Plan

Our 2009 Equity Incentive Plan (the 2009 Plan) terminated on the date the 2011 Plan was adopted. Options granted, or shares issued under the 2009 Plan that were outstanding on the date the 2011 Plan became effective, remained subject to the terms of the 2009 Plan.

2017 Inducement Award Plan

On January 5, 2017, we adopted the Fluidigm Corporation 2017 Inducement Award Plan (the "Inducement Plan") and reserved 2 million shares of our common stock for issuance pursuant to equity awards granted under the Inducement Plan. The Inducement Plan provides for the grant of equity-based awards and its terms are substantially similar to the 2011 Plan. In accordance with Rule 5635(c)(4) of the Nasdaq Listing Rules, awards under the Inducement Plan may only be made to individuals not previously our employees or non-employee members of our board of directors (or following such individual's bona fide period of non-employment), as an inducement material to the individual's entry into employment with us or in connection with a merger or acquisition, to the extent permitted by Rule 5635(c)(3) of the Nasdaq Listing Rules.

Valuation and Expense Information

We use the Black-Scholes option-pricing model to estimate the fair value of stock options granted under our equity incentive plans. The weighted average assumptions used to estimate the fair value were as follows:

	Year Ended December 31,		
	2018	2017	2016
Stock options:			
Weighted average expected volatility	68.4%	65.0%	43.4%
Weighted average expected term	4.7 years	4.2 years	6.0 years
Weighted average risk-free interest rate	2.7%	1.7%	1.4%
Dividend yield	—	—	—
Weighted-average fair value per share	$3.45	$2.97	$3.19

We determine the expected volatility based on our historical stock price volatility generally commensurate with the estimated expected term of the stock awards. The expected term of an award is based on historical forfeiture experience, exercise activity, and the terms and conditions of the stock awards. The risk-free interest rate is based on the U.S. Treasury yield in effect at the time of grant for zero coupon U.S. Treasury notes with maturities approximately equal to each grant's expected life. Each of these inputs is subjective and generally requires significant judgment by us. The fair value of the underlying common stock is also required to compute the fair value calculation of options and ESPP. We account for forfeitures as they occur.

We grant stock options at exercise prices not less than the fair value of our common stock at the date of grant. The fair value of RSUs granted to employees was estimated on the date of grant by multiplying the number of shares granted by the fair market value of our common stock on the grant date.

Activity under the 2011 Plan, the 2009 Plan, the 1999 Plan, and the Inducement Plan is as follows:

Restricted Stock Units:

	Number of Units	Weighted-Average Grant Date Fair Value per Unit
	(in 000's)	
Balance at December 31, 2015	663	$32.48
RSU granted	940	$ 7.06
RSU released	(328)	$24.71
RSU forfeited	(210)	$17.82
Balance at December 31, 2016	1,065	$15.31
RSU granted	916	$ 5.73
RSU released	(445)	$15.57
RSU forfeited	(368)	$13.11
Balance at December 31, 2017	1,168	$ 8.55
RSU granted	1,822	$ 5.98
RSU released	(945)	$ 9.63
RSU forfeited	(233)	$ 8.50
Balance at December 31, 2018	1,812	$ 7.09

The total intrinsic value of RSUs vested and released during the year ended December 31, 2018, 2017 and 2016 were approximately $6.8 million, $2.3 million and $2.4 million, respectively. The intrinsic value of vested and released RSUs is calculated by multiplying the fair market value of our common stock on the vesting date by the number of shares vested. As of December 31, 2018, the unrecognized compensation costs related to outstanding unvested RSUs under our equity incentive plans were $9.7 million. We expect to recognize those costs over a weighted average period of 2.9 years.

2018 Retention Bonus Program

Included in the 2018 RSU activity are 379,593 of grants and releases related to a retention bonus program. As disclosed in our Current Report on Form 8-K filed on February 10, 2017, we previously implemented a company-wide retention bonus incentive program in which our executive officers at the time also participated. The bonus program provides for the payment of cash bonuses to program participants who were employees at the time the plan was implemented and who remain with Fluidigm through January 1, 2019. On September 18, 2018, the compensation committee of our board of directors approved an exchange program for our executive officers and for employees resident in the United States and Canada who are retention bonus program participants. In the exchange program, eligible participants could elect to surrender their right to receive a cash bonus in exchange for fully vested restricted stock units issued under our 2011 Equity Incentive Plan on the terms described below. Among other reasons, our compensation committee adopted the exchange program to encourage employee stock ownership and to effectively manage cash resources.

In connection with the bonus exchange program, each eligible employee could elect to exchange 25%, 50%, 75%, or 100% of the retention cash bonus otherwise payable under the terms of the program. Each employee participating in the exchange would receive a number of fully vested restricted stock units equal to the quotient, rounded up to the next whole number, determined by dividing the cash amount of the retention cash bonus that such eligible employee elects to exchange by an amount equal to 85% of the lower of the closing prices of one share of our common stock on the commencement date of the exchange offer or the closing date of the exchange offer. The exchange offer closed on November 5, 2018. The total value of the 379,593 shares of common stock issued under this program was $2.8 million and is included in the total intrinsic value of RSUs released in 2018.

Stock Options:

	Number of Options	Weighted-Average Exercise Price per Option	Weighted-Average Remaining Contractual Life	Aggregate Intrinsic Value[1]
	(000's)		(in Years)	(in 000's)
Balance at December 31, 2015	3,242	$20.45	2.2	
Options granted	978	$ 7.44		
Options exercised	(57)	$ 4.04		$ 310
Option forfeited	(603)	$23.53		
Balance at December 31, 2016	3,560	$16.62	6.8	
Options granted	1,364	$ 5.61		
Options exercised	(25)	$ 4.07		$ 42
Option forfeited	(2,735)	$16.33		
Balance at December 31, 2017	2,164	$10.41	6.6	
Options granted	758	$ 6.05		
Options exercised	(40)	$ 5.24		$ 81
Option forfeited	(497)	$16.09		
Balance at December 31, 2018	2,385	$ 7.56	7.8	$5,991
Vested at December 31, 2018	1,026	$ 9.92	6.3	$2,111
Expected to vest at December 31, 2018	1,359	$ 5.78	8.9	$3,879

[1] Aggregate intrinsic value as of December 31, 2018 was calculated as the difference between the closing price per share of our common stock on the last trading day of 2018, which was $8.62, and the exercise price of the options, multiplied by the number of in-the-money options.

As of December 31, 2018, the unrecognized compensation costs related to outstanding unvested options under our equity incentive plans were $4.2 million. We expect to recognize those costs over a weighted average period of 2.6 years.

2017 Stock Option Exchange

Included in the 2017 option activity above is the impact of our 2017 Stock Option Exchange Program. On August 23, 2017, we launched a one-time Stock Option Exchange Program (the Program), which eligible employees were able to exchange certain outstanding stock options (Eligible Options), whether vested or unvested, with an exercise price greater than $4.37 per share and greater than the closing price of a share of our common stock on the Nasdaq Global Select Market on the expiration date of the exchange offer (the Offer), for restricted stock units or stock options (New Awards) covering a lesser number of shares than were subject to the Eligible Options exchanged immediately before being canceled in the Offer. Non-employee members of our board of directors were not eligible to participate in the Program. The Program expired on September 20, 2017, with a closing price of $5.13 per share.

Employees elected to surrender Eligible Options to purchase a total of 1,204,198 shares of our common stock. All surrendered options were canceled effective as of the expiration date, and immediately thereafter, in exchange for such surrendered options, we issued (i) new options to purchase an aggregate of 399,117 shares of our common stock with an exercise price of $5.13; and (ii) restricted stock units representing 54,944 shares of our common stock, each, pursuant to the terms of the Offer and our 2011 Equity Incentive Plan. The new awards granted under the Program generally vest over three years.

The Program did not result in a material incremental stock-based compensation expense because the fair value of the new awards was approximately equal to the fair value of the surrendered options immediately prior to the exchange date. The original fair value of the surrendered options plus the incremental stock-based compensation expense is being recognized over the vesting periods of the New Awards.

Performance-based Awards

2018 Performance Stock Units

During the three months ended March 31, 2018, we granted 167,000 performance stock units to certain executive officers and senior level employees. The number of performance stock units ultimately earned is calculated based on the Total Shareholder Return (TSR) of our common stock as compared to the TSR of a defined group of peer companies during the performance period from January 1, 2018, to December 31, 2020. The percentage of performance stock units that vest will depend on our relative position at the end of the performance period and can range from 0% to 200% of the number of units granted.

Under FASB ASC Topic 718, the provisions of the performance stock unit awards related to TSR are considered a market condition, and the effects of that market condition should be reflected in the grant date fair value of the awards. We used a Monte Carlo simulation pricing model to incorporate the market condition effects at our grant date with a fair value of $10.09 per unit.

Activity under the 2018 performance stock units is as follows:

	Number of Units	Weighted-Average Grant Date Fair Value per Unit
	(in 000's)	
Balance at December 31, 2017	—	$ —
RSU granted	167	10.09
RSU released	—	—
RSU forfeited	(12)	10.09
Balance at December 31, 2018	155	$10.09

As of December 31, 2018, the unrecognized compensation costs related to these awards were $1.2 million. We expect to recognize those costs over a weighted average period of 2.2 years.

2016 Performance-based Stock Options and Restricted Stock Units

In 2016, we granted 184,050 and 87,620 performance-based stock options and performance-based restricted stock units (each, a performance award), respectively, to executive officers and employees, which were accounted for as equity awards. The number of performance awards that ultimately vested depended on the achievement of certain performance criteria set by the compensation committee of our board of directors. The performance-based stock options had an exercise price per share of $7.10. We recognize stock-based compensation expense over the vesting period of the performance awards when achievement of the performance criteria becomes probable. The performance criteria were not met, and the awards did not vest. We did not recognize any expense related to these performance awards in 2018, 2017 or 2016.

2017 Employee Stock Purchase Plan

On August 1, 2017, our stockholders approved our 2017 Employee Stock Purchase Plan (ESPP) at the annual meeting of stockholders. Our ESPP offers U.S. and some non-U.S. employees the right to purchase shares of our common stock. Our ESPP has a six-month offering period, with a new period commencing on the first trading day on or after May 31 and November 30 of each year. Employees are eligible to participate through payroll deductions of up to 10% of their compensation and may not purchase more than $25,000 of stock in any calendar year. The purchase price at which shares are sold under the ESPP is

85% of the lower of the fair market value of a share of our common stock on the first day of the offering period or the last day of the offering period. Our first ESPP offering period began on October 1, 2017 with a shorter offering period ending on November 30, 2017.

Stock-Based Compensation

Total stock-based compensation expense recognized was as follows (in thousands):

	For the Year Ended December 31,		
	2018	2017	2016
2018 Retention Bonus Program	$ 2,809	$ —	$ —
Options and Restricted Stock Units	7,716	8,972	13,858
Employee Stock Purchase Plan	498	120	—
Total Share-Based Compensation	$11,023	$9,092	$13,858

10. Income Taxes

Our loss before income taxes consists of the following (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Domestic	$(47,600)	$(56,885)	$(65,211)
International	(13,820)	(6,914)	(14,966)
Loss before income taxes	$(61,420)	$(63,799)	$(80,177)

Significant components of our benefit for income taxes are as follows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Current:			
Federal	$ (27)	$ —	$ —
State	(19)	(17)	(14)
Foreign	(32)	(501)	286
Total current tax (expense) benefit	(78)	(518)	272
Deferred:			
State	—	—	—
Foreign	2,485	3,782	3,920
Total deferred benefit	2,485	3,782	3,920
Total benefit for income taxes	$2,407	$3,264	$4,192

Reconciliation of income taxes at the statutory rate to the benefit from (provision for) income taxes recorded in the statements of operations is as follows:

	Year Ended December 31,		
	2018	2017	2016
Tax benefit at federal statutory rate	21.0%	34.0%	34.0%
State tax expense, net of federal benefit	2.3	5.5	2.2
Foreign tax benefit (expense)	(1.1)	0.4	(0.7)
Change in valuation allowance	(19.2)	39.2	(31.2)
Federal research and development credit	1.5	1.9	1.3
Unrecognized tax benefit	(0.2)	(0.6)	(1.3)
Impact of the Tax Act	—	(74.6)	—
Other, net	(0.4)	(0.7)	0.9
Effective tax rate	3.9%	5.1%	5.2%

The Tax Act was enacted in December 2017. The Tax Act introduced a broad range of tax reform measures that significantly change the federal income tax laws. At December 31, 2017, we recorded the provisional income tax effects of the Tax Act under Accounting Standards Codification Topic 740, Income Taxes. Due to our having recorded a full valuation allowance against its U.S. federal and state deferred tax assets, there was no net impact on our tax provision as a result of the remeasurement of U.S. deferred taxes using the relevant tax rate at which we expect them to reverse. The one-time transition tax on post-1986 foreign unremitted earnings did not have a material impact to our effective tax rate as a result of generating net foreign deficit earnings. In accordance with Staff Accounting Bulletin ("SAB") No. 118, we completed the accounting related to tax reform in the fourth quarter of 2018 and no material adjustments to the provisional tax expense was required. We continue to monitor supplemental legislation and technical interpretations of the tax law that may cause the final impact from the Tax Act to differ from the amounts previously recorded.

At December 31, 2017, we changed our permanent reinvestment assertion and will not permanently reinvest our foreign earnings outside the United States. The cash generated from some of our foreign subsidiaries may be used domestically to fund operations. Any domestic, foreign withholding tax and state taxes that may be due upon future repatriation of earnings is not expected to be significant.

Significant components of our deferred tax assets and liabilities are as follows (in thousands):

	December 31,	
	2018	2017
Deferred tax assets:		
Net operating loss carryforwards	$ 98,920	$ 91,701
Reserves and accruals	7,167	3,927
Depreciation and amortization	4,262	5,591
Tax credit carryforwards	16,675	14,838
Stock-based compensation	1,899	5,994
Total gross deferred tax assets	128,923	122,051
Valuation allowance on deferred tax assets	(126,109)	(119,228)
Total deferred tax assets, net of valuation allowance	2,814	2,823
Deferred tax liabilities:		
Fixed asset and intangibles	(16,528)	(18,912)
Total deferred tax liabilities	(16,528)	(18,912)
Net deferred tax liability	$ (13,714)	$ (16,089)

We evaluate a number of factors to determine the realizability of our deferred tax assets. Recognition of deferred tax assets is appropriate when realization of these assets is more likely than not. Assessing the realizability of deferred tax assets is dependent upon several factors including historical financial results. The net deferred tax assets have been partially offset by a valuation allowance because we have incurred losses since our inception. The valuation allowance increased by $6.9 million during 2018, decreased by $27.1 million during 2017 and increased by $22.1 million during 2016, respectively. The change in valuation allowance during 2018 is mainly due to significant taxable losses and an increase in tax attributes. The change in valuation allowance during 2017 is mainly due to the change in Federal statutory rate from 34% to 21%, offset by a significant increase in the taxable loss in 2017.

The valuation allowances of $126.1 million and $119.2 million as of December 31, 2018 and 2017, respectively, primarily relate to temporary tax differences, net operating losses and research and development credits generated in the current and prior years. We believe it is more likely than not that U.S. federal and state of California deferred tax assets relating to temporary differences, net operating losses and research and development credits are not realizable. As such, full valuation allowances have been applied against the deferred tax assets relating to jurisdictions of the federal U.S. and the state of California.

A reconciliation of the beginning and ending amount of the valuation allowance for the years ended December 31, 2018, 2017, and 2016 is as follows (in thousands):

	Valuation Allowance
December 31, 2015	$124,137
Charges to earnings	—
Charges to other accounts	22,148
December 31, 2016	146,285
Charges to earnings	830
Charges to other accounts	(27,887)
December 31, 2017	119,228
Charges to earnings	—
Charges to other accounts	6,880
December 31, 2018	$126,108

As of December 31, 2018, we had net operating loss carryforwards for U.S. federal income tax purposes of $432.2 million, which expire beginning in 2021, and U.S. federal research and development tax credits of $8.5 million, which expire in the years 2021 through 2039. As of December 31, 2018, we had net operating loss carryforwards for state income tax purposes of $170.3 million, which expire beginning in 2028 through 2039, and California research and development tax credits of $11.0 million, which do not expire. As of December 31, 2018, we had foreign net operating loss carryforwards of $1.9 million, which expire in the years 2019 through 2027.

Utilization of the net operating loss carryforwards and credits may be subject to a substantial annual limitation due to the ownership change limitations provided by Section 382 of the Internal Revenue Code of 1986, as amended, and similar state provisions. The annual limitation may result in the expiration of net operating losses and credits before utilization. In 2015, we completed a Section 382 analysis for the period from our inception in May 1999 through December 31, 2015, which excluded the net operating loss carryforwards for DVS prior to the acquisition and determined that an ownership change as defined under Section 382 occurred in November 2001, which resulted in a reduction to our U.S. federal net operating losses by $1.2 million. In 2016, 2017 and 2018, we continued the Section 382 analysis through December 31, 2018 and determined that an ownership change did not occur during the periods.

Uncertain Tax Positions

The aggregate changes in the balance of our gross unrecognized tax benefits during 2018, 2017, and 2016 were as follows (in thousands):

December 31, 2015	$ 8,662
Increases in balances related to tax positions taken during prior period	46
Increases in balances related to tax positions taken during current period	1,673
Decreases in balances related to tax positions taken during prior period	(1,048)
December 31, 2016	9,333
Increases in balances related to tax positions taken during current period	61
Decreases in balances related to tax positions taken during prior period	(2,077)
December 31, 2017	7,317
Increases in balances related to tax positions taken during current period	255
Decreases in balances related to tax positions taken during prior period	(228)
December 31, 2018	$ 7,344

Accrued interest and penalties related to unrecognized tax benefits were included in the income tax provision and are immaterial as of December 31, 2018 and 2017.

As of December 31, 2018, there are $0.4 million unrecognized tax benefits that, if recognized, would affect our effective tax rate. We do not anticipate that our existing unrecognized tax benefits will significantly increase or decrease within the next 12 months.

We file income tax returns in the United States, various states, and certain foreign jurisdictions. As a result of net operating loss carryforwards, all of our tax years are open to federal and state examination in the United States. Tax years from 2013 are open to examination in various foreign countries.

11. Employee Benefit Plans

We sponsor a 401(k) savings plan for our employees in the United States that stipulates that eligible employees may elect to contribute to the plan, subject to certain limitations, up to the lesser of 90% of eligible compensation or the maximum amount allowed by the U.S. Internal Revenue Service. In 2015, we implemented a match formula of 100% up to $2,000 annually, following a 4-year vesting schedule. Employer matching contributions to the 401(k) plan for the years ended December 31, 2018, 2017, and 2016 were $0.4 million, $0.5 million, and $0.6 million, respectively.

12. Information About Geographic Areas

We operate in one reporting segment that develops, manufacturers and commercializes tools for life sciences research. Our chief executive officer manages our operations and evaluates our financial performance on a consolidated basis. For purposes of allocating resources and evaluating regional financial performance, our chief executive officer reviews separate sales information for the different regions of the world. Our general and administrative expenses and our research and development expenses are not allocated to any specific region. Most of our principal operations, other than manufacturing, and our decision-making functions are located at our corporate headquarters in the United States.

A summary table of our total revenue by geographic areas of our customers and by product and services for the years ended December 31, 2018, 2017 and 2016 is included in Note 3 to the Consolidated Financial Statements of this Form 10K.

Sales to customers in the United States represented $48.1 million or 43%, of total revenues for the year ended December 31, 2018. Sales to customers in the United States represented $45.8 million or 45% of total revenues for the year ended December 31, 2017, and $52.6 million or 50% for the year ended December 31, 2016.

Sales to customers in China represented $14.0 million or 12%, of total revenues for the year ended December 31, 2018. Sales to customers in China represented 11% or $11.1 million, of total revenues for each of the years ended December 31, 2017, and 2016 respectively.

We had long-lived assets consisting of property, plant and equipment, net of accumulated depreciation, in the following geographic areas for each year presented (in thousands):

	December 31,	
	2018	2017
United States	$1,881	$ 3,500
Singapore	3,748	5,167
Canada	3,104	3,481
EMEA	66	125
Asia-Pacific	26	28
Total	$8,825	$12,301

13. Commitments and Contingencies

Operating Leases

We have entered into various long-term non-cancelable operating lease agreements for equipment and facilities expiring at various times through March 2026. We lease office space under non-cancelable leases in the United States, Canada, Singapore, Japan, China, France and United Kingdom. Certain facility leases also contain rent escalation clauses. Our lease payments are expensed on a straight-line basis over the life of the leases. Rental expense under operating leases, net of amortization of lease incentives and sublease income, for the years ended December 31, 2018, 2017, and 2016 was $5.0 million, $4.7 million, and $6.3 million, respectively.

Future minimum lease payments and minimum sublease income under non-cancelable operating leases as of December 31, 2018 are as follows (in thousands):

Fiscal Year	Minimum Lease Payments	Minimum Sublease Income	Net Operating Leases
2019	$ 4,184	$(520)	$3,664
2020	2,213	(164)	2,049
2021	1,245	—	1,245
2022	827	—	827
2023	552	—	552
Thereafter	1,241	—	1,241
Total	$10,262	$(684)	$9,578

Other Commitments

In the normal course of business, we enter into various contractual and legally binding purchase commitments. As of December 31, 2018, these commitments were approximately $1.6 million.

Indemnifications

From time to time, we have entered into indemnification provisions under certain of our agreements in the ordinary course of business, typically with business partners, customers, and suppliers. Pursuant to these agreements, we may indemnify, hold harmless, and agree to reimburse the indemnified parties on a case-by-case basis for losses suffered or incurred by the indemnified parties in connection with any patent or other intellectual property infringement claim by any third party with respect to our products. The term of these indemnification provisions is generally perpetual from the time of the execution of the agreement. The maximum potential amount of future payments we could be required to make under these indemnification provisions is typically not limited to a specific amount. In addition, we have entered into indemnification agreements with our officers, directors, and certain other employees. With certain exceptions, these agreements provide for indemnification for related expenses including, among others, attorneys' fees, judgments, fines and settlement amounts incurred by any of these individuals in any action or proceeding.

We incurred legal expenses between October 2015 and the third quarter of 2017 to defend claims by Thermo Fisher Scientific, Inc., (Thermo) against one of our employees. In December 2015, Thermo Fisher Scientific, Inc., (Thermo) filed a complaint in the Circuit Court for the County of Kalamazoo, Michigan against one of its former employees who had recently been hired by us alleging, among other claims, misappropriation of proprietary information and breach of contractual and fiduciary obligations to Thermo while such individual was still an employee of Thermo. In November 2016, Thermo amended its complaint to add us as a party to the litigation, making various commercial and employment-related claims and seeking damages and injunctive relief. In July 2017, we entered into a settlement agreement with Thermo. Pursuant to the terms of the settlement agreement, we agreed to pay Thermo a one-time payment of $3.0 million in exchange for a release and dismissal of all claims with prejudice upon payment of the settlement. In August 2017, we paid the settlement of $3.0 million and received an insurance recovery payment of $1.0 million related to this matter.

Contingencies

In early March 2019, we experienced a ransomware attack that infiltrated and encrypted certain of our information technology systems, including systems containing critical business data. Immediately following the attack, actions were taken to recover the compromised systems and we believe we were able to restore their operation without significant loss of business data. Based on the nature of the attack and its impact on our systems, we do not believe confidential data was lost or disclosed, but we are continuing to monitor the situation. As of the date of this filing, we estimate the costs associated with the intrusion to be approximately $1.5 million and are seeking to recover these costs under an applicable insurance policy.

From time to time, we may be subject to various legal proceedings and claims arising in the ordinary course of business. These include disputes and lawsuits related to intellectual property, mergers and acquisitions, licensing, contract law, tax, regulatory, distribution arrangements, employee relations and other matters. Periodically, we review the status of each matter and assess its potential financial exposure. If the potential loss from any claim or legal proceeding is considered probable and a range of possible losses can be estimated, we accrue a liability for the estimated loss. Legal proceedings are subject to uncertainties, and the outcomes are difficult to predict. Because of such uncertainties, accruals are based only on the best information available at the time. As additional information becomes available, we continue to reassess the potential liability related to pending claims and litigation and may revise estimates.

14. Quarterly Results of Operations (Unaudited)

Selected quarterly results of operations for the years ended December 31, 2018 and 2017 are as follows (in thousands, except for per share amounts):

2018	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Total revenue	$ 25,248	$ 26,428	$ 28,963	$ 32,325
Net loss	$(13,247)	$(16,241)	$(14,750)	$(14,775)
Net loss per share, basic and diluted	$ (0.34)	$ (0.42)	$ (0.38)	$ (0.36)

2017	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Total revenue	$ 25,533	$ 23,912	$ 24,747	$ 27,745
Net loss	$(17,202)	$(16,933)	$(15,944)	$(10,456)
Net loss per share, basic and diluted	$ (0.59)	$ (0.58)	$ (0.46)	$ (0.27)

15. Subsequent Event

From January 9, 2019 through February 27, 2019, we received notices from holders of the 2018 Notes electing to voluntarily convert approximately $138.1 million in aggregate principal amount pursuant to the terms of the Second Supplemental Indenture dated March 6, 2018, between us and U.S. Bank National Association (Trustee) to the Indenture dated as of February 14, 2014, between us and the Trustee. As a result of such voluntary conversions, we have elected to fully satisfy our conversion obligations by delivering approximately 17.9 million shares of our common stock to such holders and have retired approximately $138.1 million of the 2018 Notes. On February 27, we notified the Trustee of our intention to exercise our Issuer's Conversion Option pursuant to the terms of the Second Supplemental Indenture with respect to the remaining approximately $11.9 million in aggregate principal amount of 2018 Notes. These bonds were converted into approximately 1.5 million shares of our common stock and the bonds retired in March 2019.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and our Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2018. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2018, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Management's Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as such term is defined in Exchange Act Rule 13a-15(f) to provide reasonable assurance regarding the reliability of our financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Management assessed our internal control over financial reporting as of December 31, 2018. Management based its assessment on criteria established in *Internal Control — Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 Framework). Based on that evaluation, our management concluded that our internal control over financial reporting was effective as of December 31, 2018.

The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers, LLP, an independent registered public accounting firm, as stated in their report included in this Annual Report on Form 10-K.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting that occurred during the three months ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Inherent Limitations on the Effectiveness of Controls

Control systems, no matter how well conceived and operated, are designed to provide a reasonable, but not an absolute, level of assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, have been detected. Because of the inherent limitations in any control system, misstatements due to error or fraud may occur and not be detected.

ITEM 9B. OTHER INFORMATION

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information called for by this item will be set forth in our Proxy Statement for the Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2018 and is incorporated herein by reference.

Our board of directors has adopted a Code of Ethics and Conduct that applies to all of our employees, officers and directors, including our Chief Executive Officer, Chief Financial Officer and other executive and senior financial officers. The full text of our code of business conduct and ethics is posted on the investor relations page on our website which is located at www.fluidigm.com. We will post any amendments to our code of business conduct and ethics, or waivers of its requirements, on our website.

ITEM 11. EXECUTIVE COMPENSATION

The information called for by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

The information, if any, required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information, if any, required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

The information required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES

1. **Financial Statements.** See “Index to Consolidated Financial Statements” in Part II, Item 8 of this Form 10-K.

2. **Financial Statement schedule.** See “Index to Consolidated Financial Statements” in Part II, Item 8 of this Form 10-K.

3. **Exhibits.** The exhibits listed in the accompanying Index to Exhibits are filed herewith or are incorporated by reference to exhibits previously filed with the U.S. Securities and Exchange Commission.

SCHEDULE II — VALUATION AND QUALIFYING ACCOUNTS AND RESERVES

	Balance at Beginning of Period	Additions/ Charged to Expense	Deductions	Balance at End of Period
		In thousands		
Year ended December 31, 2018				
Accounts receivable allowance	$391	$162	$(427)	$126
Year ended December 31, 2017				
Accounts receivable allowance	$502	$ 24	$(135)	$391
Year ended December 31, 2016				
Accounts receivable allowance	$103	$484	$ (85)	$502

	Balance at Beginning of Period	Additions/ Charged to Expense	Deductions	Balance at End of Period
		In thousands		
Year ended December 31, 2018				
Warranty allowance	$ 699	$1,573	$(1,409)	$ 863
Year ended December 31, 2017				
Warranty allowance	$1,023	$ 695	$(1,019)	$ 699
Year ended December 31, 2016				
Warranty allowance	$1,076	$ 885	$ (938)	$1,023

ITEM 16. FORM 10-K SUMMARY

None.

INDEX TO EXHIBITS

Exhibit Number	Description	Incorporated by Reference From Form	Incorporated by Reference From Exhibit Number	Date Filed
2.1	Agreement and Plan of Merger dated January 28, 2014 by and among Fluidigm Corporation, DVS Sciences, Inc., Dawid Merger Sub, Inc. and Shareholder Representative Services LLC.	8-K	2.1	1/29/2014
3.1	Eighth Amended and Restated Certificate of Incorporation of Fluidigm Corporation filed on February 15, 2011.	10-K	3.1	3/28/2011
3.2	Amended and Restated Bylaws of Fluidigm Corporation effective as of February 9, 2011.	10-K	3.2	3/28/2011
3.3	Certificate of Designation of Rights, Preferences and Privileges of Series A Participating Preferred Stock.	8-K	3.1	11/22/2016
3.4	Certificate of Elimination of Series A Participating Preferred Stock of Fluidigm Corporation.	8-K	3.1	8/2/2017
4.1	Specimen Common Stock Certificate of Fluidigm Corporation.	S-8	4.1	8/3/2017
4.2	Indenture, dated February 4, 2014, by and between Fluidigm Corporation and U.S. Bank National Association.	8-K	4.1	2/4/2014
4.3	First Supplemental Indenture, dated February 4, 2014, by and between Fluidigm Corporation and U.S. Bank National Association.	8-K	4.2	2/4/2014
4.4	Form of Global Note (included in Exhibit 4.3).	8-K	4.3	2/4/2014
4.5	Tax Benefit Preservation Plan, dated as of November 21, 2016, by and between Fluidigm Corporation and Computershare Inc., as Rights Agent.	8-K	4.1	11/22/2016
4.6	Second Supplemental Indenture, dated March 6, 2018, between Fluidigm Corporation and U.S. Bank National Association.	8-K	4.2	3/6/2018
4.7	Form of Exchange Note (included in Exhibit 4.6).	8-K	4.3	3/6/2018
10.1	Form of Indemnification Agreement between Fluidigm Corporation and its directors and officers.	S-1/A	10.1	1/28/2011
10.2	Reserved.			
10.3#	2009 Equity Incentive Plan of Fluidigm Corporation, as amended.	S-1	10.3	12/3/2010
10.3A#	Forms of agreements under the 2009 Equity Incentive Plan.	S-1	10.3A	12/3/2010
10.4#	2011 Equity Incentive Plan of Fluidigm Corporation.	S-1/A	10.4	1/28/2011

Exhibit Number	Description	Incorporated by Reference From Form	Incorporated by Reference From Exhibit Number	Date Filed
10.4A#	Forms of agreements under the 2011 Equity Incentive Plan.	S-1/A	10.4A	1/28/2011
10.4B#	Amendments to the Fluidigm Corporation 2011 Equity Incentive Plan and 2009 Equity Incentive Plan and the DVS Sciences, Inc. 2010 Equity Incentive Plan.	8-K	10.2	8/2/2017
10.4C#	Forms of U.S. agreements under the 2011 Equity Incentive Plan.	SC TO-I	(d)(2)	8/23/2017
10.4D	Rules of the Fluidigm Corporation 2011 Equity Incentive Plan for Restricted Stock Unit Awards Granted to French Participants.	SC TO-I	(d)(3)	8/23/2017
10.4E	Rules of the Fluidigm Corporation 2011 Equity Incentive Plan for Options Granted to French Participants.	SC TO-I	(d)(4)	8/23/2017
10.4F	UK Sub-plan to the Fluidigm Corporation 2011 Equity Incentive Plan.	SC TO-I	(d)(5)	8/23/2017
10.4G#	Form of Restricted Stock Unit Agreement-Non-U.S. under the 2011 Equity Incentive Plan.	SC TO-I	(d)(6)	8/23/2017
10.4H#	Form of Stock Option Agreement-Non-U.S. under the 2011 Equity Incentive Plan.	SC TO-I	(d)(7)	8/23/2017
10.5†	Second Amended and Restated License Agreement between California Institute of Technology and Fluidigm Corporation, effective as of May 1, 2004.	S-1	10.5	12/3/2010
10.5A†	First Addendum, effective as of March 29, 2007, to Second Amended and Restated License Agreement between California Institute of Technology and Fluidigm Corporation effective as of May 1, 2004.	S-1	10.5A	12/3/2010
10.6†	Co-Exclusive License Agreement between President and Fellows of Harvard College and Fluidigm Corporation effective as of October 15, 2000.	S-1	10.6	12/3/2010
10.6A†	First Amendment to Co-Exclusive License Agreement between President and Fellows of Harvard College and Fluidigm Corporation effective as of October 15, 2000.	S-1	10.6A	12/3/2010
10.7†	Co-Exclusive License Agreement between President and Fellows of Harvard College and Fluidigm Corporation effective as of October 15, 2000.	S-1	10.7	12/3/2010
10.8†	Co-Exclusive License Agreement between President and Fellows of Harvard College and Fluidigm Corporation effective as of October 15, 2000.	S-1	10.8	12/3/2010
10.9†	Letter Agreement between President and Fellows of Harvard College and Fluidigm Corporation dated December 22, 2004.	S-1	10.9	12/3/2010
10.10#	Fluidigm Corporation 2017 Inducement Award Plan and related form agreements.	8-K	10.1	1/11/2017

Exhibit Number	Description	Incorporated by Reference From Form	Incorporated by Reference From Exhibit Number	Date Filed
10.11	Loan and Security Agreement, dated as of August 2, 2018 by and between Fluidigm Corporation and Silicon Valley Bank.	8-K	10.1	8/2/2018
10.12	Reserved.			
10.13#	Amended and Restated Offer Letter to Steven C. McPhail, dated February 28, 2017.	10-K	10.13	3/3/2017
10.14#	Form of Amended and Restated Employment and Severance Agreement between Fluidigm Corporation and each of its executive officers.	8-K	10.14	12/11/2012
10.15#	Offer Letter to Stephen Christopher Linthwaite, dated July 14, 2016.	10-Q	10.1	5/8/2018
10.16#	Employment and Severance Agreement, effective as of August 1, 2016, by and between Fluidigm Corporation and Stephen Christopher Linthwaite.	10-Q	10.2	11/9/2016
10.17#	Offer Letter to Vikram Jog dated January 29, 2008.	S-1	10.17	12/3/2010
10.18#	Offer Letter to Bradley A. Kreger dated February 13, 2018.	Filed herewith		
10.19	Lease Agreement between ARE – San Francisco No. 17 LLC and Fluidigm Corporation, dated September 14, 2010, as amended September 22, 2010.	S-1/A	10.19	1/7/2011
10.19A	Second Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated April 9, 2013.	10-Q	10.19A	5/9/2013
10.19B	Fourth Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated June 4, 2014.	10-Q	10.3	8/4/2014
10.19C	Fifth Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated September 15, 2014.	10-Q	10.2	11/6/2014
10.19D	Sixth Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated December 8, 2015.	8-K	10.1	12/14/2015
10.19E	Seventh Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated March 23,2017.	10-Q	10.1	5/9/2017
10.19F	Eighth Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated August 2, 2017.	8-K	10.1	8/3/2017
10.19G	Ninth Amendment to Lease Agreement between ARE-San Francisco No. 17, LLC and Fluidigm Corporation, dated May 31, 2018.	10-Q	10.2	8/8/2018

Exhibit Number	Description	Incorporated by Reference From Form	Incorporated by Reference From Exhibit Number	Date Filed
10.20	Tenancy for Flatted Factory Space in Singapore between JTC Corporation and Fluidigm Corporation dated July 27, 2005, as amended August 12, 2008 and May 31, 2010.	S-1	10.20	12/3/2010
10.21	Offer of Tenancy for Facility Lease between Fluidigm Singapore Pte. Ltd. and SBC Institutional Trust Services (Singapore) Limited, as trustee of Ascendas Real Estate Investment Trust dated October 14, 2013.	10-K	10.21	3/12/2014
10.22	Offer of Tenancy for Lease of Additional Space at Singapore Facility between Fluidigm Singapore Pte. Ltd. and HSBC Institutional Trust Services (Singapore) Limited, as trustee of Ascendas Real Estate Investment Trust, dated April 2, 2015.	10-Q	10.1	8/10/2015
10.23†	Office Lease by and among Rodick Equities Inc., Fluidigm Canada Inc., and Fluidigm Corporation, dated August 17, 2015.	10-Q	10.1	11/9/2015
10.24#	Form of Award Agreement for purposes of the Retention Program.	8-K	10.1	2/10/2017
10.25#	Form of Retention Bonus Exchange Letter.	8-K	10.1	9/20/2018
10.26#	Executive Bonus Plan.	10-K	10.25	3/28/2011
10.27†	License Agreement between MDS Analytical Technologies, a business unit of MDS INC., and DVS Sciences Inc., dated July 17, 2008.	10-Q/A	10.3	9/15/2014
10.28†	Sublicense Agreement between DVS Sciences Inc. and Fluidigm Corporation, dated January 28, 2014.	10-Q/A	10.4	9/15/2014
10.29#	Separation Agreement and Release between Gajus V. Worthington and Fluidigm Corporation dated October 19, 2016.	8-K	99.1	10/24/2016
10.30	2017 Employee Stock Purchase Plan.	8-K	10.1	8/2/2017
10.31	Sales Agreement, dated as of August 3, 2017, between Fluidigm Corporation and Cowen and Company, LLC.	8-K	1.1	8/3/2017
10.32#	Fluidigm Corporation Change of Control and Severance Plan.	8-K	10.1	8/23/2017
10.33#	Endorsement Split-Dollar Life Insurance Agreement.	10-Q	10.5	11/7/2017
21.1	Subsidiaries of Fluidigm Corporation.	10-K	21.1	3/3/2017
23.1	Consent of PricewaterhouseCoopers LLP, Independent Registered Public Accounting Firm.	Filed herewith		
24.1	Power of Attorney (contained in the signature page to this Form 10-K).	Filed herewith		

Exhibit Number	Description	Incorporated by Reference From Form	Incorporated by Reference From Exhibit Number	Date Filed
31.1	Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 of Chief Executive Officer.	Filed herewith		
31.2	Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 of Chief Financial Officer.	Filed herewith		
32.1~	Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 of Chief Executive Officer.	Filed herewith		
32.2~	Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 of Chief Executive Officer.	Filed herewith		
101.INS	XBRL Instance Document – the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.	Filed herewith		
101.SCH	XBRL Taxonomy Extension Schema Document	Filed herewith		
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document	Filed herewith		
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document	Filed herewith		
101.LAB	XBRL Taxonomy Extension Label Document	Filed herewith		
101.PRE	XBRL Taxonomy Extension Presentation Document	Filed herewith		

# Management contracts or compensation plans or arrangements in which directors or executive officers are eligible to participate.

† Portions of the exhibit have been omitted pursuant to an order granted by the Securities and Exchange Commission for confidential treatment.

~ In accordance with Item 601(b)(32)(ii) of Regulation S-K and SEC Release No. 33-8238 and 34-47986, Final Rule: Management's Reports on Internal Control Over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports, the certifications furnished in Exhibits 32.1 and 32.2 hereto are deemed to accompany this Form 10-K and will not be deemed "filed" for purposes of Section 18 of the Exchange Act. Such certifications will not be deemed to be incorporated by reference into any filings under the Securities Act or the Exchange Act, except to the extent that Fluidigm Corporation specifically incorporates it by reference.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

FLUIDIGM CORPORATION

Dated: March 18, 2019

By: /s/ Stephen Christopher Linthwaite
Stephen Christopher Linthwaite
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Stephen Christopher Linthwaite and Vikram Jog, jointly and severally, as his or her true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign this Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents full power and authority to do and perform each and every act and thing requisite or necessary to be done in and about the premises hereby ratifying and confirming all that said attorneys-in-fact and agents, or his or their substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ Stephen Christopher Linthwaite **Stephen Christopher Linthwaite**	President and Chief Executive Officer (Principal Executive Officer); Director	March 18, 2019
/s/ Vikram Jog **Vikram Jog**	Chief Financial Officer (Principal Financial and Accounting Officer)	March 18, 2019
/s/ Samuel D. Colella **Samuel D. Colella**	Chairman of the Board of Directors	March 18, 2019
/s/ Nicolas M. Barthelemy **Nicolas M. Barthelemy**	Director	March 18, 2019
/s/ Gerhard F. Burbach **Gerhard F. Burbach**	Director	March 18, 2019
/s/ Laura M. Clague **Laura M. Clague**	Director	March 18, 2019
/s/ Patrick S. Jones **Patrick S. Jones**	Director	March 18, 2019
/s/ Carlos V. Paya **Carlos V. Paya**	Director	March 18, 2019

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7000 Shoreline Court, Suite 100
South San Francisco, California 94080
(650) 266-6000

April 23, 2019

Dear Stockholder:

You are cordially invited to attend the Annual Meeting of Stockholders of Fluidigm Corporation to be held on Monday, June 3, 2019 at 8:30 a.m., Pacific time, at our principal executive offices located at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080. At the meeting, we will be voting on the matters described in the attached formal meeting notice and proxy statement.

This year, we are pleased to announce that we are taking advantage of U.S. Securities and Exchange Commission rules that allow companies to furnish proxy materials to their stockholders over the Internet. We believe that this process will allow us to provide our stockholders with the information they need in a timely manner, while reducing the environmental impact of printing and distributing our proxy materials and lowering our costs.

On or about April 23, 2019, we expect to mail to our stockholders a Notice of Internet Availability of Proxy Materials (the “Notice”) containing instructions on how to access the proxy statement for our 2019 Annual Meeting and our Annual Report on Form 10-K for the year ended December 31, 2018. The Notice also provides instructions for voting online or by telephone, as well as information on how to receive a paper copy of the proxy materials by mail.

Your vote is very important. Whether or not you plan to attend the Annual Meeting and regardless of the number of shares you own, it is important that your shares be represented. We hope you will vote as soon as possible via the Internet, by telephone, or—if you requested a paper copy of the proxy materials by mail—by mailing a completed, signed, and dated proxy card in the envelope provided. Any stockholder who attends the meeting may vote in person, even if he or she has already voted online, by telephone, or by mail.

Thank you for your continued support of Fluidigm. We look forward to seeing you at our Annual Meeting.

Sincerely,

S. Christopher Linthwaite

Stephen Christopher Linthwaite
President and Chief Executive Officer

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FLUIDIGM CORPORATION
7000 Shoreline Court, Suite 100
South San Francisco, California 94080
(650) 266-6000

NOTICE OF 2019 ANNUAL MEETING OF STOCKHOLDERS

Time and Date

8:30 a.m., Pacific time, on Monday, June 3, 2019.

Place

Fluidigm's offices located at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080.

Items of Business

- To elect the three nominees for Class III director named in this proxy statement, each to hold office until our 2022 annual meeting of stockholders or until his or her successor is duly elected and qualified.
- To vote, on an advisory basis, to approve the compensation of our named executive officers for the year ended December 31, 2018, as set forth in this proxy statement.
- To vote on an amendment and restatement of our 2011 Equity Incentive Plan to increase the shares reserved thereunder and to make certain other changes.
- To ratify the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019.
- To transact any other business that may properly come before the 2019 Annual Meeting.

Adjournments and Postponements

Any action on the items of business described above may be considered at the Annual Meeting at the time and on the date specified above or at any time and date to which the Annual Meeting may be properly adjourned or postponed.

Record Date

You are entitled to vote only if you were a Fluidigm stockholder of record as of the close of business on the record date, April 8, 2019.

Meeting Admission

You are entitled to attend the Annual Meeting only if you were a Fluidigm stockholder as of the close of business on the record date or otherwise hold a valid proxy for the Annual Meeting. If you are not a stockholder of record but hold shares through a broker, bank, trustee, or nominee (i.e., in "street name"), you should provide proof of your beneficial ownership as of the record date, such as your most recent account statement prior to the record date, a copy of the voting instruction card provided by your broker, bank, trustee, or nominee, or similar evidence of ownership.

Annual Report

You may access our Annual Report on Form 10-K for the year ended December 31, 2018 and our proxy solicitation materials by visiting http://www.viewproxy.com/Fluidigm/2019. Our 2018 Annual Report is not a part of the proxy solicitation materials.

Voting

Your vote is very important. Whether or not you plan to attend the Annual Meeting, we encourage you to read the proxy statement accompanying this notice and submit your proxy or voting instructions as soon as possible. For specific instructions on how to vote your shares, please refer to the instructions in the section entitled "General Information" beginning on page 1 of the proxy statement accompanying this notice, or provided in the Notice of Internet Availability of Proxy Materials.

This notice of our Annual Meeting of Stockholders and the accompanying proxy statement and form of proxy are being distributed and made available on or about April 23, 2019.

PROXY STATEMENT
FOR 2019 ANNUAL MEETING OF STOCKHOLDERS

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FLUIDIGM CORPORATION
7000 Shoreline Court, Suite 100
South San Francisco, California 94080

PROXY STATEMENT

FOR THE 2019 ANNUAL MEETING OF STOCKHOLDERS
to be held on Monday, June 3, 2019

GENERAL INFORMATION

In this proxy statement: the terms “we,” “our,” “Fluidigm,” and the “Company” each refer to Fluidigm Corporation; the term “Board” means our Board of Directors; and the term “proxy materials” means this proxy statement and the form of proxy. These proxy materials are furnished in connection with the solicitation by our Board of proxies to be voted at our 2019 annual meeting of stockholders (the “Annual Meeting”), which will take place on Monday, June 3, 2019 at 8:30 a.m., Pacific time at the Company’s offices located at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080, and any postponements, adjournments or continuations thereof.

The information provided in the “question and answer” format below is for your convenience only and is merely a summary of the information contained in this proxy statement. You should read this entire proxy statement carefully. Information contained on or accessible through our website is not intended to be incorporated by reference into this proxy statement and references to our website in this proxy statement are intended to be inactive textual references only.

Why did I receive a notice regarding the availability of proxy materials on the Internet instead of a full set of proxy materials?

Under rules adopted by the U.S. Securities and Exchange Commission (the “SEC”), we have elected to furnish our proxy materials to our stockholders primarily via the Internet, instead of mailing printed copies of the proxy materials to each stockholder. On or about April 23, 2019, we expect to mail to our stockholders a Notice of Internet Availability of Proxy Materials (the “Notice”) containing instructions on how to access our proxy materials and our Annual Report on Form 10-K for the year ended December 31, 2018 via the Internet and how to vote your proxy. If you received the Notice, you will not automatically receive a printed copy of our proxy materials in the mail. If you would like to receive a printed copy, please follow the instructions provided in the Notice.

Our 2019 proxy materials and our 2018 Annual Report are accessible at:
http://www.viewproxy.com/Fluidigm/2019

What information is contained in this proxy statement?

The information in this proxy statement relates to the proposals to be voted on at the Annual Meeting, the voting process, the compensation of our directors and most highly paid executive officers, our corporate governance policies, information on our Board of Directors, and certain other required information.

What items of business will be voted on at the Annual Meeting?

The items of business scheduled to be voted on at the Annual Meeting are as follows:

- the election of the three nominees for Class III director named in this proxy statement, each to hold office until our 2022 annual meeting of stockholders or until his or her successor is duly elected and qualified;
- to vote, on an advisory basis, to approve the compensation of our named executive officers for the year ended December 31, 2018, as set forth in this proxy statement;

- to vote on an amendment and restatement of our 2011 Equity Incentive Plan to increase the shares reserved thereunder and to make certain other changes; and
- to ratify the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019.

We will also transact any other business that properly comes before the Annual Meeting.

How does the Board recommend that I vote?

Our Board of Directors recommends that you vote your shares:

- "FOR" the nominees for Class III director named in this proxy statement;
- "FOR" approval of the compensation of our named executive officers for the year ended December 31, 2018, on an advisory basis;
- "FOR" approval of the amendment and restatement of our 2011 Equity Incentive Plan to increase the shares reserved thereunder and to make certain other changes; and
- "FOR" the ratification of the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019.

What is a proxy?

A proxy is your legal designation of another person to vote the stock you own, in the event that you are unable to cast your vote directly at the meeting. The person you designate is your "proxy," and you give the proxy authority to vote your shares at the meeting—according to your instructions—by submitting your voting instructions online, by telephone, or via a physical proxy card. We have designated our President and Chief Executive Officer, Stephen Christopher Linthwaite, and our Chief Financial Officer, Vikram Jog, to serve as proxies for the Annual Meeting.

What shares can I vote?

Each share of our common stock issued and outstanding as of the close of business on April 8, 2019, the record date for our 2019 Annual Meeting, is entitled to vote on all items being considered at the Annual Meeting. You may vote all shares owned by you as of the record date, including (i) shares held directly in your name as the stockholder of record and (ii) shares you own through an account with a broker, bank, trustee, or other intermediary, sometimes referred to as owning in "street name." On the record date, we had 68,997,806 shares of common stock issued and outstanding.

How many votes am I entitled to per share?

For all matters described in this proxy statement for which your vote is being solicited, each holder of shares of common stock is entitled to one vote for each share of common stock held by such holder as of the record date.

What is the difference between holding shares as a stockholder of record and as a beneficial owner?

Many stockholders beneficially own shares held in "street name" by a broker, bank, trustee, or other nominee rather than holding the shares directly in their own name. As summarized below, there are some distinctions between shares held of record and those owned beneficially.

- ***Stockholder of Record.*** If your shares are registered directly in your name with our transfer agent, Computershare Trust Company, N.A., you are considered the *stockholder of record* with respect to those shares, and the Notice was sent directly to you by our mailing agent. As the stockholder of record, you have the right to grant your voting proxy directly to our designated proxies or to vote in person at the Annual Meeting. You may vote online or by telephone as described below under the heading "How can I vote my shares without attending the annual meeting?" and on the Notice. If you requested a printed copy of the proxy materials, you may also vote by mail by following the instructions on your proxy card.

- ***Beneficial Owner.*** If your shares are held in a brokerage account or by another intermediary, you are considered the *beneficial owner* of shares held in street name, and the Notice was forwarded to you by your broker, bank, trustee, or other nominee. As the beneficial owner, you have the right to direct your broker, bank, trustee, or other nominee how to vote your shares, and you are also invited to attend the Annual Meeting.

Since a beneficial owner is not the stockholder of record, you may not vote your shares in person at the Annual Meeting unless you obtain a "legal proxy" from the broker, bank, trustee or nominee that holds your shares giving you the right to vote the shares at the meeting. If you are a beneficial owner and do not wish to vote in person or you will not be attending the Annual Meeting, you may vote by following the instructions provided by your broker, bank, trustee, or other nominee.

How can I contact Fluidigm's transfer agent?

Contact our transfer agent by writing Computershare Trust Company, N.A., 462 South 4th Street, Suite 1600, Louisville, KY 40202. You may also contact our transfer agent by calling (800) 662-7232 or (781) 575-2879 or via its Investor Center at https://www-us.computershare.com/Investor/Contact.

How can I attend the Annual Meeting?

You are entitled to attend the Annual Meeting only if you were a Fluidigm stockholder as of the record date or you hold a valid proxy for the Annual Meeting. If you are not a stockholder of record but beneficially own shares held in street name, you should provide proof of beneficial ownership as of the record date, such as your most recent account statement prior to April 8, 2019, together with a copy of the voting instruction card provided by your broker, bank, trustee or nominee, or other similar evidence of ownership.

If you do not comply with the procedures outlined above, you may not be admitted to the Annual Meeting.

Please let us know if you plan to attend the meeting by indicating your plans when prompted if you vote online or by telephone, or by marking the appropriate box on your proxy card if you vote by mail.

Will the Annual Meeting be webcast?

We do not expect to webcast the Annual Meeting.

How can I vote my shares in person at the Annual Meeting?

Shares held in your name as the stockholder of record may be voted by you in person at the Annual Meeting. Shares owned beneficially and held in street name may be voted by you in person at the Annual Meeting only if you obtain a legal proxy from the broker, bank, trustee, or other nominee that holds your shares giving you the right to vote the shares. Even if you plan to attend the Annual Meeting, we recommend that you also submit your proxy or voting instructions as described below so that your vote will be counted if you later decide not to attend the meeting.

How can I vote my shares without attending the Annual Meeting?

By telephone or via the Internet

If you are a stockholder of record, you may vote by following the telephone or Internet voting instructions on your Notice.

If you are a beneficial owner of shares, your broker, bank, trustee, or other nominee may make telephone or Internet voting available to you. The availability of telephone and Internet voting for beneficial owners will depend on the voting processes of your broker, bank, trustee, or other nominee. Therefore, we recommend that you follow the voting instructions in the materials you receive.

By mail, if you requested a printed copy of the proxy materials

If you are a stockholder of record, complete, sign and date the enclosed proxy card or voting instruction card and return it in the return envelope provided (which is postage prepaid if mailed in the United States). If the prepaid envelope is missing, please mail your completed proxy card to Fluidigm Corporation, c/o Alliance Advisors, 200 Broadacres Drive, 3rd Floor, Bloomfield, New Jersey 07003.

If you are a stockholder of record and you return your signed proxy card but do not indicate your voting preferences, the persons named in the proxy card as proxy holders—Stephen Christopher Linthwaite and Vikram Jog—will vote the shares represented by your proxy card as recommended by our Board.

If you are a beneficial owner of shares and you requested a printed copy of the proxy materials from your broker, bank, trustee, or other nominee, simply complete the proxy card and mail it according to the instructions provided by your broker, bank, trustee, or other nominee.

You may attend the Annual Meeting in person even if you have already voted by proxy.

Can I change my vote or revoke my proxy?

You may change your vote at any time prior to the taking of the vote at the Annual Meeting. If you are the stockholder of record, you may change your vote by (i) granting a new proxy bearing a later date (which automatically revokes the earlier proxy) using any of the methods described above (and until the applicable deadline for each method), (ii) providing a written notice of revocation to our corporate secretary at Fluidigm Corporation, 7000 Shoreline Court, Suite 100, South San Francisco, California 94080, Attn: Corporate Secretary, prior to your shares being voted, or (iii) attending the Annual Meeting and voting in person. Attendance at the meeting will not cause your previously granted proxy to be revoked unless you specifically so request. For shares held in street name, you may change your vote by submitting new voting instructions to your broker, bank, trustee, or nominee following the instructions they provided or, if you have obtained a legal proxy from your broker, bank, trustee, or nominee giving you the right to vote your shares, by attending the Annual Meeting and voting in person.

Is there a list of stockholders entitled to vote at the Annual Meeting?

The names of stockholders of record entitled to vote at the Annual Meeting will be available at the Annual Meeting and from our corporate secretary for ten days prior to the meeting for any purpose germane to the meeting, between the hours of 9:00 a.m. and 4:30 p.m., at our corporate headquarters at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080.

Is my vote confidential?

Proxy instructions, ballots, and voting tabulations that identify individual stockholders are handled in a manner that protects your voting privacy. Your vote will not be disclosed either within Fluidigm or to third parties, except as necessary to meet applicable legal requirements, to allow for the tabulation of votes and certification of the vote, or to facilitate a successful proxy solicitation.

How many shares must be present or represented to conduct business at the Annual Meeting?

Holders of a majority of the issued and outstanding shares of common stock as of the record date must be present in person or represented by proxy, also referred to as a quorum, to hold and transact business at the Annual Meeting. Abstentions and “broker non-votes” are counted as present and entitled to vote for purposes of determining a quorum. A “broker non-vote” occurs when a broker, bank, trustee, or other nominee holding shares for a beneficial owner does not vote on a particular proposal because that holder does not have discretionary voting power for that particular item and has not received voting instructions from the beneficial owner. If there is no quorum, the chairperson of the meeting or the holders of a majority of the issued and outstanding shares of common stock present at the Annual Meeting may adjourn the meeting to another date.

What is the voting requirement to approve each of the proposals?

Proposal	Vote Required	Discretionary Voting Allowed?
Election of Class III Directors	Plurality of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the election of directors	No
Advisory Vote on Approval of Executive Compensation	Majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the subject matter	No
Approval of the Amended and Restated 2011 Equity Incentive Plan	Majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the subject matter	No
Ratification of Appointment of PricewaterhouseCoopers LLP for the year ending December 31, 2019	Majority of the shares of our common stock present in person or represented by proxy at the meeting and entitled to vote on the subject matter	Yes

If you are a beneficial owner, your broker, bank, trustee, or other nominee is permitted to vote your shares on the ratification of the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019, even if the record holder does not receive voting instructions from you. However, your broker, bank, trustee, or other nominee does not have discretionary authority to vote on the election of the Class III directors without instructions from you, in which case a broker non-vote will occur and your shares will not be voted on this matter. In addition, discretionary voting is not allowed with respect to the advisory vote to approve the compensation of our named executive officers or the proposal seeking the approval of our amended and restated 2011 Equity Incentive Plan. Accordingly, if you are a beneficial owner, it is particularly important that you provide your instructions for voting your shares on the election of the Class III directors, the advisory vote on approval of executive compensation, and the approval of our amended and restated 2011 Equity Incentive Plan to your broker, bank, trustee, or other nominee.

Election of Class III Directors

The election of directors requires a plurality vote of the shares of our common stock present in person or by proxy at the meeting and entitled to vote thereon to be approved. Therefore, the three nominees receiving the highest number of affirmative "FOR" votes will be elected as Class III directors. You may (i) vote "FOR" all nominees, (ii) "WITHHOLD" your vote as to all nominees, or (iii) vote "FOR ALL EXCEPT" for those specific nominees from whom you withhold your vote. A properly executed proxy card marked "WITHHOLD" or "FOR ALL EXCEPT" will not be voted with respect to the election of the applicable Class III director(s) although it will be counted for purposes of determining whether there is a quorum. Abstentions and broker non-votes will not affect the outcome of the election of the Class III directors.

Advisory Vote on Approval of Executive Compensation

The affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the proposal is required to approve, on an advisory basis, the compensation awarded to our named executive officers for the year ended December 31, 2018. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions have the same effect as a vote against the proposal. Broker non-votes are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal. Although the vote is non-binding, our Board and our Compensation Committee value the opinions of our stockholders in this matter and, to the extent there is any significant vote against the named executive officer compensation as disclosed in this proxy statement, we will endeavor to communicate with stockholders to better understand the concerns that influenced the vote, consider our stockholders' concerns and the Compensation Committee will evaluate whether any actions are necessary to address those concerns.

Approval of Amended and Restated 2011 Equity Incentive Plan

The affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote thereon is required to approve our Amended and Restated 2011 Equity Incentive Plan. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions have the same effect as a vote against the proposal. Broker non-votes are not deemed to be votes cast, are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal.

Ratification of Appointment of PricewaterhouseCoopers LLP

The affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the proposal is required to ratify the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions have the same effect as a vote against the proposal. Broker non-votes are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal. Notwithstanding the appointment of PricewaterhouseCoopers LLP and even if our stockholders ratify the appointment, our Audit Committee, in its discretion, may appoint another independent registered public accounting firm at any time during our fiscal year if our Audit Committee believes that such a change would be in the best interests of our Company and our stockholders.

Interest of Executive Officers and Directors

None of our executive officers or directors has any substantial interest in any matter to be acted upon, other than (i) our directors, with respect to the election to office of the directors so nominated; and (ii) our directors and executive officers with respect to the Amended and Restated 2011 Equity Incentive Plan in which such directors and executive officers are eligible to participate.

What happens if additional matters are presented at the Annual Meeting?

Other than the items of business described in this proxy statement, we are not aware of any other business to be acted upon at the Annual Meeting. If you grant a proxy, the persons named as proxy holders, Stephen Christopher Linthwaite and Vikram Jog, or either of them, will have the discretion to vote your shares on any additional matters properly presented for a vote at the meeting. If for any reason a Class III director nominee is not available as a candidate for director, the persons named as proxy holders will vote your proxy for such other candidate as may be nominated by our Board.

Who will count the votes?

A representative of our mailing agent, Alliance Advisors, LLC, will tabulate the votes and act as inspector of elections.

Who will bear the cost of soliciting votes for the Annual Meeting?

We will pay the entire cost of preparing, assembling, printing, mailing, and distributing these proxy materials and soliciting votes. In addition to the mailing of these proxy materials, the solicitation of proxies or votes may be made in person, by telephone, or by electronic communication by our directors, officers, and employees, who will not receive any additional compensation for such solicitation activities. We may also reimburse brokerage firms, bank, trustee, and other nominees for the cost of forwarding proxy materials to beneficial owners.

Where can I find the voting results of the Annual Meeting?

We will announce preliminary voting results at the Annual Meeting. We will also disclose voting results on a Current Report on Form 8-K (a "Form 8-K") filed with the SEC within four business days after the Annual Meeting. If final voting results are not available to us in time to file a Form 8-K within four business days after the Annual Meeting, we will file a Form 8-K to publish preliminary results and, within four business days after final results are known, file an additional Form 8-K to publish the final results.

What is "householding" and how does it affect me?

We have adopted a procedure approved by the SEC called "householding." Under this procedure, stockholders of record who have the same address and last name will receive only one copy of the Notice unless one or more of these stockholders notifies us that they wish to receive individual copies. Stockholders who participate in householding will continue to be able to request and receive separate proxy cards. This procedure will reduce our printing costs and postage fees.

If you are eligible for householding but you and other stockholders of record with whom you share an address received multiple copies of the Notice, or if you hold stock in more than one account, and, in either case, you wish to receive only a single copy of the Notice for your household, please contact our mailing agent, Alliance Advisors LLC, either by calling (973) 873-7700 or by writing to Alliance Advisors, 200 Broadacres Drive, 3rd Floor, Bloomfield, New Jersey 07003.

If you participate in householding and wish to receive a separate copy of the Notice, or if you do not wish to continue to participate in householding and prefer to receive separate copies in the future, please contact Alliance Advisors LLC as indicated above.

Upon request, we will promptly deliver a separate copy of the Notice and, if applicable, the proxy materials to any stockholder at a shared address to which we delivered a single copy of any of these documents.

Beneficial owners can request information about householding from their broker, banks, trustee, or other nominee.

What is the deadline to propose actions for consideration at next year's annual meeting of stockholders or to nominate individuals to serve as directors?

Stockholder Proposals

Stockholders may present proper proposals for inclusion in our proxy statement and for consideration at the next annual meeting of stockholders by submitting their proposals in writing to our corporate secretary in a timely manner. For a stockholder proposal to be considered for inclusion in our proxy statement for our next annual meeting of stockholders, our corporate secretary must receive the written proposal at our principal executive offices not later than December 25, 2019; *provided*, *however*, that in the event that we hold our 2020 annual meeting of stockholders more than 30 days before or 60 days after the one-year anniversary date of the 2019 annual meeting, we will disclose the new deadline by which stockholder proposals must be received under Item 5 of our earliest possible Quarterly Report on Form 10-Q or, if impracticable, by any means reasonably calculated to inform stockholders. In addition, stockholder proposals must otherwise comply with the requirements of Rule 14a-8 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). Such proposals also must comply with SEC regulations under Rule 14a-8 regarding the inclusion of stockholder proposals in company-sponsored proxy materials. Proposals should be addressed to:

Fluidigm Corporation
Attn: Corporate Secretary
7000 Shoreline Court, Suite 100
South San Francisco, California 94080

Our bylaws also establish an advance notice procedure for stockholders who wish to present a proposal before an annual meeting of stockholders, but do not intend for the proposal to be included in our proxy statement. Our bylaws provide that the only business that may be conducted at an annual meeting is business that is (i) specified in the Company's proxy materials with respect to such meeting, (ii) otherwise properly brought before the meeting by or at the direction of our Board, or (iii) properly brought before the meeting by a stockholder of record entitled to vote at the annual meeting who has delivered timely written notice to our corporate secretary, which notice must contain the information specified in our bylaws. To be timely for our 2020 annual meeting of stockholders, our corporate secretary must receive the written notice at our principal executive offices:

- not earlier than February 8, 2020, and
- not later than March 9, 2020.

In the event that we hold our 2020 annual meeting of stockholders more than 30 days before or more than 60 days after the one-year anniversary date of the 2019 annual meeting, then notice of a stockholder proposal that is not intended to be included in our proxy statement must be received no earlier than the close of business on the 120th day before such annual meeting and no later than the close of business on the later of the following two dates:

- the 90th day prior to such annual meeting, or
- the 10th day following the day on which public announcement of the date of such meeting is first made.

If a stockholder who has notified us of his, her or its intention to present a proposal at an annual meeting does not appear to present such proposal at such meeting, we are not required to present the proposal for a vote at the meeting.

Nomination of Director Candidates

Our bylaws permit stockholders to nominate directors for election at an annual meeting of stockholders. To nominate a director, the stockholder must provide the information required by our bylaws. In addition, the stockholder must give timely notice to our corporate secretary in accordance with our bylaws, which, in general, require that the notice be received by our corporate secretary within the time described above under "Stockholder Proposals" for stockholder proposals that are not intended to be included in our proxy statement.

In addition, it is the policy of our Nominating and Corporate Governance Committee to consider recommendations for candidates to the Board from stockholders holding not less than one percent (1%) of the outstanding shares of our common stock continuously for at least twelve months prior to the date of submission of the recommendation or nomination. Any such recommendations should include the nominee's name and qualifications for membership on our Board of Directors, and should be directed to our corporate secretary at our address set forth above. For additional information regarding stockholder recommendations for director candidates, please see the section entitled "*Corporate Governance and Board of Directors — Process for Recommending Candidates to the Board of Directors*."

Availability of Bylaws

Our bylaws are available on our website at http://investors.fluidigm.com/corporate-governance. You may also contact our corporate secretary at our principal executive offices for a copy of the relevant bylaw provisions regarding the requirements for making stockholder proposals and nominating director candidates.

CORPORATE GOVERNANCE AND BOARD OF DIRECTORS

Policy on Business Conduct and Ethics

We are committed to the highest standards of integrity and ethics in the way we conduct our business. We have adopted a code of ethics and conduct that applies to our Board of Directors, officers, and employees, including our Chief Executive Officer, Chief Financial Officer, Principal Accounting Officer and other executive and senior officers. Our code of ethics and conduct establishes our policies and expectations with respect to a wide range of business conduct, including preparation and maintenance of financial and accounting information, compliance with laws, and conflicts of interest.

Under our code of ethics and conduct, each of our directors, officers, and employees is required to report suspected or actual violations to the extent permitted by law. In addition, we have adopted separate procedures concerning the receipt and investigation of complaints relating to accounting or audit matters. These procedures have been adopted and are administered by our Audit Committee.

Our code of ethics and conduct is available on our website at http://investors.fluidigm.com/corporate-governance. When required by the rules of the SEC or the Nasdaq Global Select Market ("Nasdaq"), we will disclose any future amendment to, or waiver of, any provision of the code of ethics and conduct for our Chief Executive Officer, Principal Financial Officer, Principal Accounting Officer, or any member of our Board on our website at www.fluidigm.com in the Governance section of the Investors webpage, within four business days following the date of such amendment or waiver.

Corporate Governance Principles

Our Board of Directors has adopted a set of principles that establish the corporate governance policies pursuant to which the Board intends to conduct its oversight of our business in accordance with its fiduciary responsibilities. Among other things, these corporate governance principles address the establishment and operation of Board committees, the role of our chairman, and matters relating to director independence and performance assessments. Our corporate governance principles are available on our website at http://investors.fluidigm.com/corporate-governance.

Role and Composition of the Board

As identified in our corporate governance principles, the role of our Board of Directors is to oversee the performance of our Chief Executive Officer and other senior management. Our Board is responsible for hiring, overseeing, and evaluating management while management is responsible for running our day-to-day operations.

Our Board of Directors currently comprises seven members and is divided into three staggered classes of directors. The Board is nominating three nominees for election as Class III directors.

The following table sets forth the names, ages as of April 8, 2019, and certain other information for each of our current directors:

Name	Class	Age	Position	Director Since	Current Term Expires	Expiration of Term For Which Nominated
Nicolas Barthelemy[(1)][(2)]	I	53	Director	2017	2020	—
Patrick S. Jones[(1)]	I	74	Director	2011	2020	—
Gerhard F. Burbach[(1)][(2)]	II	57	Director	2013	2021	—
Carlos Paya[(3)]	II	60	Director	2017	2021	—
Laura M. Clague[(1)]	III	60	Director	2018	2019	2022
Samuel D. Colella[(2)][(3)]	III	79	Chairman	2000	2019	2022
Stephen Christopher Linthwaite	III	47	President, Chief Executive Officer, and Director	2016	2019	2022

[(1)] Member of our Audit Committee

(2) Member of our Compensation Committee

(3) Member of our Nominating and Corporate Governance Committee

At each annual meeting of stockholders, a class of directors is elected for a term of three years to succeed the class of directors whose terms are then expiring. The terms of the directors will expire upon the election and qualification of successor directors at the annual meeting of stockholders to be held during the years 2020 for the Class I directors, 2021 for the Class II directors, and 2022 for the Class III directors.

2018 Board Meetings

During 2018, our Board of Directors held eight (8) meetings. All of our directors attended at least 75% of the aggregate number of meetings of the Board and of the committees on which they served during the past fiscal year, in each case during the period that he or she served as a director.

Board Leadership Structure

Our corporate governance principles provide that the Board will fill the chairman and Chief Executive Officer positions based upon the Board's view of what is in our best interests at any point in time. Although our current chairman is a non-employee director, the Board has not adopted any policy requiring separation of the chairman and Chief Executive Officer positions or requiring allocation of the chairman position to a non-employee director. Samuel D. Colella, an independent director with substantial board and executive leadership experience, currently serves as our chairman. In addition to Fluidigm, Mr. Colella currently serves on the boards of directors of Flexion Therapeutics, Inc. (FLXN) and of several private companies. Our Board of Directors believes that Mr. Colella's qualifications to serve as chairman include his broad understanding of the life science industry and his extensive experience with emerging private and public companies, including prior service as chairman of other boards of directors.

Separating the positions of the chairman and Chief Executive Officer allows our Chief Executive Officer to focus on our day-to-day business, while allowing our chairman to lead our Board in its fundamental role providing independent advice to and oversight of management. The Board believes that having an independent director serve as chairman is the appropriate leadership structure for Fluidigm at this time and demonstrates our commitment to good corporate governance.

Director Independence

As a company listed on Nasdaq, we are required by the Nasdaq listing requirements to maintain a board of directors comprising a majority of "independent directors," as determined affirmatively by our Board. In addition, the Nasdaq rules require that, subject to specified exceptions, each member of our Audit, Compensation, and Nominating and Corporate Governance Committees be independent. In April 2019, our Board of Directors undertook a review of the independence of our directors and considered whether any director has a material relationship with us that could compromise his or her ability to exercise independent judgment in carrying out his or her responsibilities. As a result of this review, our Board of Directors determined that a majority of our directors are "independent directors" as defined under applicable Nasdaq rules, including Nicolas Barthelemy, Gerhard F. Burbach, Laura M. Clague, Samuel D. Colella, Patrick S. Jones, and Carlos Paya. Stephen Christopher Linthwaite is not considered an independent director because of his positions as our President and Chief Executive Officer. There are no family relationships among any of our directors and officers.

Executive Sessions of Independent Directors

In order to promote open discussion among independent directors, our Board of Directors has a policy of conducting executive sessions of independent directors during each regularly scheduled board meeting and at such other times as requested by an independent director. These executive sessions are chaired by our chairman. Mr. Linthwaite does not participate in such sessions.

Board's Role in Risk Oversight

While our Board of Directors has the ultimate oversight responsibility for the risk management process, it has charged our Audit Committee with responsibility to oversee management's processes for identifying, monitoring, and addressing enterprise risks, evaluate and discuss with management its assessments of matters relating to enterprise risks, and oversee and monitor management's plans to address such risks. Our Audit Committee oversees an enterprise-wide approach to risk management designed to support the achievement of organizational objectives, including strategic objectives, to improve long-term organizational performance, and to enhance stockholder value. A fundamental part of risk management is not only understanding the most significant risks a company faces and what steps management is taking to manage those risks, but also understanding what level of risk is appropriate for a given company. The Audit Committee's review of our business is an integral aspect of its assessment of management's tolerance for risk and its determination as to the appropriate level of risk for our Company.

In addition, in setting compensation, our Compensation Committee strives to create incentives that encourage a level of risk-taking consistent with our business strategy and to encourage a focus on building long-term value that does not encourage excessive risk-taking. In connection with its oversight of compensation-related risks, our Compensation Committee has reviewed our compensation programs and practices for employees, including executive and non-executive programs and practices. In its review, our Compensation Committee evaluated whether our policies and programs encourage unnecessary or excessive risk-taking and controls, and how such policies and programs are structured with respect to risks and rewards, as well as controls designed to mitigate any risks. As a result of this review, our Compensation Committee determined that any risks that may result from our compensation policies and practices for our employees are not reasonably likely to have a material adverse effect on Fluidigm.

Our Nominating and Corporate Governance Committee assists our Board of Directors in fulfilling its oversight responsibilities with respect to the management of risk associated with corporate governance and board organization, membership, and structure.

At periodic meetings of the Board and its committees and in other meetings and discussions, management reports to, and seeks guidance from, the Board and its committees with respect to the most significant risks that could affect our business, such as legal, financial, tax, and audit related risks. In addition, among other matters, management provides our Audit Committee periodic reports on our compliance programs and efforts, and investment policy and practices.

Board Committees

Our Board of Directors has three standing committees: an Audit Committee, a Compensation Committee, and a Nominating and Corporate Governance Committee. Each committee operates under a written charter approved by our Board of Directors that satisfies the applicable standards of the SEC and Nasdaq. The committee charters are available on our website at http://investors.fluidigm.com/corporate-governance.

The table below shows the members and chairs of each committee and the number of meetings held in 2018.

	Audit	Compensation	Nominating and Corporate Governance
Nicolas Barthelemy	X	X	—
Gerhard F. Burbach	X	C	—
Laura M. Clague	X	—	—
Samuel D. Colella	—	X	C**
Patrick S. Jones	C*	—	—
Carlos Paya	—	—	X**
Meetings in 2018	5	6	7

C = Chair

* Board-designated "audit committee financial expert" under SEC rules

** Dr. Paya was appointed to serve as chair in February 2019.

Audit Committee. Our Audit Committee currently consists of directors Patrick S. Jones, Nicolas Barthelemy, Gerhard F. Burbach, and Laura M. Clague. Mr. Jones is the chair of the Audit Committee. Our Board of Directors has determined that each of Patrick S. Jones, Nicolas Barthelemy, Gerhard F. Burbach, and Laura M. Clague, is independent and financially literate under the current rules and regulations of the SEC and Nasdaq, and that Patrick S. Jones qualifies as an "audit committee financial expert" within the meaning of the rules and regulations of the SEC.

Our Audit Committee oversees our corporate accounting and financial reporting process and our enterprise risk management process, and assists our Board of Directors in monitoring our financial systems and our legal and regulatory compliance. Our Audit Committee is authorized to, among other things:

- oversee the work of our independent registered public accounting firm;
- approve the hiring, discharge, and compensation of our independent registered public accounting firm;
- approve engagements of our independent registered public accounting firm to render any audit or permissible non-audit services;
- evaluate the qualifications, independence, and performance of our independent registered public accounting firm;
- discuss and, as appropriate, review with management and our independent registered public accounting firm our annual and quarterly financial statements and our major critical accounting policies and practices;
- review management's assessment of our internal controls; and
- review the adequacy and effectiveness of our internal control policies and procedures.

Compensation Committee. Our Compensation Committee currently consists of directors Gerhard F. Burbach, Nicolas Barthelemy, and Samuel D. Colella. Mr. Burbach is the chair of our Compensation Committee as of the date of this proxy statement, however Mr. Barthelemy will replace him as chair on the date of the Annual Meeting. Each member of our Compensation Committee is an independent director under the applicable rules and regulations of the SEC and Nasdaq, a nonemployee director as defined in Rule 16b-3 promulgated under the Exchange Act, and an outside director as defined pursuant to Section 162(m) of the U.S. Internal Revenue Code, as amended. Furthermore, if required to ensure compliance with Rule 16b-3 under the Exchange Act, a subcommittee of the Compensation Committee or the Board considers and approves the grant of equity awards to our executive officers.

Our Compensation Committee oversees our corporate compensation programs and is authorized to, among other things:

- review the compensation and benefits of our Chief Executive Officer and other executive officers;
- review our corporate goals and objectives relevant to the compensation of our Chief Executive Officer;
- assist our Board in providing oversight of the Company's overall compensation plans and benefits program; and
- administer our equity incentive plans.

Please see the sections entitled "*Compensation of Non-Employee Directors*" and "*Executive Compensation*" for a description of our processes and procedures for the consideration and determination of executive and director compensation.

Nominating and Corporate Governance Committee. Our Nominating and Corporate Governance Committee currently consists of directors Samuel D. Colella and Carlos Paya. Dr. Paya is the chair of the Nominating and Corporate Governance Committee. Our Board of Directors has determined that each member of our Nominating and Corporate Governance Committee is an independent director under the applicable rules and regulations of the SEC and Nasdaq.

Our Nominating and Corporate Governance Committee oversees and assists our Board of Directors in reviewing and recommending nominees for election as directors and oversees our corporate governance matters. The Nominating and Corporate Governance Committee is authorized to, among other things:

- evaluate and make recommendations regarding the composition, organization, and governance of the Board and its committees;
- evaluate the performance of members of the Board and make recommendations regarding committee and chair assignments;
- recommend desired qualifications for Board membership and conduct searches for potential members of the Board;
- review and recommend Board compensation programs for outside directors; and
- develop and make recommendations with regard to our corporate governance guidelines.

Compensation Committee Interlocks and Insider Participation

None of the members of our Compensation Committee during our last fiscal year (which included Gerhard F. Burbach, Nicolas Barthelemy, and Samuel D. Colella) is, or was during 2018, an officer or employee of our Company. None of our executive officers currently serves, or in the past year has served, as a member of the board of directors or compensation committee of any entity that has one or more executive officers serving on our Board or Compensation Committee.

To the extent any members of our Compensation Committee and affiliates have participated in transactions with us meeting the disclosure requirements of Item 404 of Regulation S-K, their respective transactions are described in "*Related Person Transactions and Section 16(a) Beneficial Ownership Reporting Compliance — Related Person Transactions*." See also "*Corporate Governance and Board of Directors — Board Committees*" for further information regarding our Compensation Committee.

Considerations in Identifying and Evaluating Director Nominees

Our Nominating and Corporate Governance Committee has established policies and procedures relating to the consideration of any individual recommended as a prospective director nominee from stockholders. Please see the section entitled "*Process for Recommending Candidates to the Board of Directors*" below. The Committee will consider candidates recommended by stockholders in the same manner as candidates recommended to the Committee from other sources.

In its evaluation of director candidates, including the members of the Board eligible for reelection, our Nominating and Corporate Governance Committee considers the following:

- the current size and composition of our Board and the needs of the Board and its respective committees;
- factors such as character, integrity, judgment, experience, independence, area of expertise, corporate experience, length of service, potential conflicts of interest, other commitments, and the like (the Committee evaluates these factors, among others, and does not assign any particular weighting or priority to any of these factors); and
- other factors that our Nominating and Corporate Governance Committee may consider appropriate.

Our Nominating and Corporate Governance Committee also focuses on issues of diversity, such as diversity of gender, race and national origin, education, professional experience and differences in viewpoints and skills. In February 2018, our Nominating and Corporate Governance Committee approved an amendment to our director nominating policies to include a specific reference to factors relating to diversity when considering potential director candidates. Our Board intends to consider these factors, including in particular gender diversity, in connection with its deliberations over Board expansion and potential candidates.

Any nominee for a position on the Board must satisfy the following minimum qualifications:

- the highest personal and professional ethics and integrity;
- proven achievement and competence in the nominee's field and the ability to exercise sound business judgment;
- skills that are complementary to those of the existing Board;
- the ability to assist and support management and make significant contributions to the Company's success; and
- an understanding of the fiduciary responsibilities required of a member of the Board and the commitment of time and energy necessary to diligently carry out those responsibilities.

If our Nominating and Corporate Governance Committee determines that an additional or replacement director is required, the Nominating and Corporate Governance Committee may take such measures as it considers appropriate in connection with its evaluation of a director candidate, including candidate interviews, inquiry of the person or persons making the recommendation or nomination, engagement of an outside search firm to gather additional information, or reliance on the knowledge of the members of the Committee, Board, or management. Fluidigm has retained a third-party search firm to assist with the identification and evaluation of qualified candidates to serve on the Board of Directors.

Process for Recommending Candidates to the Board of Directors

Our Nominating and Corporate Governance Committee is responsible for, among other things, determining the criteria for membership to our Board and recommending candidates for election to the Board of Directors. It is the policy of our Nominating and Corporate Governance Committee to consider recommendations for candidates to the Board from stockholders holding not less than one percent (1%) of the outstanding shares of our common stock continuously for at least twelve months prior to the date of submission of the recommendation or nomination. Stockholder recommendations for candidates to the Board of Directors must be directed in writing to Fluidigm Corporation, 7000 Shoreline Court, Suite 100, South San Francisco, California 94080, Attention: Corporate Secretary, and must include the candidate's name, home and business contact information, detailed biographical data, relevant qualifications, a signed letter from the candidate confirming willingness to serve, information regarding any relationships between the candidate and Fluidigm, and evidence of the recommending stockholder's ownership of our stock. Such recommendations must also include a statement from the recommending stockholder in support of the candidate, particularly within the context of the criteria for Board membership, including issues of character, integrity, judgment, diversity of experience, independence, area of expertise, corporate experience, length of service, potential conflicts of interest, other commitments, and the like, and personal references. For details regarding the process to nominate a director directly for election to the Board at an annual meeting of the stockholders, please see the section entitled "*General Information — What is the deadline to propose actions for consideration at next year's annual meeting of stockholders or to nominate individuals to serve as directors? — Nomination of Director Candidates*."

Director Attendance at Annual Meetings

Although we do not have a formal policy regarding attendance by members of our Board at annual meetings of stockholders, we encourage, but do not require, directors to attend. One of the then-six members of our Board attended our 2018 annual meeting of stockholders.

Communications with the Board of Directors

Stockholders who wish to communicate with our Board are welcome to do so either (i) in writing, at the following address: Fluidigm Corporation, 7000 Shoreline Court, Suite 100, South San Francisco, California 94080, Attn: Corporate Secretary, or (ii) online at http://investors.fluidigm.com/contact-us. Communications are distributed to our Board, or to any individual directors as appropriate, depending on the facts and circumstances outlined in the communication.

COMPENSATION OF NON-EMPLOYEE DIRECTORS

Compensation Policy

Non-employee directors receive an annual retainer for service on our Board of Directors and an annual retainer for service on committees of the Board as set forth below:

Annual cash retainer for each non-employee director	$40,000
Annual cash retainer for each Audit Committee member	$10,000
Annual cash retainer for each Compensation Committee member	$ 7,000
Annual cash retainer for each Nominating and Corporate Governance Committee member	$ 5,000
Additional cash retainer for chairmanship of the Board	$40,000
Additional cash retainer for chairing the Audit Committee	$10,000
Additional cash retainer for chairing the Compensation Committee	$ 8,000
Additional cash retainer for chairing the Nominating and Corporate Governance Committee	$ 5,000

Additionally, we have adopted an outside director equity compensation policy to formalize the granting of equity compensation to our non-employee directors under our 2011 Equity Incentive Plan. The policy provides for automatic, nondiscretionary grants of nonstatutory stock options and restricted stock units, or RSUs, subject to the terms and conditions of the policy and the 2011 Equity Incentive Plan. Nevertheless, non-employee directors remain eligible to receive all types of awards under the 2011 Equity Incentive Plan, except for incentive stock options, and may receive discretionary awards not covered by the policy.

Under the policy, we automatically grant an option to purchase 15,000 shares of our common stock and 10,000 RSUs to anyone who becomes a non-employee director on the date such person first becomes a non-employee director. An employee director who subsequently ceases to be an employee, but remains a director, does not receive such an initial award.

Prior to May 2018, each non-employee director was automatically granted an annual stock option to purchase 5,000 shares of our common stock and 5,000 RSUs on the date of each annual meeting of stockholders beginning on the date of the first annual meeting of stockholders that is held after such non-employee director receives his or her initial award. In May 2018, we amended our outside director equity compensation policy to provide that each non-employee director is automatically granted an annual stock option to purchase 10,600 shares of our common stock and 6,100 RSUs on the date of each annual meeting of stockholders beginning on the date of the first annual meeting of stockholders that is held after such non-employee director receives his or her initial award.

The exercise price of all stock options granted pursuant to the policy is equal to or greater than the fair market value of our common stock on the date of grant and the term of all stock options is ten years. Subject to the adjustment provisions of the 2011 Equity Incentive Plan, initial awards of options vest and initial awards of RSUs vest as to 25% of the shares subject to such awards on each anniversary of the date of grant, provided such non-employee director continues to serve as a director through each such date. Subject to the adjustment provisions of the 2011 Equity Incentive Plan, 1/12th of the shares subject to the annual option awards vest each month after the date of grant and the annual RSU awards vest in full on the earlier of the day prior to the next annual meeting of our stockholders or the one-year anniversary of the date of grant, in each case provided such non-employee director continues to serve as a director through each such date.

The administrator of the 2011 Equity Incentive Plan in its discretion may change or otherwise revise the terms of awards granted under the outside director equity compensation policy.

In the event of a "change of control," as defined in our 2011 Equity Incentive Plan, with respect to awards granted under the 2011 Equity Incentive Plan to non-employee directors, the participant non-employee director will fully vest in and have the right to exercise awards as to all shares underlying such award regardless of performance goals, vesting criteria, or other conditions.

RSUs in Lieu of Cash and RSU Deferral

Non-employee directors have the option to elect to receive an RSU award in lieu of 100% of their annual cash retainers payable for services to be rendered as a non-employee director, chairperson of the board, or chair or member of any Board committee. RSUs elected in lieu of payments in cash vest quarterly but settlement of such RSUs can be deferred as described below.

Each non-employee director may elect to defer settlement of his or her RSU grants until the earlier of the termination of his or her service on our Board of Directors or a qualifying change in control.

Non-Employee Director Stock Ownership Guidelines

Our Board of Directors has approved stock ownership guidelines for our non-employee directors to further align their interests with the interests of our stockholders.

Pursuant to the guidelines, each non-employee director is expected to accumulate and hold a number of shares of our common stock equal to the lesser of (i) that number of shares with a value equal to three times his or her Board cash retainer or (ii) 19,540 shares, and to maintain this minimum amount of stock ownership during the director's tenure on the Board. For purposes of determining stock ownership pursuant to the guidelines, we include shares owned outright and vested in-the-money stock options, but do not include value or shares attributable to unvested time vesting restricted stock, unvested and/or out-of-the money stock options and/or unearned performance shares. Our non-employee directors are expected to achieve the applicable level of ownership by the end of the fiscal year that follows the five-year anniversary of the date he or she becomes covered by the guidelines.

Non-employee directors are not required to purchase shares on the open market in order to comply with the guidelines. In the event a non-employee director falls out of compliance with the guidelines at any time, he or she will be required to maintain 50% of the shares (net of tax and exercise costs) acquired through the vesting or exercise of awards until the guidelines are again satisfied. The guidelines include a once-met-always-met policy such that each non-employee director will be deemed to satisfy the guideline if they hold at least the number of shares that, as of the first measurement date they comply with the guidelines, was equal to the guideline value (i.e., following the initial compliance, the policy for each non-employee director will reset to the lesser of the guideline value or the number of shares that originally satisfied the guideline).

2018 Director Compensation

The following table sets forth information concerning compensation paid or accrued for services rendered to us by members of our Board for the year ended December 31, 2018. The table excludes Mr. Linthwaite, who was a named executive officer and did not receive any compensation from us in his role as a director in 2018.

	Fees Earned or Paid in Cash ($)	Stock Awards ($)[1]	Option Awards ($)[1]	Total ($)
Nicolas Barthelemy	56,995[2]	33,977	33,805	124,777
Gerhard F. Burbach	64,993[3]	33,977[4]	33,805	132,776
Laura M. Clague	8,560	74,200	61,557	144,317
Samuel D. Colella	96,995[2]	33,977	33,805	164,777
Patrick S. Jones	60,000	33,977	33,805	127,782
Carlos Paya	44,997[2]	33,977	33,805	112,779

[1] Amounts represent the aggregate grant date fair value of the option award and restricted stock unit awards, as applicable, calculated in accordance with Financial Accounting Standards Board ASC Topic 718, Stock Compensation, as amended, without regard to estimated forfeitures. See Note 9 of the notes to our audited consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2018 for a discussion of valuation assumptions made in determining the grant date fair value and compensation expense of our stock options and restricted stock unit awards.

[2] Amount includes RSUs received in lieu of cash fees for 2018.

[3] Amount includes RSUs received in lieu of cash fees for 2018 with respect to which settlement has been deferred.

[4] Amount includes RSUs with respect to which settlement has been deferred.

Director Equity Awards

The aggregate number of shares underlying stock options and RSUs outstanding as of December 31, 2018 for each non-employee director was as follows:

	Aggregate Number of Shares Underlying Stock Options Outstanding as of December 31, 2018	Aggregate Number of Shares Underlying Restricted Stock Units Outstanding as of December 31, 2018
Nicolas Barthelemy	33,600	13,600
Gerhard F. Burbach	85,600	30,215[1]
Laura M. Clague	15,000	10,000
Samuel D. Colella	43,600	6,100
Patrick S. Jones	109,600	6,100
Carlos Paya	33,600	13,600

[1] Amount includes RSUs—including some received in lieu of cash fees for 2018—with respect to which settlement has been deferred.

PROPOSAL NUMBER 1
ELECTION OF CLASS III DIRECTORS

Board Structure

Our Board of Directors currently comprises seven members and is divided into three staggered classes of directors. At each annual meeting of stockholders, a class of directors is elected for a term of three years to succeed the class of directors whose terms are then expiring. The terms of the directors will expire upon the election and qualification of successor directors at the annual meeting of stockholders to be held this year for the Class III directors, in 2020 for the Class I directors, and in 2021 for the Class II directors.

Nominees for Class III Directors (Term Expiring in 2022)

At the 2019 Annual Meeting, three Class III directors will be elected to the Board by the holders of our common stock. Our Nominating and Corporate Governance Committee recommended, and our Board of Directors nominated, Laura M. Clague, Samuel D. Colella, and Stephen Christopher Linthwaite, each a current Class III director, as nominees for re-election as Class III directors at the 2019 Annual Meeting.

Ms. Clague, Mr. Colella, and Mr. Linthwaite have each agreed to serve if elected, and management has no reason to believe that they will be unavailable to serve. In the event a nominee is unable or declines to serve as a director at the time of the 2019 Annual Meeting, proxies will be voted for any nominee who may be proposed by the Nominating and Corporate Governance Committee and designated by the present Board of Directors to fill the vacancy.

Biographical Information Concerning the Class III Director Nominees

Laura M. Clague, age 60, has served as a member of our Board of Directors since October 2018. Ms. Clague has served as the Senior Vice President and Chief Financial Officer of Retrophin, Inc. since November 2014. Ms. Clague previously served as the Chief Financial Officer of the San Diego and Ohio operations of Amylin Pharmaceuticals, Inc., a wholly owned subsidiary of Bristol-Myers Squibb. Prior to the acquisition by Bristol-Myers Squibb in 2012, Ms. Clague was the Vice President, Corporate Controller and Chief Accounting Officer of Amylin for 10 years, and during this time also served as the Chief Financial Officer of the Amylin/Lilly Collaboration. From 1988 to 1999, Ms. Clague was the director of finance and accounting operations for Sony Electronics, Inc. From 1985 to 1988, Ms. Clague served as internal audit supervisor at Cubic Corporation. From 1982 to 1985, Ms. Clague held various audit positions at KPMG. Ms. Clague also serves on the Board of Directors of LRAD Corporation where she chairs the Audit Committee. Ms. Clague is a certified public accountant in the State of California, and has a B.S. in Business Administration from Menlo College. We believe that Ms. Clague's extensive background in finance and accounting and her experience in the life sciences industry qualify her to serve on our Board of Directors.

Samuel D. Colella, age 79, has served as a member and chairman of our Board of Directors since July 2000. Mr. Colella is a managing director of Versant Ventures, a healthcare venture capital firm he co-founded in 1999, and has been a general partner of Institutional Venture Partners since 1984. Mr. Colella currently serves on the board of directors of Flexion Therapeutics, Inc. (Nasdaq: FLXN), a specialty pharmaceutical company. Mr. Colella also is currently a member of the board of directors of several private companies. Mr. Colella served on the board of directors of Genomic Health, Inc. (Nasdaq: GHDX), a molecular diagnostics company, from 2001 to 2014; Alexza Pharmaceuticals, Inc. (Nasdaq; ALXA), a pharmaceutical company, from 2002 to 2012; Jazz Pharmaceuticals, Inc. (Nasdaq: JAZZ), a biopharmaceutical company, from 2003 to 2012; Veracyte, Inc. (Nasdaq: VCYT), a diagnostics company, from 2006 to 2014. Mr. Colella received a B.S. in business and engineering from the University of Pittsburgh and an M.B.A. from Stanford University. We believe that Mr. Colella's broad understanding of the life science industry and his extensive experience working with emerging private and public companies, including prior service as chairman of boards of directors, qualifies him to serve on, and as chairman of our Board of Directors.

Stephen Christopher Linthwaite, age 47, joined Fluidigm as President and Chief Operating Officer in August 2016 and has served as our President, Chief Executive Officer, and Director since October 2016.

From August 2003 to April 2016, Mr. Linthwaite held various managerial positions at Thermo Fisher Scientific Inc., a life sciences company, and prior to its acquisition by Thermo Fisher, at Life Technologies Corporation, a life sciences company, including president, genetic sciences division, from December 2014 to April 2016, president, genetic analysis platform, from September 2011 to December 2014, and various other managerial positions at Invitrogen prior to the creation of Life Technologies through a merger of Invitrogen and Applied Biosystems. Prior to joining Invitrogen, Mr. Linthwaite held various strategic consulting roles. Mr. Linthwaite served on the board of directors of Claritas Genomics, Inc. from December 2014 to April 2016. Mr. Linthwaite received an M.B.A. from the University of Virginia (Darden) School of Business, and a B.A. in Foreign Affairs from the University of Virginia. Prior to business school, Mr. Linthwaite served on active duty in the U.S. Army as an armor officer. We believe that Mr. Linthwaite's extensive industry experience with life sciences companies qualifies him to serve on our Board.

Required Vote

The Class III directors elected to the Board of Directors will be elected by a plurality of the votes present in person or represented by proxy and entitled to vote on the election of directors. In other words, the three nominees receiving the highest number of "FOR" votes will be elected as Class III directors. Abstentions and broker non-votes will not affect the outcome of the election of the Class III directors. Shares represented by executed proxies will be voted, if authority to do so is not expressly withheld (as indicated on the proxy card), for the election of Laura M. Clague, Samuel D. Colella, and Stephen Christopher Linthwaite.

Recommendation

Our Board of Directors recommends a vote "FOR" the election to the Board each of Laura M. Clague, Samuel D. Colella, and Stephen Christopher Linthwaite as Class III directors.

Continuing Class I Directors (Term Expiring in 2020)

Patrick S. Jones, age 74, has served as a member of our Board of Directors since March 2011. Mr. Jones has been a private investor since March 2001. Mr. Jones currently serves on the board of directors of Talend SA (Nasdaq: TLND), a data integration software company, and Itesoft SA (PAR: ITE.PA), a business process automation software company. From 2003 to May 2018, Mr. Jones served as chairman of Inside Secure SA (PAR: INSD.PA), a company that makes digital security solutions. From 2005 to May 2015, Mr. Jones served on the board of directors of Lattice Semiconductor Corporation (Nasdaq: LSCC), a fabless semiconductor company. From 2012 to 2013, Mr. Jones served as chairman of Dialogic Inc. (OTC: DLGC), a communications technology company. From 2005 to 2012, Mr. Jones served as chairman of Epocrates, Inc., a provider of clinical solutions to healthcare professionals and interactive services to the healthcare industry, which was acquired by athenahealth, Inc. in 2013. From 2007 to 2012, Mr. Jones also served on the board of directors of Openwave Systems Inc., a telecom infrastructure software provider that changed its name to Unwired Planet (Nasdaq: UPIP) in 2012. From 2007 to 2011, Mr. Jones served on the board of directors of Novell, Inc., an enterprise infrastructure software provider that was sold to Attachmate Corporation in 2011. From June 1998 to March 2001, Mr. Jones was the senior vice president and chief financial officer of Gemplus International S.A. (now GEMALTO N.V.), a provider of solutions empowered by smart cards. From March 1992 to June 1998, he was vice president of finance and corporate controller at Intel Corporation, a producer of microchips and communications products. Prior to that, Mr. Jones served as chief financial officer of LSI Corporation (formerly known as LSI Logic), a semiconductor company. Mr. Jones received a B.A. from the University of Illinois and an M.B.A. from St. Louis University. We believe that Mr. Jones' significant financial and accounting expertise and international business experience qualify him to serve on our Board of Directors.

Nicolas M. Barthelemy, age 53, has served as a member of our Board of Directors since March 2017. Mr. Barthelemy brings over 25 years of health-care industry experience to the director role. From 2014 to February 2017, Mr. Barthelemy served as the president and chief executive officer of Biotheranostics, Inc., a molecular diagnostics company. From 2010 until 2013, he served as president, global commercial operations at Life Technologies Corporation, a global life sciences company, which was acquired by Thermo Fisher Scientific Inc. in February 2014. Prior to that position, he led the $850M Cell Systems division from 2005 to 2010. Before Life Technologies, from 1996 to 2004, Mr. Barthelemy was with Biogen Inc., a biotechnology company, most recently as vice president, manufacturing. He began his career with Merck & Co., Inc. (NYSE: MRK), a pharmaceutical company, as a project engineer in the vaccine division and worked for the company from 1991 to 1996. From January 2018 to November 2018, Mr. Barthelemy served on the board of directors of Genewiz (privately held), a biotechnology company. Mr. Barthelemy currently serves as a member of the boards of directors of Repligen Corporation (Nasdaq: RGEN), 908 Devices Inc. (privately held), and of Biocare Medical, LLC (privately held). All three companies are in the life sciences sector. He received an M.S. in Chemical Engineering from the University of California, Berkeley in 1991, and an engineering degree from Ecole Superieure de Physique et Chimie Industrielles, Paris in 1989. We believe that Mr. Barthelemy's extensive experience in manufacturing, distributing and commercializing life science instruments, reagents and services, his knowledge of the research and clinical markets as well as his relevant public board experience qualify him to serve on our Board of Directors.

Continuing Class II Directors (Term Expiring in 2021)

Gerhard F. Burbach, age 57, has been a member of our Board of Directors since January 2013. Mr. Burbach currently serves as chairman of the board of directors of Procyrion Inc., a private medical device company focused on the treatment of chronic heart failure, and as a member of the boards of directors of Vascular Dynamics, a private medical device company focused on the treatment of hypertension, and BWX Technologies, Inc. (NYSE: BWXT), a company that manufactures and supplies nuclear components and fuel. Mr. Burbach served on the board of directors of Autonomic Technologies, Inc., a private medical device company focused on the treatment of severe headaches, from December 2015 to April 2019, including service as chairman of the board beginning April 2016 and as interim chief executive officer and president from December 2015 to April 2016. From January 2006 to September 2014, Mr. Burbach served as president, chief executive officer, and director of Thoratec Corporation (Nasdaq: THOR), a company that develops, manufactures, and markets proprietary medical devices used for circulatory support. In addition, from 2004 to February 2013, Mr. Burbach served as a member of the board of directors of Digirad Corporation (Nasdaq: DRAD), a company focused on diagnostic imaging products. From April 2005 to January 2006, Mr. Burbach served as president and chief executive officer of Digirad Corporation. From July 2003 to April 2005, he served as president and chief executive officer of Bacchus Vascular, Inc., a developer of catheter-based medical devices. From January 2001 to July 2003, he served as chief executive officer of Philips Nuclear Medicine, a division of Philips Electronics, and before its acquisition by Philips, he worked for four years for ADAC Laboratories, most recently as president. Mr. Burbach also spent six years with the management consulting firm of McKinsey & Company, Inc., where he was most recently a senior engagement manager in the firm's healthcare practice. Mr. Burbach received a B.S. in Industrial Engineering from Stanford University in 1984 and an M.B.A. from Harvard business School in 1990. We believe that Mr. Burbach's experience as a chief executive officer and director of other public life sciences companies qualifies him to serve on our Board of Directors.

Carlos Paya, M.D., Ph.D., age 60, has served as a member of our Board of Directors since March 2017. Since May 2011, Dr. Paya has served as president, chief executive officer and director of Immune Design Corp. He previously served as president of Elan Corporation, a pharmaceutical corporation, which was acquired by Perrigo Company, from November 2008 to April 2011. Before joining Elan Corporation, Dr. Paya was at Eli Lilly & Company, a pharmaceutical corporation, from September 2001 to November 2008, as vice president, Lilly Research Laboratories. From January 1991 to August 2001, Dr. Paya was professor of medicine, immunology, and pathology, and vice dean of the clinical investigation program at the Mayo Clinic in Rochester, Minnesota. He received his M.D. and Ph.D. degrees from the University of Madrid and underwent postdoctoral training at the Institute Pasteur, Paris, France. We believe that Dr. Paya's experience in the life sciences industry gives him the qualifications and skills to serve on our Board of Directors.

PROPOSAL NUMBER 2
ADVISORY VOTE ON EXECUTIVE COMPENSATION

At our 2017 annual meeting, our Board recommended and our stockholders approved holding an advisory vote on the compensation of our named executive officers every year: we believe an annual vote allows for a meaningful evaluation period of performance against our compensation practices. Accordingly, as required by Section 14A of the Exchange Act, we are asking our stockholders to cast an advisory vote to approve the compensation of our named executive officers as described in this proxy statement.

We encourage you to read our Compensation Discussion and Analysis beginning on page 33, which describes in more detail how our executive compensation program operates and is designed to achieve our goals, as well as the compensation tables and narrative beginning on page 48, which provide detailed information on the compensation of our named executive officers.

Compensation Program and Philosophy

The primary goal of our executive compensation program is to ensure that we hire and retain talented and experienced executive officers who are motivated to achieve or exceed our short-term and long-term corporate goals. Our compensation philosophy is team-oriented and our success is dependent on what our management team can accomplish together. Therefore, we seek to provide our non-CEO executive officers with comparable levels of base salary, bonuses, and annual equity awards that are based largely on overall company performance.

In determining the form and amount of compensation payable to our executive officers, we are guided by the following objectives and principles:

- Team-oriented approach to establishing compensation levels;
- Compensation should relate to performance;
- Equity awards help executive officers think like stockholders; and
- Total compensation opportunities should be competitive.

Our Board of Directors believes that our current executive compensation program has been effective at linking executive compensation to our performance and aligning the interests of our executive officers with those of our stockholders. We are asking our stockholders to indicate their support for the compensation of our named executive officers as described in this proxy statement by voting in favor of the following resolution:

"RESOLVED, that the stockholders approve, on an advisory basis in a non-binding vote, the compensation of Fluidigm Corporation named executive officers as disclosed pursuant to Item 402 of Securities and Exchange Commission Regulation S-K, including the Compensation Discussion and Analysis, the compensation tables, and narrative disclosures set forth in the proxy statement relating to Fluidigm's 2019 Annual Meeting of Stockholders."

Required Vote

The affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the proposal is required to approve, on an advisory basis, the compensation awarded to named executive officers for the year ended December 31, 2018. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions have the same effect as a vote against the proposal. Broker non-votes are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal.

Although this say-on-pay vote is advisory and, therefore, will not be binding on us, our Compensation Committee and our Board of Directors value the opinions of our stockholders. Accordingly, to the extent there is a significant vote against the compensation of our named executive officers, we will consider our stockholders' concerns, and the Compensation Committee will evaluate what actions may be necessary or appropriate to address those concerns.

Recommendation

Our Board of Directors recommends a vote "FOR" the approval, on an advisory basis, of the compensation of our named executive officers as disclosed in this proxy statement.

PROPOSAL NUMBER 3
APPROVAL OF AMENDED AND RESTATED 2011 EQUITY INCENTIVE PLAN

We are asking our stockholders to approve an amendment and restatement of our 2011 Equity Incentive Plan (the "Restated Plan"). Our Board of Directors adopted the Restated Plan in April 2019, subject to the approval of our stockholders at the Annual Meeting. If the Restated Plan is not approved by stockholders, then the existing version of our 2011 Equity Incentive Plan (the "Existing Plan") will continue by its terms and will terminate automatically in January 2021. If stockholders approve the Restated Plan, then:

- The Restated Plan will have its share reserve available for grant increased by 4,950,644 to 6,347,000 shares.
- The annual automatic share increase or "evergreen" provision of the Existing Plan will be eliminated.
- Limits on compensation to our non-employee directors will be set forth in the Restated Plan.
- Our non-stockholder-approved 2017 Inducement Award Plan (the "Inducement Plan"), under which 1,321,435 shares of our common stock remain available for issuance as of March 31, 2019, will be terminated (which means no further grants can be made under the Inducement Plan but existing outstanding awards continue by their terms).
- The Restated Plan will continue for a term of 10 years from the date it was adopted by the Board.
- The Restated Plan eliminates the flexibility of the Board or other plan administrator to accelerate the vesting of awards upon a change in control transaction. Awards will be treated in accordance with the terms of the Restated Plan or as specifically provided in an award agreement.
- The Restated Plan eliminates the Company's ability to do a repricing or an exchange program with respect to awards.
- The Restated Plan eliminates the Company's ability to pay dividends or dividend equivalents on unvested awards.
- Awards granted under our Restated Plan will be subject to recoupment under our current clawback policy and any clawback policy that we are required to adopt under applicable law.

The aggregate number of shares of our common stock reserved for issuance under the Existing Plan during its entire term is 8,118,280, plus (x) any shares forfeited under pre-existing equity incentive plans after the effectiveness of the Existing Plan and (y) any future shares added to the Existing Plan through the automatic annual increases in the share reserve that are made on the first day of each fiscal year (the "Automatic Share Increases"), with the next such increase scheduled to occur on the first day of fiscal year 2020. Each such increase is limited to the least of (i) 1,000,000 shares, (ii) 4% of the outstanding shares of our common stock on the last day of the immediately preceding fiscal year, or (iii) an amount determined by our Board of Directors. As of March 31, 2019, 4,133,243 shares of our common stock are subject to outstanding awards granted under the Existing Plan, and 1,396,356 shares of our common stock remain available for issuance (which does not take into account any shares that may be subsequently added to the Existing Plan through future Automatic Share Increases or forfeitures).

In determining and recommending the increase to the share reserve under the Restated Plan, our Board of Directors considered the effect of the elimination of the Automatic Share Increases, the termination of the Inducement Plan, and a number of other factors, including dilutive impact, burn rate, and plan duration.

Historical Grant Practices. Our Board of Directors considered the historical numbers of stock options, RSUs, performance-based stock options, and performance-based RSUs that we have granted in the past three years. The annual share usage, or burn rate, under our equity compensation program for the last three years was as follows:

Annual Share Usage	2016	2017	2018	Three-Year Average
Stock options granted	793,527	1,363,460[1]	757,770	971,586
Non-performance RSUs granted	852,233	915,883[2]	1,821,885	1,196,667
Non-performance RSUs vested	326,957	445,355	945,119	572,477
Performance-based stock options granted	184,050	—	—	61,350
Performance-based RSUs granted	87,620	—	167,000	84,873
Performance-based RSUs vested	—	—	—	—
Total equity awards granted[3]	1,917,430	2,279,343	2,746,655	2,314,476
Basic weighted average shares of common stock outstanding as of December 31	29,151,433	32,980,163	39,651,703	33,927,763
Annual share usage	1,066,155	155,315[4]	1,862,614	1,028,028[4]

(1) 379,443 of the stock options granted in 2017 were awarded solely pursuant to our stock option exchange program.

(2) 54,944 of the RSUs granted in 2017 were awarded solely pursuant to our stock option exchange program.

(3) Represents stock options, performance-based stock options, RSUs, and performance-based RSUs.

(4) Adjusted to exclude the effect of the 2017 stock option exchange program.

Forecasted Grant Practices. Based on our historical grant practices, we currently forecast granting equity awards covering approximately 4,300,000 shares over the next two-year period, which is equal to 6.0% of the fully diluted number of shares of our common stock outstanding as of March 31, 2019. In light of this forecast, the termination of our Inducement Plan, and the elimination of the Automatic Share Increases, we believe, and our Board of Directors considered, that the requested increase to the Restated Plan's share reserve will provide a sufficient number of shares to allow us to grant equity awards for the purpose of our expected new hires, focal awards, any special retention needs, and employee growth through any opportunistic acquisitions or hiring for the next two years. However, circumstances could alter this projection, such as a change in business conditions, our stock price, competitive pressures for attracting and retaining employees, or our company strategy.

Awards Outstanding Under Existing Grants and Dilutive Impact. As of March 31, 2019, we have outstanding equity awards under the Existing Plan, the Inducement Plan, and prior plans covering approximately 4,881,537 shares. These outstanding equity awards (commonly referred to as the "overhang"), together with the shares currently available for grant under the Existing Plan and the Inducement Plan, represent approximately 10.6% of the fully diluted number of shares of our common stock. The dilutive impact of the additional 4,950,644 shares that would be available for issuance under the Restated Plan—combined with the cancellation of the shares currently available for grant under the Inducement Plan—would increase the overhang percentage to approximately 14.9%, each based on our fully diluted number of shares of our common stock as of March 31, 2019 (in all cases without consideration of shares potentially issuable upon conversion of outstanding convertible indebtedness).

If the stockholders do not approve the Restated Plan, the Existing Plan will continue without these amendments, including the retention of the provision for Automatic Share Increases. In that case, the shares reserved for issuance under the Existing Plan may be insufficient to achieve our future incentive, recruiting, and retention objectives. Consequently, without stockholder approval of our Restated Plan, we believe our ability to attract and retain the individuals necessary to drive our performance and increase long-term stockholder value will be impaired. We therefore believe that stockholder approval of our Restated Plan is important to our continued success.

Our executive officers and directors have an interest in the approval of the Restated Plan by our stockholders because they would be eligible to receive awards under the Restated Plan. Our Board of Directors and Compensation Committee have approved the Restated Plan, subject to the approval of our stockholders at the Annual Meeting.

Summary of the Restated Plan

Our Restated Plan was adopted by our Board of Directors in April 2019. The following general description of the material features of the Restated Plan is qualified in its entirety by reference to the provisions of the Restated Plan set forth in Exhibit I to this proxy statement.

Eligibility. Our Restated Plan provides for the grant of incentive stock options, within the meaning of Section 422 of the Internal Revenue Code of 1986, as amended, to our employees and the employees of our subsidiaries, and for the grant of nonstatutory stock options, restricted stock, restricted stock units, stock appreciation rights, performance units and performance shares to our employees, directors and consultants and the employees and consultants of our subsidiaries. As of December 31, 2018, we had six non-employee directors, approximately 35 consultants, and approximately 535 employees (including our employee director).

Share Reserve. The total number of shares of our common stock reserved for issuance under our Restated Plan is equal to (i) 6,347,000 shares plus (ii) any shares that, as of immediately prior to the date of the Annual Meeting, were subject to outstanding awards under the Existing Plan.

Generally, if an option award expires or becomes unexercisable without having been exercised in full, or if restricted stock, performance shares, or shares subject to restricted stock units or performance units are forfeited or repurchased by us due to failure to vest, the unpurchased, forfeited, or repurchased shares that were subject to such awards will become available for future grant or sale under the Restated Plan (unless it has terminated). With respect to stock appreciation rights, only shares actually issued will cease to be available. Shares used to pay the exercise price of an award or to satisfy the tax withholding obligations related to an award will become available for future grant or sale. To the extent an award is paid out in cash rather than shares, such cash payment will not reduce the number of shares available for issuance.

Administration. Our Restated Plan will be administered by our Board of Directors or a committee appointed by our Board of Directors. Currently, our Compensation Committee administers our Existing Plan. Different committees may administer our Restated Plan with respect to different groups of service providers. To make grants to certain officers and key employees, the members of the committee must qualify as "non-employee directors" under Rule 16b-3 of the Exchange Act.

Subject to the provisions of our Restated Plan, the administrator generally has the power to make all determinations deemed necessary or advisable for administering the Restated Plan. The administrator has the power to determine the terms of awards, including the exercise price (if any), the number of shares subject to each such award, the time when awards may vest or be exercised (including the ability to accelerate the vesting and exercisability of awards), and the form of consideration payable upon exercise, if applicable. The administrator also has the authority to amend awards. The administrator may not implement any exchange program under which (i) outstanding awards are surrendered or cancelled in exchange for awards of the same type (which may have higher or lower exercise prices and different terms), awards of a different type, and/or cash, (ii) participants have the opportunity to transfer any outstanding awards to a financial institution or other person or entity selected by the administrator, and/or (iii) the exercise price of an outstanding award is increased or reduced. In addition, the administrator may provide for dividends or dividend equivalents to accrue on unvested awards, but no dividends or dividend equivalents will be paid until the vesting of such awards. The administrator's decisions, determinations, and interpretations are final and binding on all participants and any other holders of awards.

Stock Options. Options may be granted under our Restated Plan. Subject to the provisions of our Restated Plan, the administrator determines the terms and conditions of options, including when such options vest and become exercisable (and the administrator has the discretion to accelerate the time at which such options will vest or become exercisable). The per share exercise price of any option generally must be at least 100% of the fair market value of a share of our common stock on the date of grant, and the term of an incentive stock option may not be more than 10 years. However, with respect to any incentive stock option granted to an individual who owns 10% of the voting power of all classes of stock of our company or any of its parent or subsidiary corporations, the term of such option must not exceed 5 years, and the per share exercise price of such incentive stock option must be at least 110% of the fair market value of a share of our common stock on the grant date. After a participant's service terminates, he or she generally may exercise the vested portion of his or her option for the period of time stated in his or her option agreement. Generally, if termination is due to death or disability, the option will remain exercisable for 12 months. In all other cases, the option will generally remain exercisable for 3 months following the termination of service. However, in no event may an option be exercised later than the expiration of its term.

Stock Appreciation Rights. Stock appreciation rights may be granted under our Restated Plan. Stock appreciation rights allow the recipient to receive the appreciation in the fair market value of our common stock between the exercise date and the date of grant. Subject to the provisions of our Restated Plan, the administrator determines the terms and conditions of stock appreciation rights, including when such rights vest and become exercisable (and the administrator has the discretion to accelerate the time at which such rights will vest or become exercisable) and whether to pay any increased appreciation in cash, shares of our common stock, or a combination of both. The per share exercise price of a stock appreciation right must be at least 100% of the fair market value per share on the date of grant, and the term of a stock appreciation right may not be more than 10 years. After a participant's service terminates, he or she generally may exercise the vested portion of his or her stock appreciation right for the period of time stated in his or her option agreement. However, in no event may a stock appreciation right be exercised later than the expiration of its term.

Restricted Stock. Restricted stock may be granted under our Restated Plan. Restricted stock awards are grants of shares of our common stock that vest in accordance with terms and conditions established by the administrator. The administrator will determine the number of shares of restricted stock granted to any employee, director or consultant. The administrator may impose whatever conditions to vesting it determines to be appropriate (for example, the administrator may set restrictions based on the achievement of specific performance goals or continued service to us), and the administrator has the discretion to accelerate the time at which any restrictions will lapse or be removed. Shares of restricted stock that do not vest are subject to our right of repurchase or forfeiture.

Restricted Stock Units. Restricted stock units may be granted under our Restated Plan. Restricted stock units are bookkeeping entries representing an amount equal to the fair market value of one share of our common stock. The administrator determines the terms and conditions of restricted stock units including the vesting criteria (which may include accomplishing specified performance criteria or continued service to us) and the form and timing of payment. The administrator has the discretion to accelerate the time at which any restrictions will lapse or be removed.

Performance Units and Shares. Performance units and performance shares may be granted under our Restated Plan. Performance units and performance shares are awards that will result in a payment to a participant only if performance objectives established by the administrator are achieved or the awards otherwise vest. The administrator will establish organizational or individual performance objectives in its discretion, which, depending on the extent to which they are met, will determine the number and/or the value of performance units and performance shares to be paid out to participants. The administrator has the discretion to reduce or waive any performance objectives or other vesting provisions for performance units or performance shares. Performance units will have an initial dollar value established by the administrator on or before to the grant date. Performance shares will have an initial value equal to the fair market value of our common stock on the grant date. The administrator has the discretion to pay earned performance units or performance shares in the form of cash, shares, or in some combination of both.

Transferability of Awards. Our Restated Plan does not allow for the transfer of awards unless the administrator provides otherwise, and in no event may an award be transferred for value or consideration. Additionally, only the recipient of an award may exercise an award during his or her lifetime.

Outside Directors. Our Restated Plan provides that any outside (non-employee) director, in any fiscal year, may not be granted equity awards under our Restated Plan with an aggregate grant date fair value of more than $400,000, or $500,000 with respect to his or her first year of service as an outside director. For purposes of this limitation, the grant date fair value is determined in accordance with GAAP. Any equity awards granted under our Restated Plan to an outside director for his or her services as an employee, or for his or her services as a consultant (other than as a non-employee director), will not count for purposes of the limitation. The maximum limit does not reflect the intended size of any potential compensation or equity awards to our outside (non-employee) directors. The outside (non-employee) director annual limits were developed with input from Meridian Compensation Partners, LLC, the Compensation Committee's independent executive compensation advisor based on a review of non-employee director limits in equity plans for comparable companies.

Certain Adjustments. If there are certain changes in our capitalization, the administrator will adjust the number and class of shares that may be delivered under the Restated Plan; the number, class, and price of shares covered by each outstanding award; and the numerical share limits contained in the Restated Plan.

Dissolution or Liquidation. If there is a proposed liquidation or dissolution of our company, the administrator will notify participants as soon as practicable before the effective date of such event and all awards, to the extent that they have not been previously exercised, will terminate immediately before the consummation of such event.

Merger or Change in Control. Our Restated Plan provides that if there is a merger of the company with or into another company or a "change in control" (as defined under the Restated Plan) of our company, each outstanding award will be treated as provided in the applicable award agreement or as described below. The administrator is not required to treat all awards similarly. If the successor corporation does not assume or substitute an equivalent award for any outstanding award, then such award will fully vest, all restrictions on such award will lapse, all performance goals or other vesting criteria applicable to such award will be deemed achieved at 100% of target levels, and the administrator will notify participants that awards will become fully exercisable, if applicable, for a specified period before the transaction. The award will then terminate upon the expiration of the specified period of time.

With respect to awards held by a non-employee director that are assumed or substituted for, if such non-employee director's service as our director or that of a successor corporation is terminated on or after the date of such merger or change in control (except for a voluntary resignation that is not at the request of the acquirer), then the non-employee director will fully vest in and have the right to exercise his or her options and/or stock appreciation rights, all restrictions on his or her restricted stock and restricted stock units will lapse, and, with respect to performance units and performance shares, all performance goals or other vesting criteria will be deemed achieved at 100% of target levels and all other terms and conditions met in the event.

Forfeiture and Clawback. All awards granted under our Restated Plan will be subject to recoupment under our current clawback policy and any clawback policy that we are required to adopt under applicable law. In addition, the administrator may provide in an award agreement that the recipient's rights, payments, and benefits with respect to such award shall be subject to reduction, cancellation, forfeiture, or recoupment upon the occurrence of specified events.

Plan Amendments and Termination. Our Restated Plan will automatically terminate in 2029, unless we terminate it sooner. In addition, our Board of Directors has the authority to amend, suspend, or terminate the Restated Plan, but such action will not impair the rights of any participant without his or her written consent.

New Plan Benefits

The number of awards that an employee, director, or consultant may receive under the Restated Plan is in the discretion of the administrator and therefore cannot be determined in advance. For (i) each of our named executive officers, (ii) our executive officers, as a group, (iii) our directors who are not executive officers, as a group, and (iv) all of our employees who are not executive officers, as a group, the following table sets forth the following information:

(A) the aggregate number of shares subject to stock options granted under the Existing Plan and the Inducement Plan during 2018,

(B) the average per share exercise price of such options,

(C) the aggregate number of RSUs (including performance-based RSUs) granted under the Existing Plan and the Inducement Plan during 2018, and

(D) the dollar value of such RSUs.

	Shares subject to Stock Options	Average Per Share Exercise Price of Options	Shares subject to Restricted Stock Units	Dollar Value of Restricted Stock Units[1]
Stephen Christopher Linthwaite *President and Chief Executive Officer*	95,500	$6.33	179,500	$ 2,385,555
Vikram Jog *Chief Financial Officer*	27,500	$6.33	68,219	$ 906,631
Nicholas Khadder *Senior Vice President, General Counsel, and Corporate Secretary*	27,500	$6.33	72,050	$ 957,545
Bradley Kreger *Senior Vice President, Global Operations*	100,000	$5.90	50,000	$ 664,500
Steven C. McPhail *Chief Commercial Officer*	16,200	$6.33	46,730	$ 621,042
Executive group	668,770	$6.05	981,240	$13,040,680
Non-executive director group	68,000	$5.98	75,418	$ 1,002,305
Non-executive officer employee group	—	—	932,227	$12,389,297

[1] Reflects the aggregate fair value of the equity awards computed in accordance with ASC 718, based on the $13.29 closing price per share of our common stock on the Nasdaq Global Select Market on Friday, March 29, 2019.

Required Vote

The affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the proposal is required to approve Restated Plan. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions have the same effect as a vote against the proposal. Broker non-votes are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal.

Recommendation

Our Board of Directors recommends a vote "FOR" the approval of the Restated Plan.

PROPOSAL NUMBER 4
RATIFICATION OF APPOINTMENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Our Audit Committee has appointed PricewaterhouseCoopers LLP to audit the financial statements of our company for the fiscal year ending December 31, 2019 and recommends that stockholders vote in favor of the ratification of such appointment. During 2018, PricewaterhouseCoopers LLP served as our registered independent public accounting firm.

At the Annual Meeting, stockholders are being asked to ratify the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for our fiscal year ending December 31, 2019. Stockholder ratification of the appointment of PricewaterhouseCoopers LLP is not required by our bylaws or other applicable legal requirements. However, our Board of Directors is submitting the appointment of PricewaterhouseCoopers LLP to our stockholders for ratification as a matter of good corporate governance. In the event that this appointment is not ratified by the affirmative vote of a majority of the shares of common stock present in person or represented by proxy at the Annual Meeting and entitled to vote, such appointment will be reconsidered by our Audit Committee. Even if the appointment is ratified, our Audit Committee, in its sole discretion, may appoint another independent registered public accounting firm at any time during our fiscal year ending December 31, 2019 if our Audit Committee believes that such a change would be in the best interests of Fluidigm and its stockholders. A representative of PricewaterhouseCoopers LLP is expected to be present at the Annual Meeting, will have an opportunity to make a statement if he or she wishes to do so, and is expected to be available to respond to appropriate questions from stockholders.

Required Vote

Ratification of the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019 requires the affirmative "FOR" vote of a majority of the voting power of the shares present in person or represented by proxy at the meeting and entitled to vote on the proposal. You may vote "FOR," "AGAINST," or "ABSTAIN" on this proposal. Abstentions are deemed to be votes cast and have the same effect as a vote against the proposal. Broker non-votes are not deemed to be votes cast, are not included in the tabulation of voting results on this proposal, and will not affect the outcome of voting on this proposal.

Recommendation

Our Board of Directors recommends a vote "FOR" the ratification of the appointment of PricewaterhouseCoopers LLP as our independent registered public accounting firm for the year ending December 31, 2019.

Principal Accounting Fees and Services

The following table sets forth the aggregate fees for audit services provided by PricewaterhouseCoopers LLP for the years ended December 31, 2018 and December 31, 2017:

	2018	2017
Audit fees[1]	$1,511,635	$1,395,500
Audit-related fees[2]	132,355	240,000
Tax fees[3]	—	—
All other fees[4]	3,600	165,028
Total fees	$1,647,590	$1,800,528

[1] Audit fees for 2018 and 2017 consist of fees billed or to be billed by PricewaterhouseCoopers LLP for professional services rendered for the integrated audit of our annual consolidated financial statements

and management's report on internal controls included in our Annual Report on Form 10-K; for the review of the consolidated financial statements included in our quarterly reports on Form 10-Q; and for other services, including statutory audits and services rendered in connection with SEC filings.

(2) Audit-related fees consist of fees for assurance and related services that are reasonably related to the performance of the audit or review of our financial statements and are not reported under "Audit Fees." These services include consultations concerning financial accounting and reporting standards.

(3) Tax fees consist of fees billed by PricewaterhouseCoopers LLP for professional services rendered for tax compliance, consultation and planning services.

(4) All other fees consist of fees billed by PricewaterhouseCoopers LLP for professional services other than the services reported above. These fees primarily consist of fees attributable to permissible consulting services as well as fees to license specialized accounting research software.

Policy on Audit Committee Pre-Approval of Services Performed by Independent Registered Public Accounting Firm

Consistent with the requirements of the SEC and the Public Company Accounting Oversight Board, or PCAOB, regarding auditor independence, our Audit Committee has responsibility for appointing, setting compensation, and overseeing the work of our independent registered public accounting firm. In recognition of this responsibility, our Audit Committee has established a policy for the pre-approval of all audit and permissible non-audit services provided by the independent registered public accounting firm. These services may include audit services, audit-related services, tax services, and other services. The Audit Committee generally pre-approves particular services or categories of services on a case-by-case basis. The independent registered public accounting firm and management are required to periodically report to the Audit Committee regarding the extent of services provided by the independent registered public accounting firm in accordance with these pre-approvals, and the fees for the services performed to date.

All of the services of PricewaterhouseCoopers LLP for 2017 and 2018 described above were pre-approved by the Audit Committee.

Report of the Audit Committee

The Audit Committee assists the Board in fulfilling its oversight responsibility over Fluidigm's financial reporting process. It is not the duty of the Audit Committee to plan or conduct audits, to prepare Fluidigm's financial statements, or to assess Fluidigm's internal control over financial reporting. Management has the primary responsibility for preparing the financial statements and assuring their accuracy, effectiveness, and completeness. Management is also responsible for the reporting process, including the system of internal controls. The independent registered public accounting firm is responsible for auditing Fluidigm's financial statements and internal control over financial reporting and expressing its opinion as to whether the statements present fairly, in accordance with accounting principles generally accepted in the United States, Fluidigm's financial condition, results of operations, and cash flows. However, the Audit Committee reviews and discusses the financial statements with management and the independent registered public accounting firm prior to the presentation of financial statements to our stockholders and, as appropriate, initiates inquiries into various aspects of Fluidigm's financial affairs.

Unless the Audit Committee has reason to question its reliance on management or the independent registered public accounting firm, the members of the Audit Committee necessarily rely on information provided to them by and on the representations made by management and the independent registered public accounting firm. Accordingly, the Audit Committee's oversight does not provide an independent basis to determine that management has applied appropriate accounting and financial reporting principles. Furthermore, the Audit Committee's authority and oversight responsibilities do not independently assure that the audits of Fluidigm's financial statements have been carried out in accordance with the standards of the PCAOB or that the financial statements are presented in accordance with accounting principles generally accepted in the United States.

In this context, the Audit Committee has met and held discussions with management and the independent registered public accounting firm to review Fluidigm's audited 2018 consolidated financial statements (including the quality of Fluidigm's accounting principles). Management represented to the

Audit Committee that Fluidigm's consolidated financial statements were prepared in accordance with accounting principles generally accepted in the United States, and the Audit Committee consulted with management and the independent registered public accounting firm prior to approving the presentation of the audited 2018 consolidated financial statements to stockholders. The Audit Committee discussed with the independent registered public accounting firm the matters required to be discussed by Statement on Auditing Standards No. 1301, *Communications with Audit Committees*, as adopted by the PCAOB.

The Audit Committee has discussed with the independent accountant the independent accountant's independence from Fluidigm and its management. As part of that review, the Audit Committee received the written disclosures and letter required by the applicable requirements of the PCAOB regarding the independent accountant's communications with the Audit Committee concerning independence. Based on the reviews and discussions referred to above, the Audit Committee recommended to the Board, and the Board approved, Fluidigm's audited consolidated financial statements for the year ended December 31, 2018 for filing with the SEC as part of Fluidigm's Annual Report on Form 10-K. The Audit Committee has appointed PricewaterhouseCoopers LLP as the company's independent registered public accounting firm for the year ending December 31, 2019.

The Audit Committee

Patrick S. Jones (Chair)
Gerhard F. Burbach
Nicolas Barthelemy
Laura M. Clague

The Audit Committee Report does not constitute soliciting material, and shall not be deemed to be filed or incorporated by reference into any other filing by Fluidigm under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, except to the extent Fluidigm specifically incorporates the Audit Committee Report by reference therein.

EXECUTIVE OFFICERS

The names of our executive officers, their ages, their positions with Fluidigm and other biographical information as of April 8, 2019 are set forth below. There are no family relationships among any of our executive officers or directors.

Name	Age	Position
Stephen Christopher Linthwaite	47	President, Chief Executive Officer, and Director
Vikram Jog	62	Chief Financial Officer
Nicholas Khadder	45	Senior Vice President, General Counsel, and Corporate Secretary
Bradley Kreger	44	Senior Vice President, Global Operations
Steven C. McPhail[1]	65	Chief Commercial Officer

[1] As disclosed in our Current Report on Form 8-K filed with the SEC on August 2, 2018, Mr. McPhail notified us of his intention to retire on July 30, 2018. His retirement was effective on April 18, 2019.

Stephen Christopher Linthwaite. Please see the biographical information provided above in the section entitled "*Board of Directors and Corporate Governance — Nominees for Class III Directors (Term Expiring in 2022).*"

Vikram Jog has served as our Chief Financial Officer since February 2008. From April 2005 to February 2008, Mr. Jog served as chief financial officer for XDx, Inc. (now CareDx, Inc.), a molecular diagnostics company. From March 2003 to April 2005, Mr. Jog was a vice president of Applera Corporation, a life science company that is now part of Thermo Fisher Scientific, and vice president of finance for its related businesses, Celera Genomics and Celera Diagnostics. From April 2001 to March 2003, Mr. Jog was vice president of finance for Celera Diagnostics and corporate controller of Applera Corporation. Mr. Jog received a Bachelor of Commerce degree from Delhi University and an M.B.A. from Temple University. Mr. Jog is a member of the American Institute of Certified Public Accountants.

Nicholas Khadder has served as our Senior Vice President, General Counsel, and Corporate Secretary since June 2016. From 2010 to June 2016, Mr. Khadder held various positions at Amyris, Inc., an industrial biotechnology company, including senior vice president, general counsel and corporate secretary from 2013 to June 2016, interim general counsel from July 2013 to December 2013 and assistant general counsel from October 2010 to July 2013. Prior to joining Amyris, Mr. Khadder served in senior corporate counsel roles at LeapFrog Enterprises, Inc., an educational entertainment company, from August 2008 to September 2010, and at Protiviti, Inc., an internal audit and risk consulting firm, from June 2005 to July 2008. Before commencing his in-house legal career, Mr. Khadder was a corporate law associate at Fenwick & West LLP from 1998 to 2005. Mr. Khadder received a J.D. from Berkeley Law (the University of California, Berkeley, School of Law) and a B.A. in English from the University of California, Berkeley.

Bradley Kreger joined Fluidigm as Senior Vice President, Global Operations in April 2018. From December 2016 to April 2018, Mr. Kreger was Senior Director, Operations, Clinical Sequencing Division at Thermo Fisher Scientific, a life sciences company. From 1995 to December 2016, Mr. Kreger held various staff and management positions at Affymetrix, a biotechnology company, including VP, Reagent Manufacturing & Global Process Engineering, Senior Director, Global Process Engineering and Manufacturing Science, and Director, Global Process Engineering and Manufacturing Science. Mr. Kreger received a MBA from Western Governors University and a B.S. in Biotechnology and Business from Charter Oak State College.

Steven C. McPhail joined Fluidigm as General Manager, Production Genomics in May 2015 and became our Chief Commercial Officer in August 2016. From December 2014 to March 2015, Mr. McPhail was vice president, special projects at Quintiles Transnational Corporation, a biopharmaceutical development and commercial outsourcing services firm. From February 2003 to August 2012, Mr. McPhail was president and chief executive officer of Expression Analysis, Inc., a genomic services company that was acquired by Quintiles Transnational Corporation in August 2012, where Mr. McPhail was president of the post-acquisition operation until December 2014. Prior to Expression Analysis, Inc., Mr. McPhail held various staff and management positions at companies in the diagnostic, biotechnology, and medical device markets, including ArgoMed Inc., Xanthon, Inc., TriPath Imaging Inc., Dynex Technologies, Inc., and Abbott Laboratories. Mr. McPhail serves on the board of visitors of NC Children's Hospital and on the board of trustees of the Carolinas chapter of the Crohn's and Colitis Foundation of America as well as ImproveCareNow, a quality improvement network designed to improve the care and outcomes of children with inflammatory bowel disease. Mr. McPhail received a B.S. in Biology from San Diego State University.

COMPENSATION DISCUSSION AND ANALYSIS

The following discussion and analysis of compensation arrangements of our named executive officers should be read together with the compensation tables and related disclosures set forth below.

Introduction

In this Compensation Discussion and Analysis (“CD&A”), we provide the following:

- Executive Summary . . . . page 33
- 2018 Advisory Vote on Executive Compensation . . . . page 34
- Listening to Our Stockholders. . . . . page 34
- Compensation Risk and Governance . . . . page 35
- Compensation Philosophy and Objectives. . . . . page 35
- Compensation Process . . . . page 37
- Elements of Executive Compensation. . . . . page 39
- Guidelines and Policies. . . . . page 44
- Other Benefits . . . . page 45

Executive Summary

Compensation Highlights

In 2018, the Compensation Committee took the following steps to align 2018 compensation with performance and stockholder interests:

- Adopted an executive compensation clawback policy.
- Adopted share ownership guidelines for executive officers and non-employee directors.
- Introduced performance stock unit awards as part of the annual equity grants. Awards are subject to three-year cliff vesting and a performance condition modifier based on three-year cumulative total shareholder return (“TSR”) relative to the TSRs of the constituent companies in the Russell 3000 Index. For 2018, performance stock units represented 25% of the target long-term incentive (“LTI”) award for each executive.
  - For 2019, the Compensation Committee increased the weighting of performance stock units to 51% of the target LTI award for each executive, with the remaining 49% granted in time-based restricted stock units.
- The 2018 annual cash incentive program was determined based on predefined financial goals with adjustments based on each executive’s strategic goals and contributions.
  - For 2019, the Company’s annual cash incentive program will continue to be driven by revenue and cash (each weighted 50%)

Performance Highlights

The Company’s strong performance in 2018 included:

- Return to double digit revenue growth: Annual revenue of $113.0 million in 2018 from $101.9 million in 2017 reflecting execution on the company’s innovation and strategy
- Focus on financial discipline: Operating losses decreased to –$20.4 million in 2018 from –$30.8 million in 2017.
- Improvement in balance sheet and liquidity:
  - August 2, 2018 added a $15 million Revolving Credit Facility with Silicon Valley Bank
  - December 14, 2018 public offering of common stock with aggregate gross proceeds of approximately $63.3 million
  - March 2019 retirement of 2018 2.75% convertible notes due 2034 with an aggregate principal value of $150 million
- From January 1, 2018 to March 29, 2019, the price of our common stock rose 113%.

Named Executive Officers

Stephen Christopher Linthwaite	President and Chief Executive Officer
Vikram Jog	Chief Financial Officer
Nicholas Khadder	Senior Vice President, General Counsel, and Corporate Secretary
Bradley Kreger	Senior Vice President, Global Operations
Steven C. McPhail	Former Chief Commercial Officer

2018 Advisory Vote on Executive Compensation

At our annual meeting of stockholders held on May 31, 2018, our stockholders had the opportunity to cast an advisory vote on our 2017 executive compensation. At that meeting, 49.1% of the votes cast by our stockholders voted in support of our executive compensation program described in last year's proxy statement. After receiving an initial negative recommendation on our say-on-pay proposal from certain proxy advisory services, and again following the disappointing results of the say-on-pay vote at our 2018 annual meeting, our management team reached out to and had multiple in-depth discussions with the proxy advisory groups as well as institutional stockholders representing a significant percentage of our outstanding shares. The purpose of these discussions was to gain insight and perspective into our executive compensation programs and policies as disclosed in our proxy statement. Management and the Compensation Committee then considered the input from the proxy advisory services and institutional investors along with current best practices. The Compensation Committee additionally hired a new independent compensation consultant and undertook a comprehensive review of our executive compensation program to ensure that the program appropriately links executive pay to Company performance. The comprehensive review included:

- engagement with a number of our institutional stockholders, including outreach to our top six institutional investors, collectively representing approximately 60% of our then-outstanding common stock;
- examination of reports issued by the principal proxy advisory services;
- analysis of compensation practices at peer companies; and
- solicitation of advice from the Compensation Committee's compensation consultants.

Listening to Our Stockholders

Based on the results of the review and analysis and on the feedback received from our stockholders during our engagement efforts, the Compensation Committee made significant changes to our executive compensation program as set forth in the table below. We also increased the focus and intensity of our stockholder engagement efforts. Through these exchanges, we gained greater appreciation for our stockholders' views, and we are adjusting our incentive program to better link desired performance outcomes, our reward practices, and industry conditions. Over the last year and continuing into 2019, members of the Board and management have continued to reach out to our largest active stockholders and spoken with those expressing concerns.

Compensation Component	Our Practice Prior to 2018	Investor Feedback	What We Did in Response to Investor Feedback
Clawback Policy	We had not adopted a clawback policy.	Incentive compensation should be subject to a clawback.	In 2018, we adopted a clawback policy that is applicable to our CEO and to all officers who report directly to the CEO, including our named executive officers.
Type of Equity Awards	Our equity awards granted to our named executive officers were predominantly time-based.	Equity awards should include a meaningful amount of performance-based awards in addition to time-based awards.	We increased the portion of long-term compensation in performance stock units to 51% of total LTI for 2019 (from 25% in 2018 and 0% in 2017).
Stock Ownership Guidelines	We had not adopted stock ownership guidelines, in part due to the significant existing equity holdings of our executive officers.	Executive officers and non-employee members of the Board of Directors should be subject to stock ownership guidelines.	In 2018, we adopted stock ownership guidelines for our CEO, our other executive officers, and the non-employee members of the Board of Directors.

Compensation Risk and Governance

The Company's compensation program has the following features for alignment with best practices:

What we do ✓

- ✓ *Our Compensation Committee is made up of solely independent directors and makes all executive compensation decisions.*
- ✓ *Our potential change in control payments and benefits are double-trigger and reasonable in amount.*
- ✓ *We balance near- and long-term strategic objectives by providing a mix of cash and equity incentives.*
- ✓ *We adopted stock ownership guidelines for our non-employee directors and executive officers.*
- ✓ *We adopted an executive compensation clawback policy.*
- ✓ *A meaningful portion of the equity awards granted to our executive officers in 2018 consist of performance-based equity awards subject to a 3-year performance period.*
- ✓ *We review our Compensation Committee charter on a regular basis.*
- ✓ *We support and review the annual stockholder advisory vote, and engage with stockholders on their feedback around our executive compensation programs.*
- ✓ *We prohibit hedging and pledging of our common stock by our named executive officers.*
- ✓ *We conduct an annual assessment to identify and mitigate risk in compensation programs.*

What we don't do ✗

- ✗ *We do not offer tax gross-ups to any of our named executive officers.*
- ✗ *We do not pay dividends on unvested equity awards.*
- ✗ *We do not offer supplemental executive retirement plans to our named executive officers or any other executives.*
- ✗ *We do not guarantee salary increases or bonuses for our named executive officers.*
- ✗ *We do not encourage excessive risk taking in our incentive plan designs.*

Compensation Philosophy and Objectives

The Compensation Committee of our Board of Directors is responsible for establishing, implementing, and monitoring adherence with our compensation philosophy. The Compensation Committee seeks to ensure that the total compensation paid to our executive officers is fair and reasonable.

The primary goal of our executive compensation program is to ensure that we attract, hire, and retain talented and experienced executive officers who are motivated to achieve or exceed our corporate goals. We seek to have an executive compensation program that fosters synergy among our management team, incentivizes our executive officers to achieve our short-term and long-term goals, and fairly rewards our executive officers for corporate and individual performance. In determining the form and amount of compensation payable to our executive officers, we are guided by the following objectives and principles:

- ***Team-oriented approach to establishing compensation levels.*** We believe that it is critical that our executive officers work together as a team to achieve overall corporate goals rather than focusing exclusively on individual departmental objectives.
- ***Compensation should relate to performance.*** We believe that executive compensation should be directly linked to corporate as well as individual performance, with an emphasis on performance-based compensation.

- ***Equity awards help executive officers think like stockholders.*** We believe that our executive officers' total compensation should have a significant equity component because stock-based awards help reinforce the executive officers' long-term interest in our overall performance and align the interests of our executive officers with the interests of our stockholders.

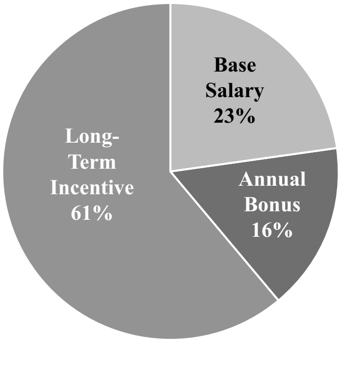
- ***Total compensation opportunities should be competitive.*** We believe that our total compensation programs should be competitive so that we can attract, retain, and motivate talented executive officers who will help us to perform better than our competitors.

We consider total cash and equity compensation for our executive officers, consisting of base salary, cash incentive bonuses, and equity awards, at approximately the 50th percentile of our peer group as a general guideline for the appropriate level of total cash and equity compensation. An individual executive may be compensated above or below the guideline percentage based on factors such as performance, job criticality, experience and skill set. For 2018, we considered equity incentives for our executive officers at approximately the 50th percentile of our peer group as a general guideline for the appropriate level of equity compensation, but we did not attempt to benchmark equity compensation to any specific percentile. For new executive officer hires, we establish initial cash and equity compensation through arm's length negotiation at the time we hire the individual executive officer, taking into account his or her position, qualifications, experience, prior salary level, the compensation of our other executive officers, and the most recent compensation survey of our peer group.

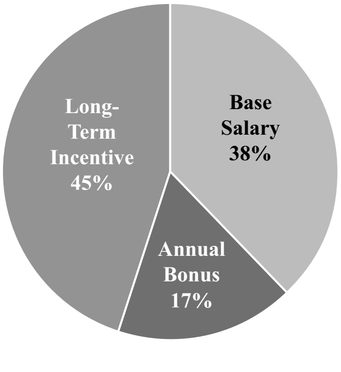
Our Compensation Committee has not adopted any formal or informal policies or guidelines for allocating compensation between cash and non-cash compensation, among different forms of non-cash compensation, or with respect to long-term and short-term performance. The determination of our Compensation Committee as to the appropriate use and weight of each component of executive compensation is subjective, based on its views of the relative importance of each component in meeting our overall objectives and factors relevant to the executive officer.

The Compensation Committee believes in a pay-for-performance compensation philosophy and intends to deliver a majority of target total pay opportunities through the annual bonus program and long-term incentives. The charts below compare the percentage breakdown of target total direct compensation — comprising annual base salary, target bonus opportunity, and target LTI award — for 2018 for our CEO compared to our other current named executive officers. As illustrated below, more than 75% of our CEO's compensation is at risk in the form of annual bonus and long-term incentives. For the other named executive officers, more than 60% of compensation is at risk or variable. For purposes of the pie chart below and the table in the section entitled "*Elements of Executive Compensation*," we consider compensation to be at risk or variable if the compensation: (i) is earned subject to performance-based conditions; or (ii) varies as a result of performance, including stock price performance over time.

2018 Target Compensation CEO



2018 Target Compensation Other Named Executive Officers



Compensation Process

Role of the Compensation Committee in Setting Executive Compensation

The Compensation Committee has principal responsibility for reviewing our executive compensation structure, evaluating the performance of our executive officers relative to our corporate objectives, and considering and approving executive compensation.

The fundamental responsibilities of our Compensation Committee are to:

- assist the Board of Directors in providing oversight of our compensation policies, plans, and benefit programs;

- assist the Board of Directors in discharging the Board's responsibilities relating to oversight of the compensation of our executive officers (including officers reporting under Section 16 of the Exchange Act);

- review and approve or make recommendations to the Board of Directors with respect to executive officer compensation, plans, policies, and programs; and

- administer our equity compensation plans for executive officers and employees.

In determining each executive officer's compensation, our Compensation Committee reviews our corporate financial performance and financial condition and assesses the performance of the individual executive officers. Individual executive officer performance is evaluated by our Chief Executive Officer, in the case of other executive officers, and by the Compensation Committee, in the case of our Chief Executive Officer. While our Chief Executive Officer provides input on his compensation, he does not participate in Compensation Committee or Board deliberations regarding his own compensation. Our Chief Executive Officer meets with the Compensation Committee to discuss executive compensation matters and to make recommendations to the Compensation Committee with respect to other executive officers. The Compensation Committee may modify individual compensation components for executive officers and is not bound to accept the Chief Executive Officer's recommendations. The Compensation Committee (or, in some cases, the independent members of the Board) makes all final compensation decisions for our executive officers. In addition, it is the Compensation Committee's practice to consult with the independent members of the Board of Directors prior to making material changes to our compensation policies.

Although we generally make many compensation decisions in the first quarter of the calendar year, the compensation evaluation process is ongoing. Compensation discussions and decisions are designed to promote our fundamental business objectives and strategy. Evaluation of management performance and rewards is performed annually or more often as needed.

Independent Compensation Consultants

Our Compensation Committee is authorized to engage the services of outside consultants. The Compensation Committee engaged Compensia, Inc., an independent compensation consulting firm, as its compensation consultant for 2018 to review our executive compensation program, assess the competitiveness of such program, and advise our Compensation Committee on matters related to executive compensation. During 2018, Compensia assisted the Compensation Committee by providing the following services:

- assisting us in confirming and updating an appropriate peer group of companies for purposes of benchmarking our levels of compensation;

- gathering and analyzing compensation data from available compensation surveys;

- advising us on policies related to executive officer and director stock ownership and structuring of such policies relative to peer group companies' publicly disclosed policies; and

- assisting us in assessing the competitiveness of our executive officer compensation program.

Compensia served at the discretion of and reported directly to the Compensation Committee. The Compensation Committee assessed the independence of Compensia taking into account, among other things, the independence standards and factors set forth in Exchange Act Rule 10C-1 and the applicable Nasdaq Listing Standards, and concluded that there were no conflicts of interest with respect to the work that Compensia performed for the Compensation Committee in 2018. Compensia did not provide any services to us or our management in 2018 other than those provided to the Compensation Committee and Board of Directors as described below.

Since October 2018, the Compensation Committee has engaged Meridian Compensation Partners, LLC as its independent executive compensation advisor. Meridian serves at the discretion of and reports directly to the Compensation Committee. The Compensation Committee has assessed Meridian's independence, taking into account, among other things, the independence standards and factors set forth in Exchange Act Rule 10C-1 and the applicable Nasdaq Listing Standards, and concluded that that there were no conflicts of interest with respect to the work that Meridian performed for the Compensation Committee in 2018. Meridian did not provide any services to us or our management in 2018 other than those provided to the Compensation Committee and Board of Directors as described below.

Competitive Market Data

As directed by our Compensation Committee, Compensia reviewed companies in medical device and biotechnology research-related industries that were comparable to us with respect to revenue, market capitalization, and industry based upon information available in public filings, from Radford's July 2017 Technology Industry Survey, and Compensia's proprietary database. The benchmark companies considered by our Compensation Committee and Compensia as part of their executive compensation assessments were as follows:

AtriCure
CareDx
Cutera
Digirad
Entellus Medical[1]
Enzo Biochem
GenMark Diagnostics
Harvard Bioscience
Invitae
LeMaitre Vascular
Meridian Bioscience
Mesa Laboratories
NanoString Technologies
Natera
Pacific Biosciences of California
Repligen
SeaSpine Holdings
STAAR Surgical Company
SurModics
Tandem Diabetes Care
Veracyte

[1] Acquired by Stryker in February 2018

Elements of Executive Compensation

This section describes each component of compensation we pay to our executives.

	Compensation Element	Objective	Type of Compensation
Fixed Pay	Base Salary	Provide a fixed annual income	Annual cash compensation
At-Risk / Variable Pay	Annual Bonus Program	Provide variable income based on business results; awards are tied to achieving objective financial results and individual performance	Annual cash compensation with payouts tied to financial results and individual performance
	Restricted Stock Units	Provide alignment with stockholders and promote retention through the 4-year service-vesting requirement	Awards vest 25% on the first anniversary of the grant date and then in equal quarterly installments over the next 3 years
	Stock Options	Align executives with stockholders as executives realize value through stock price appreciation and promote retention through the 4-year service-vesting requirement	Awards vest 25% on the first anniversary of the grant date and then in equal monthly installments over the next 3 years
	Performance Stock Units	Provide performance incentives and align executives' interests with stockholders by rewarding sustained share price performance and promote retention through the service-vesting requirement	Awards vest after 3 years subject to relative TSR performance against the companies comprising the Russell 3000 Index

Base Salary

We pay an annual base salary to each of our executive officers in order to provide them with a fixed rate of cash compensation during the year. Our executive compensation philosophy is team-oriented as our success is dependent on our management team's ability to work together to accomplish our corporate objectives. Therefore, we seek to provide our non-CEO executive officers with generally comparable levels of base salary.

2018 Base Salary. The Compensation Committee annually reviews the base salaries of our executive officers, including the named executive officers, and makes adjustments to base salaries as it determines to be necessary or appropriate. In May 2018, our Compensation Committee reviewed our executive officers' base salaries in light of 2017 performance ratings, the 2018 Compensia survey, and general compensation trends in our industry. As a result of this review, the Committee approved base salary increases of less than 5% to reflect competitive market conditions for the named executive officers effective July 1, 2018.

Base Salary Summary. The table below reflects the highest annualized base salaries in 2017 and 2018 for each of our named executive officers:

Named Executive Officers	2017 Base Salary	2018 Base Salary	2018 Base Salary Percentage Increase[1]
Stephen Christopher Linthwaite *President and Chief Executive Officer*	$543,000	$564,720	4.0%
Vikram Jog *Chief Financial Officer*	$349,685	$362,274	3.6%
Nicholas Khadder *Senior Vice President, General Counsel, and Corporate Secretary*	$334,750	$347,471	3.8%
Bradley Kreger *Senior Vice President, Global Operations*	—	$325,000[2]	—
Steven C McPhail *Former Chief Commercial Officer*	$349,891	$356,889	2.0%

[1] Represents percentage of increase over prior year's highest annualized base salary.

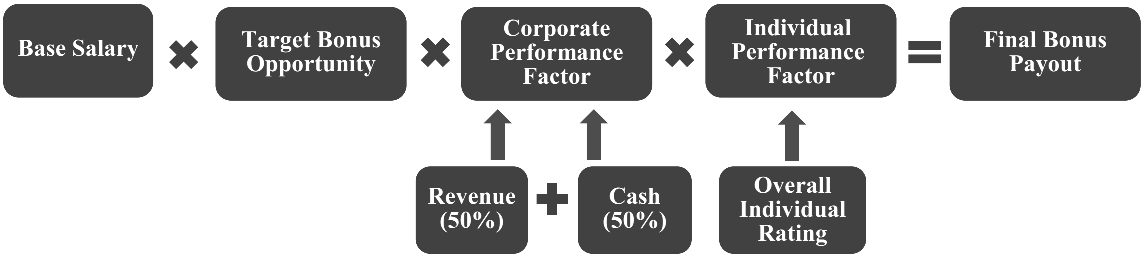
[2] Mr. Kreger joined Fluidigm on April 2, 2018. This represents Mr. Kreger's annualized base salary at the time he was hired, which did not increase in July 2018.

Annual Cash Incentive Program / Executive Bonus Plan

Our annual cash incentive program, which is adopted by the Compensation Committee pursuant to our executive bonus plan, is intended to provide a significant portion of our executive officers' potential compensation. In contrast to the longer term incentives of equity incentive awards, our bonus plan is designed to ensure that our executive officers are focused on our near-term performance and on working together to achieve key identified corporate objectives, typically weighted toward financial objectives, during the applicable fiscal year.

2018 Bonus Program. In late 2017 and early 2018, our Compensation Committee, in conjunction with Compensia, reviewed our executive compensation programs, including a review of their incentive structures, with an objective of ensuring that the programs promote both short-term and long-term growth. With respect to our executive bonus plan, the Compensation Committee structured the program for the 2018 performance period with the objective of incentivizing a return to revenue growth, cash management, and achievement of other strategic objectives described below under Individual Performance Goals. The Compensation Committee maintained the levels of target awards at 70.0% of base salary for our Chief Executive Officer and 42.5% for the other executive officers, consistent with its philosophy of setting bonus and total cash compensation at approximately the median of our peer group.

Bonus Program Structure. For the 2018 corporate performance period, our bonus program was based on the achievement of two corporate performance metrics — revenue and cash — and then as adjusted by an individual performance multiplier.


Base Salary
✖
Target Bonus Opportunity
✖
Corporate Performance Factor
✖
Individual Performance Factor
=
Final Bonus Payout
Revenue (50%)
+
Cash (50%)
Overall Individual Rating

Corporate Performance Goals. With respect to the corporate goals weighting, revenue goals and cash goals were each weighted at 50%. Revenue goals were to be earned at 90% of target if a minimum threshold revenue was achieved, increasing on a linear basis such that 100% of the bonus award target would be earned at target revenue and continuing up to a cap of 120% of the bonus award target for substantial over-performance relative to the Company's revenue target. Cash goals were to be earned at 80% of target if a minimum threshold cash balance was achieved, increasing on a linear basis such that 100% of the bonus award target would be earned at target cash balance and continuing up to a maximum of 136% of the bonus award target for substantial over-performance relative to the Company's cash balance. No bonuses would be paid under the executive bonus program for 2018 if the minimum threshold revenue and cash conditions were not satisfied. The Compensation Committee set the threshold level of revenue and cash at an amount intended to incentivize revenue growth and effective operating expense and liquidity management. The Compensation Committee also chose to make individual performance a multiplier, as opposed to an additive, in order to further the Company's pay-for-performance culture.

Performance Measure	Weight	Threshold (% of Target)	Target ($M)	Maximum (% of Target)	FY2018 Result ($M)	Weighted Achievement vs. Target
Revenue	50%	90%	$110.5	120%	$113.0	52.8%
Cash	50%	80%	$ 36.5	136%	$ 38.3	53.4%
					Total Funding	106.2%

Individual Performance Goals. The individual performance objectives identified for each of the executive officers are summarized below.

Named Executive Officer	Title	Individual Performance Goals
Stephen Christopher Linthwaite	Chief Executive Officer	Revenue, 3-year Strategic Plan, Partnering Strategy
Vikram Jog	Chief Financial Officer	Cash Management, Controllable Profit, Controllable Margin, Management and Development of 3-year Plan
Nicholas Khadder	Senior Vice President, General Counsel, and Corporate Secretary	Compliance, Legal Cost Structure and Management, IP Monetization
Bradley Kreger	Senior Vice President, Global Operations	Inventory Management Optimization, Support of Quarterly Demand Forecast, Operations Metrics Improvement
Steven C. McPhail	Former Chief Commercial Officer	Revenue, Backlog, Forecast Management, Sales and Marketing Coordination

Bonus Awards. In February 2019, our Compensation Committee reviewed our performance in 2018 relative to the corporate objectives identified above. The Compensation Committee also reviewed, with substantial input from Mr. Linthwaite with respect to the other named executive officers, each named executive officer's individual performance based in large part on achievements in the functional department overseen by the respective named executive officer. In evaluating corporate performance relative to 2018 objectives, the Compensation Committee determined that the Company had slightly exceeded its revenue objectives and, after taking into account the impact of fees associated with a convertible debt exchange in 2018, had also over-achieved on its cash objectives. The following table sets forth the target bonuses and actual bonuses for each of the named executive officers for the 2018 performance period under the bonus plan.

Named Executive Officer	Target Bonus	Target Bonus as a Percent of 2018 Base Salary	Individual Performance Factor	Bonus Awarded	Bonus Awarded as a Percent of 2018 Target Bonus
Stephen Christopher Linthwaite	$395,304	70.0%	110%	$461,794	117%
Vikram Jog	$153,966	42.5%	125%	$204,390	133%
Nicholas Khadder	$147,675	42.5%	100%	$156,831	106%
Bradley Kreger[1]	$103,310	42.5%	105%	$115,517	112%
Steven C. McPhail	$151,678	42.5%	100%	$161,298	106%

[1] Mr. Kreger became eligible to participate in our 2018 executive bonus program on his hire date, April 2, 2018. The estimated future payout amount Mr. Kreger was eligible to earn was based on his salary, pro-rated by month, from April to December 2018.

Committee Discretion. Under the executive bonus plan, the Compensation Committee retains discretion to pay or eliminate bonuses irrespective of achievement of the pre-established goals. We believe that maintaining this flexibility is helpful in ensuring that executive officers are neither rewarded nor penalized as a result of unusual circumstances not foreseeable at the time the goals were developed.

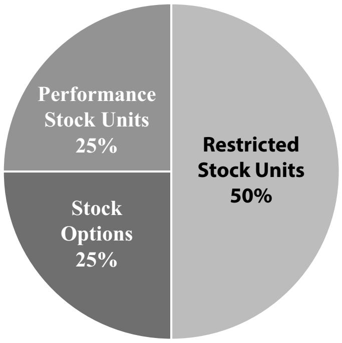
Long-Term Equity Incentive Awards

The final component of our executive compensation program includes long-term equity incentive awards. We believe that equity awards are an effective means of aligning the interests of executive officers and stockholders, rewarding executive officers for the Company's success over the long term, and providing executive officers an incentive to remain with us. We have historically granted equity awards to new executive officers upon the commencement of their employment and consider additional grants to existing executive officers annually, based on our overall corporate performance, individual performance, and the executive officers' existing equity grants and equity holdings.

Grants of Equity Awards

In 2018, the Company granted 25% of target long-term incentive compensation in the form of performance-based restricted stock units ("PSUs"), 25% in the form of stock options, and the remaining 50% in the form of restricted stock units. The number of PSUs ultimately earned is calculated based on the total shareholder return ("TSR") of our common stock as compared to the TSR of the companies comprising the Russell 3000 Index as of the beginning of 2018 (the "Russell 3000") during the performance period from January 1, 2018 to December 31, 2020. The percentage of PSUs that vest will depend on our relative position at the end of the performance period and can range from 0% to 200% of the number of units granted.

Mix of Long-term Incentive Compensation for 2018



- PSUs have two vesting components that must be met before the performance award vests: (1) a performance-based component and (2) a time-based component. PSUs become eligible to vest at the end of 3 years subject to the Company's relative TSR performance against the Russell 3000. No PSUs will become eligible to vest if relative TSR below the 25th percentile. 50% of the target number of PSUs will become eligible to vest if relative TSR ranks at the 25th percentile. 100% of the target number of PSUs will become eligible to vest if relative TSR ranks at the 50th percentile. A maximum of 200% of the target number of PSUs will become eligible to vest if relative TSR ranks at or above the 75th percentile. The number of PSUs that become eligible to vest will be linearly interpolated for relative TSR performance between the 25th and 50th percentile and for relative TSR performance between the 50th percentile and

75th percentile. If there is a change in control before December 31, 2020, the performance period will end on the date of the closing of the change in control and the PSUs will become eligible to vest if and to the extent the performance condition described above (based on the shortened performance period and an ending price equal to the per share amount payable to Company stockholders in the change in control) is achieved.

- Stock options vest 25% on the first anniversary of the grant date and then in equal installments on a monthly basis over the next three years.

- Restricted stock units generally vest 25% on the first anniversary of the grant date and then in equal installments on a quarterly basis over the next three years.

- All long-term incentive compensation is subject to the named executive officer's continued service through the applicable vesting dates.

The stock options, restricted stock units, and performance-based restricted stock units awarded to our named executive officers in 2018 are set forth in the table below.

Grant Summary. The table below provides a summary of grants of equity awards to our named executive officers in 2018:

	2018		
Named Executive Officer	**Time-based Stock Options**	**Time-based Restricted Stock Units**	**Performance-based Restricted Stock Units**
Stephen Christopher Linthwaite *President and Chief Executive Officer*	95,500[1]	125,000[2]	54,500
Vikram Jog *Chief Financial Officer*	27,500[1]	52,519[2][3]	15,700
Nicholas Khadder *Senior Vice President, General Counsel, and Corporate Secretary*	27,500[1]	56,350[2][4]	15,700
Bradley Kreger *Senior Vice President, Global Operations*	100,000[5]	50,000[6]	—
Steven C McPhail *Former Chief Commercial Officer*	16,200[1]	37,530[2][7]	9,200

[1] 12/48th of the shares underlying the option vested on March 19, 2019, and 1/48th of such shares will continue to vest each month thereafter until fully vested on March 19, 2022, subject to continued service through the applicable vesting date.

[2] 3/48th of the total number of shares underlying the restricted stock units granted vested on August 20, 2018, and 3/48th of the total number of shares underlying the restricted stock units have vested and will continue to vest every three months thereafter until fully vested, subject to continued service through the applicable vesting date.

[3] Includes 16,503 restricted stock units received in 2018 pursuant to our retention bonus exchange program.

[4] Includes 20,334 restricted stock units received in 2018 pursuant to our retention bonus exchange program.

[5] 25% of the shares underlying the option vested on April 2, 2019, and 1/48th of such shares will continue to vest each month thereafter until fully vested on April 2, 2023, subject to continued service through the applicable vesting date.

(6) 12/48th of the total number of shares underlying the restricted stock units granted will vest on May 20, 2019, and 3/48th of such shares will continue to vest every three months thereafter, subject to continued service through the applicable vesting date.

(7) Includes 16,344 restricted stock units received in 2018 pursuant to our retention bonus exchange program.

Retention Bonus Exchange Program. In 2017, our Compensation Committee approved a retention compensation program that was intended to provide incentives to certain key employees, including our executive officers, to remain employed with the Company and focused on increasing value for the stockholders, providing for a lump sum cash payment if the individual remained employed with us through January 1, 2019, and a grant of time-vesting stock options and restricted stock units pursuant to our 2011 Equity Incentive Plan. In September 2018, our Compensation Committee approved an exchange program that allowed eligible employees, including our executive officers, to exchange all or a portion of their unpaid cash awards under the retention compensation program for fully vested restricted stock units under our 2011 Equity Incentive Plan. The cash bonus exchange program launched on September 20, 2018. Upon completion of the exchange program, 45 employees elected to exchange approximately $2,387,500 in retention cash bonuses in exchange for restricted stock units representing a total of 379,593 shares of our common stock. We believe the bonus exchange program increased the participating executives' alignment with stockholders, supported a long-term perspective, and conserved cash for the Company.

Guidelines and Policies

Executive Officer Stock Ownership Guidelines

Our Board of Directors has approved stock ownership guidelines for our executive officers to further align their interests with the interests of our stockholders.

Pursuant to the guidelines, our chief executive officer is expected to accumulate and hold a number of shares of our common stock equal to the lesser of (i) that number of shares with a value equal to three times his annual base salary or (ii) 265,300 shares and to maintain this minimum amount of stock ownership throughout his tenure as chief executive officer. Under the guidelines, our other key executives, including our named executive officers other than the chief executive officer, are expected to accumulate and hold a number of shares of our common stock equal to the lesser of (i) that number of shares with a value equal to his or her annual base salary, or (ii) the number of shares determined by dividing his or her then-current annual base salary by $6.14 and to maintain this minimum amount of stock ownership throughout his or her tenure as a covered key executive. For purposes of determining share ownership under the guidelines, shares owned includes shares owned outright and vested in-the-money stock options, but does not include value or shares attributable to unvested time vesting restricted stock, unvested and/or out-of-the money stock options and/or unearned performance shares.

Our key executive officers, including our chief executive officer and our other named executive officers, will be expected to achieve the applicable level of ownership by the end of the fiscal year that follows the five-year anniversary of the date he or she becomes covered by the guidelines.

In the event such an executive falls out of compliance with the guidelines at any time, he or she will be required to maintain 50% of the shares (net of tax and exercise costs) acquired through vesting or exercise of awards until the guidelines are again satisfied. The guidelines include a once-met-always-met policy such that each executive covered by our guidelines will be deemed to satisfy the guideline if they hold at least the number of shares that, as of the first measurement date they comply with the guidelines, was equal to the guideline value (i.e., following the initial compliance, the policy for each executive will reset to the lesser of the guideline value or the number of shares that originally satisfied the guideline).

Clawback Policy

During 2018, we adopted a compensation clawback policy pursuant to which we may seek the recovery of performance-based incentive compensation paid by us. The clawback policy applies to our CEO and to all officers who report directly to the CEO, including our named executive officers. The clawback policy provides that if (i) we restate our financial statements as a result of a material error; (ii) the amount of cash incentive compensation or performance-based equity compensation that was paid or is payable based on achievement of specific financial results paid to a participant would have been less if the financial statements had been correct; (iii) no more than two years have elapsed since the original filing date of the financial statements upon which the incentive compensation was determined; and (iv) our Compensation Committee unanimously concludes, in its sole discretion, that fraud or intentional misconduct by such participant caused the material error and it would be in our best interests to seek from such participant recovery of the excess compensation, then our Compensation Committee may, in its sole discretion, seek repayment from such participant.

No Hedging or Pledging

The Company's Insider Trading Policy prohibits all officers, directors, and other employees with access to sensitive Company information from engaging in any form of hedging transaction (derivatives, equity swaps, forwards, etc.) in the Company's stock, including, among other things, short sales and transactions involving publicly traded options. In addition, such officers, directors, and employees are prohibited from holding the Company's stock in margin accounts and from pledging the Company's stock as collateral for loans. We believe that these policies further align the interests of our officers and directors with those of our stockholders.

Other Benefits

Change of Control and Severance Plan

Each of our executive officers participates in our Change of Control and Severance Plan adopted in August 2017, which provides for specified payments and benefits if the executive officer's employment is terminated for a reason other than for cause, death or disability, or if the executive officer's employment is terminated by the executive officer for good reason, with the payments and benefits provided generally greater if such termination occurs in connection with a change of control. The terms of our executive officers' participation in the Change of Control and Severance Plan are described under the section entitled "*Executive Compensation — Potential Payments upon Termination or Change of Control.*"

Our Board of Directors concluded that it is in the best interests of our Company and our stockholders to provide assurances of specified benefits to certain of our employees, including our executive officers, whose employment is subject to being involuntarily terminated other than for death, disability, or cause or voluntarily terminated for good reason under the circumstances described in the plan. Our Board determined to provide such executive officers with certain severance benefits upon their termination of employment without cause outside of the change of control context in order to provide executive officers with enhanced financial security and incentive to remain with our Company. In addition, we believe that providing for acceleration of equity awards if an executive officer is terminated following a change of control transaction aligns the executive officer's interest more closely with those of other stockholders when evaluating the transaction rather than putting the executive officer at risk of losing the benefits of those equity incentives.

In determining the amount of cash payments, benefits coverage, and acceleration of vesting to be provided to executive officers upon termination, our Board considered the following factors:

- the expected time required for an executive officer to find comparable employment following a termination event;
- feedback received from potential candidates for executive officer positions at our Company as to the level of severance payments and benefits they would require to leave other employment and join our Company;
- in the context of a change of control, the amount of vesting acceleration that would align the executive officer's interests more closely with the interests of stockholders when considering a potential change of control transaction; and
- the period of time following a change of control during which management positions are evaluated and subject to a heightened risk of elimination.

Split-Dollar Life Insurance

The Company has entered into an agreement with Mr. Linthwaite to pay the full amount of the premium of a life insurance policy covering Mr. Linthwaite with an initial face amount of $2,500,000. We entered into this agreement for the purposes of ensuring Mr. Linthwaite's focus on increasing value for the stockholders. The value of the Company's payment of such premiums is treated as taxable income to Mr. Linthwaite. In the event of Mr. Linthwaite's death, Mr. Linthwaite's designated beneficiaries will receive $2,000,000 of the proceeds from the life insurance policy, and the Company will receive the remainder of the proceeds. The Company is entitled to 100% of the policy's cash value, less any policy loans and unpaid interest or prior cash withdrawals. The agreement will terminate upon the first to occur of: (1) Mr. Linthwaite's termination of employment for any reason before age 65; (2) Mr. Linthwaite's reaching the age of 65 while employed by the Company; or (3) the surrender, lapse, or other termination of the life insurance policy by the Company.

Employee Benefits

Executive officers are eligible to participate in all of our employee benefit plans, such as medical, dental, vision, group life, disability, accidental death and dismemberment insurance, and our 401(k) plan, in each case on the same basis as other employees, subject to applicable law. Subject to applicable limits, we match contributions made to U.S.-based employees' 401(k) defined contribution plans to a maximum of $2,000 per year. We also provide vacation and other paid holidays to all employees, including our executive officers, which we believe are comparable to those provided at peer companies.

Accounting and Tax Considerations

Deductibility of Executive Compensation

Section 162(m) of the Internal Revenue Code of 1986, as amended (the "Code"), places a limit of $1,000,000 on the amount of compensation that we can deduct as a business expense in any year with respect to our Chief Executive Officer and certain of our other executive officers. While the Compensation Committee considers the deductibility of compensation as a factor in making compensation decisions, the Committee retains the flexibility to provide compensation that is consistent with our goals for our executive compensation program even if such compensation is not fully tax deductible.

Taxation of Nonqualified Deferred Compensation

Section 409A of the Code imposes additional taxes on certain non-qualified deferred compensation arrangements that do not comply with its requirements. These requirements regulate an individual's election to defer compensation and the individual's selection of the timing and form of distribution of the deferred compensation. Section 409A generally also provides that distributions of deferred compensation only can be made on or following the occurrence of certain events (i.e., the individual's separation from service, a predetermined date, a change in control, or the individual's death or disability). For certain executive officers, Section 409A requires that such individual's distribution commence no earlier than six months after such officer's separation from service. We have endeavored to structure our compensation arrangements to comply with Section 409A and will continue to do so. Further, we do not offer tax gross-ups related to Section 409A to any of our named executive officers.

Accounting for Stock-Based Compensation

The impact of accounting treatment is considered in developing and implementing our compensation programs, including the accounting treatment as it applies to amounts awarded or paid to our executives.

Risk Management Considerations

In setting compensation, our Compensation Committee strives to create incentives that encourage a level of risk-taking consistent with our business strategy and to encourage a focus on building long-term value that does not encourage excessive risk-taking. In connection with its oversight of compensation-related risks, our Compensation Committee has reviewed our compensation programs and practices for employees, including executive and non-executive programs and practices. In its review, our Compensation Committee evaluated whether our policies and programs encourage unnecessary or excessive risk-taking and controls, and how such policies and programs are structured with respect to risks and rewards, as well as controls designed to mitigate any risks. As a result of this review, our Compensation Committee determined that any risks that may result from our compensation policies and practices for our employees are not reasonably likely to have a material adverse effect on Fluidigm.

Compensation Committee Report

The Compensation Committee oversees Fluidigm's compensation policies, plans, and benefit programs. The Compensation Committee has reviewed and discussed the Compensation Discussion and Analysis required by Item 402(b) of Regulation S-K with management. Based on such review and discussions, the Compensation Committee has recommended to the Board of Directors that the Compensation Discussion and Analysis be included in this proxy statement.

The Compensation Committee

Gerhard F. Burbach (Chair)
Samuel D. Colella
Nicolas Barthelemy

The Compensation Committee Report does not constitute soliciting material, and shall not be deemed to be filed or incorporated by reference into any other filing by Fluidigm under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, except to the extent Fluidigm specifically incorporates the Compensation Committee Report by reference therein.

SUMMARY COMPENSATION TABLE FOR 2018

The following table provides information regarding the compensation of our Chief Executive Officer, Chief Financial Officer, each of the next three most highly compensated executive officers during 2018, together referred to as our "named executive officers," for 2018, 2017, and 2016.

Name and Principal Position	Year	Salary ($)	Bonus[1] ($)	Stock Awards ($)[2]	Option Awards ($)[2]	Non-Equity Incentive Plan Compensation ($)[3]	All Other Compensation ($)	Total ($)
Stephen Christopher Linthwaite[4]	2018	553,860	—	1,186,155	344,884	461,794	38,515[5]	2,585,213
President and Chief Executive Officer	2017	521,500	—	468,160	591,695	400,000	38,515	2,019,870
	2016	197,349	—	126,700	872,746	—	2,000	1,198,795
Vikram Jog	2018	355,979	122,122	341,734	99,312	204,390	2,000[6]	1,125,539
Chief Financial Officer	2017	344,592	—	213,136	272,898	141,500	2,000	974,126
	2016	339,500	—	76,680	80,939	—	2,000	499,199
Nicholas Khadder[7]	2018	341,110	150,472	341,734	99,312	156,831	2,000[6]	1,091,461
Senior Vice President, General Counsel, and Corporate Secretary	2017	326,125	—	194,656	247,606	155,500	1,323	925,210
	2016	173,580	—	97,740	101,671	—	1,323	374,314
Bradley Kreger[8] *Senior Vice President, Global Operations*	2018	243,750	—	295,000	338,930	115,517	2,000[6]	995,197
Steven C McPhail[9]	2018	353,390	120,946	200,665	58,504	161,298	2,000[6]	896,804
Former Chief Commercial Officer	2017	344,796	—	126,588	160,413	141,600	2,000	775,397
	2016	339,700	—	92,820	80,934	—	2,000	515,459

(1) Amounts represent the value of restricted stock units received pursuant to our retention bonus exchange program.

(2) Amounts represent the aggregate grant date fair value of equity awards granted to the named executive officer in the year indicated (other than the new options granted in exchange for the options surrendered in the exchange program in 2017) calculated in accordance with FASB Topic ASC 718 without regard to estimated forfeitures. The 2018 performance RSUs and the 2016 performance stock options and performance RSUs were valued on the target outcome of performance-based conditions (i.e., based on 100% achievement). See Note 9 of the notes to our audited consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2018 for a discussion of assumptions made in determining the grant date fair value and compensation expense of our equity awards.

(3) The amounts in this column represent total performance-based bonuses earned under our executive bonus plan for service rendered during the applicable year. All such amounts were paid subsequent to year end. For a description of our executive bonus plan, please see the section entitled "Executive Bonus Plan" under "Compensation Discussion and Analysis" above.

(4) Mr. Linthwaite joined Fluidigm as our Chief Operating Officer and President on August 4, 2016. On October 19, 2016, he was appointed our Chief Executive Officer and President.

(5) Consists of Company contributions of $2,000 made to Mr. Linthwaite's 401(k) defined contribution plan, $27,500 of payments made by the Company for life insurance policy premiums in 2018, and $9,015 of payments made by the Company in disability insurance premiums.

(6) Consists of Company contributions made to the applicable named executive officer's 401(k) defined contribution plan.

(7) Mr. Khadder joined Fluidigm as our Senior Vice President, General Counsel, and Corporate Secretary on June 6, 2016.

(8) Mr. Kreger joined Fluidigm as Senior Vice President, Global Operations in April 2018. Mr. Kreger was not a named executive officer prior to 2018.

(9) Mr. McPhail joined Fluidigm as General Manager, Production Genomics in May 2015 and became our Chief Commercial Officer in August 2016.

GRANTS OF PLAN-BASED AWARDS FOR 2018

The following table presents information concerning each grant of an award made to a named executive officer in 2018 under any plan.

		Estimated Future Payouts Under Non-Equity Incentive Plan Awards ($)(1)			Estimated Future Payments Under Equity Incentive Plan Awards (#)			All Stock Awards: Number of Shares of Stock or Units (#)	All Option Awards: Number of Securities Underlying Options (#)	Exercise or Base Price of Option Awards ($/Sh)(2)	Grant Date Fair Value of Stock and Option Awards ($)(3)
Name	Grant Date	Threshold	Target	Maximum	Threshold	Target	Maximum				
Stephen Christopher Linthwaite	03/19/2018	—	—	—	27,250	54,500	109,000	—	—	—	549,905
	03/19/2018	—	—	—	—	—	—	—	95,500(4)	6.33	344,889
	04/30/2018(5)	355,774	395,304	988,260	—	—	—	—	—	—	—
	06/11/2018	—	—	—	—	—	—	125,000(4)	—	—	636,250
Vikram Jog	03/19/2018	—	—	—	7,850	15,700	31,400	—	—	—	158,413
	03/19/2018	—	—	—	—	—	—	—	27,500(4)	6.33	99,314
	04/30/2018(5)	138,570	153,966	384,916	—	—	—	—	—	—	—
	06/11/2018	—	—	—	—	—	—	36,016(4)	—	—	183,321
	11/05/2018	—	—	—	—	—	—	16,503(6)	—	—	122,122
Nicholas Khadder	03/19/2018	—	—	—	7,850	15,700	31,400	—	—	—	158,413
	03/19/2018	—	—	—	—	—	—	—	27,500(4)	6.33	99,314
	04/30/2018(5)	132,907	147,675	369,187	—	—	—	—	—	—	—
	06/11/2018	—	—	—	—	—	—	36,016(4)	—	—	183,321
	11/05/2018	—	—	—	—	—	—	20,334(6)	—	—	150,472
Bradley Kreger	04/30/2018(5)	92,979	103,310	258,275	—	—	—	—	—	—	—
	04/30/2018	—	—	—	—	—	—	50,000(7)	—	—	295,000
	04/30/2018	—	—	—	—	—	—	—	100,000(7)	5.90	338,930
Steven C. McPhail	03/19/2018	—	—	—	4,600	9,200	18,400	—	—	—	92,828
	03/19/2018	—	—	—	—	—	—	—	16,200(4)	6.33	58,505
	04/30/2018(5)	136,510	151,678	379,194	—	—	—	—	—	—	—
	06/11/2018	—	—	—	—	—	—	21,186(4)	—	—	107,837
	11/05/2018	—	—	—	—	—	—	16,344(6)	—	—	120,946

(1) The target amounts shown in this column reflect our annual incentive plan awards provided under our 2018 executive bonus plan. The maximum amounts in this column reflect the greatest payouts that could be made if pre-established maximum performance levels were met or exceeded. Actual 2018 executive bonus plan payouts are reflected in the non-equity incentive plan compensation column of the Summary Compensation Table.

(2) Based upon the closing sale price of our common stock as reported on the Nasdaq Global Select Market on the date of grant.

(3) All amounts reported represent the grant date fair value of the equity awards, calculated in accordance with FASB ASC Topic 718 without regard to estimated forfeitures. See Note 9 of the notes to our audited consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2018 for a discussion of assumptions made in determining the grant date fair value.

(4) Represents awards granted under our 2011 Equity Incentive Plan.

(5) Corresponds to the date on which our Compensation Committee set the target bonus amounts payable to each of our named executive officers pursuant to our 2018 executive bonus plan. Under our 2018 executive bonus plan, the payouts were based on achievement of Company and individual performance goals, as discussed in the section of our Compensation Discussion & Analysis titled “Executive Bonus Plan — Bonus Plan Structure.” The portion of the bonus subject to revenue achievement was not subject to an aggregate cap in 2018.

(6) Represents restricted stock units received in 2018 pursuant to our retention bonus exchange program.

(7) Represents an award granted under our 2017 Inducement Award Plan (the “Inducement Plan”).

OUTSTANDING EQUITY AWARDS AT FISCAL YEAR-END FOR 2018

The following table presents information concerning unexercised options and unvested stock awards outstanding as of December 31, 2018 for each named executive officer. Each outstanding equity award was granted pursuant to our 2011 Equity Incentive Plan except for the award granted to Mr. Kreger, which was granted pursuant to the Inducement Plan.

	Option Awards					Stock Awards			
Name	**Number of Securities Underlying Unexercised Options (#) Exercisable**	**Number of Securities Underlying Unexercised Options (#) Unexercisable**	**Equity Incentive Plan Awards: Number of Securities Underlying Unexercised Unearned Options (#)**	**Option Exercise Price ($)**	**Option Expiration Date**	**Number of Shares or Units of Stock that Have Not Vested (#)**	**Market Value of Shares or Units of Stock that Have Not Vested ($)**	**Equity Incentive Plan Awards: Number of Unearned Shares, Units or Other Rights That Have Not Vested (#)**	**Equity Incentive Plan Awards: Market Payout Value of Unearned Shares, Units or Other Rights That Have Not Vested ($)**
Stephen Christopher Linthwaite	75,833[1]	64,167	—	4.99	11/8/2026	41,167[2]	354,860[3]	—	—
	90,800[4]	98,700	—	6.16	2/13/2027	109,376[5]	942,821[3]	—	—
	23,333[6]	46,667	—	5.13	9/20/2027	—	—	54,500[7]	469,790[3]
	—	95,500	—	6.33	3/19/2028	—	—	—	—
Vikram Jog	41,878[4]	45,522	—	6.16	2/13/2027	201[8]	1,733[3]	—	—
	513[6]	1,028	—	5.13	9/20/2027	1,576[9]	13,585[3]	—	—
	691[6]	1,382	—	5.13	9/20/2027	18,742[2]	161,556[3]	—	—
	1,148[6]	2,296	—	5.13	9/20/2027	31,514[10]	271,651[3]	—	—
	2,203[6]	4,406	—	5.13	9/20/2027	—	—	15,700[7]	135,334[3]
	2,980[6]	5,961	—	5.13	9/20/2027	—	—	—	—
	322[6]	645	—	5.13	9/20/2027	—	—	—	—
	—	27,500	—	6.33	3/19/2028	—	—	—	—
Nicholas Khadder	4,500[6]	9,000	—	5.13	9/20/2027	4,275[11]	36,851[3]	—	—
	18,881[6]	37,762	—	5.13	9/20/2027	17,117[2]	147,549[3]	—	—
	—	27,500	—	6.33	3/19/2028	31,514[10]	271,651[3]	—	—
	—	—	—	—	—	—	—	15,700[7]	135,334[3]
Bradley Kreger	—	100,000	—	5.90	4/30/2028	50,000[12]	431,000[3]	—	—
Steven C. McPhail	2,375[6]	4,752	—	5.13	9/20/2027	1,550[13]	13,361[3]	—	—
	2,980[6]	5,961	—	5.13	9/20/2027	1,576[9]	13,585[3]	—	—
	12,232[6]	24,465	—	5.13	9/20/2027	11,132[2]	95,958[3]	—	—
	—	16,200	—	6.33	3/19/2028	18,538[10]	159,798[3]	—	—
	—	—	—	—	—	—	—	9,200[7]	79,304[3]

[1] 12/48th of the shares subject to the option vested on October 19, 2017 and 1/48th of the shares subject to the option have vested and will continue to vest each month thereafter such that the option will be fully vested on October 19, 2020. Vesting is subject to continued service through the applicable vesting date.

[2] 4/48th of the total number of shares underlying the restricted stock units granted vested on May 20, 2017, and 3/48th of the total number of shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

[3] Based on the closing price of our common stock of $8.62 per share on December 31, 2018, as reported on the Nasdaq Global Select Market, and the number of the restricted stock units that had not vested as of December 31, 2018.

[4] 15/48th of the total number of shares subject to the option vested on March 1, 2018, and 1/48th of the shares subject to the option have vested and will continue to vest each month thereafter such that the option will be fully vested on January 1, 2021. Vesting is subject to continued service through the applicable vesting date.

[5] 3/48th of the total number of shares underlying the restricted stock units granted vested on August 20, 2018, and 3/48th of the total number of shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(6) 1/12th of the total number of shares subject to the option vested on February 20, 2018, and 1/12th of the shares subject to the option have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(7) These performance-based restricted stock units become eligible to vest at the end of three years subject to the Company's relative TSR performance against the Russell 3000 Index as of the beginning of 2018 during the performance period from January 1, 2018 to December 31, 2020. The percentage of performance-based restricted stock units that vest will depend on our relative position at the end of the performance period and can range from 0% to 200% of the number of units granted.

(8) 4/48th of the shares underlying the restricted stock units vested on May 20, 2015 and 3/48th of the shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(9) 4/48th of the shares underlying the restricted stock units vested on May 20, 2016 and 3/48th of the shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(10) 3/48th of the shares underlying the restricted stock units vested on August 20, 2018 and 3/48th of the shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(11) 14/48th of the shares underlying the restricted stock units vested on August 20, 2017 and 3/48th of the shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(12) 12/48th of the shares underlying the restricted stock units will vest on May 20, 2019 and 3/48th of the shares underlying the restricted stock units granted will vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

(13) 12/48th of the shares underlying the restricted stock units vested on May 20, 2016 and 3/48th of the shares underlying the restricted stock units granted have vested and will continue to vest every three months thereafter until fully vested. Vesting is subject to continued service through the applicable vesting date.

OPTION EXERCISES AND STOCK VESTED IN 2018

The following table provides additional information about the value realized by the named executive officers upon option award exercises and the vesting of restricted stock unit awards during the year ended December 31, 2018.

	Option Awards		Stock Awards	
Name	Number of Shares Acquired on Exercise (#)	Value Realized on Exercise ($)	Number of Shares Acquired on Vesting (#)	Value Realized on Vesting ($)[1]
Stephen Christopher Linthwaite	—	—	34,624	253,249
Vikram Jog	—	—	32,439	237,829
Nicholas Khadder	—	—	35,436	260,067
Bradley Kreger	—	—	—	—
Steven C. McPhail	—	—	28,579	209,359

[1] Value realized on vesting of stock awards is based on the closing price of our common stock on the vesting date and does not necessarily reflect actual proceeds received.

As of December 31, 2018, our named executive officers had not been awarded any equity awards other than stock options, restricted stock units, and performance stock units.

Pension Benefits & Nonqualified Deferred Compensation

We do not provide a pension plan for our employees and no named executive officers participated in a nonqualified deferred compensation plan during the fiscal year ended December 31, 2018.

Potential Payments Upon Termination or Change of Control

The Compensation Committee has approved a Change of Control and Severance Plan (the "Severance Plan") under which our named executive officers, other executive officers, and certain other designated employees are eligible to receive severance benefits.

We adopted the Severance Plan because we recognize that we will from time to time consider the possibility of an acquisition by another company or other change of control transaction and that such consideration can cause such executive officers to consider alternative employment opportunities.

We have entered into individual participation agreements with each of our named executive officers under our Change of Control and Severance Plan (our "Severance Plan"), which provides for the following payments and benefits if the named executive officer's employment with us is terminated in certain circumstances.

Under the Severance Plan, if any named executive officer's employment is terminated outside of the period beginning 3 months before a change of control (as defined in the Severance Plan) and ending 12 months after a change of control (such period, the "Change of Control Period") for a reason other than cause or the named executive officer's death or disability (as such terms are defined in the Severance Plan), then, subject to the Severance Conditions (as defined below), the named executive officer will be entitled to receive the following severance benefits:

- Continued payments (less applicable withholdings) totaling 75% of the named executive officer's annual base salary in effect as of the date of termination in equal installments over a period of nine months (or, in the case of Mr. Linthwaite, our President and CEO, 200% of his annual base salary paid in equal installments over a period of 24 months) following his termination.
- Reimbursement of costs of continued health coverage for the named executive officer, his or her spouse, and/or his or her dependents, as applicable, for a period of up to 9 months (or, in Mr. Linthwaite's case, 12 months) following termination.

- Reasonable outplacement services in accordance with any applicable policy of ours that is in effect as of the named executive officer's termination (or if no such policy is in effect, as determined by us).

Under the Severance Plan, if any named executive officer's employment is terminated within the Change of Control Period either (i) by us for a reason other than cause or the named executive officer's death or disability or (ii) by the named executive officer for good reason (as defined in the named executive officer's participation agreement under the Severance Plan), then, subject to the Severance Conditions, the named executive officer will be entitled to receive the following severance benefits:

- A lump-sum payment (less applicable withholdings) totaling 150% (or, in Mr. Linthwaite's case, 200%) of the sum of (x) his or her annual base salary (as in effect immediately before termination or immediately before the change of control, whichever is higher) plus (y) the greater of (A) his or her annual target bonus (as in effect immediately before termination or immediately before the change of control, whichever is higher) or (B) the average of the annual bonuses actually paid to him or her for the three fiscal years preceding the year in which his or her termination occurs.

- Reimbursement of costs of continued health coverage for the named executive officer, his or her spouse, and/or his or her dependents, as applicable, for a period of up to 18 months (or, in Mr. Linthwaite's case, 24 months) following termination.

- 100% vesting acceleration of his or her then-outstanding and unvested equity awards, provided that, if an equity award is to vest and/or the amount of the award to vest is to be determined based on the achievement of performance criteria, then, unless otherwise provided in the applicable equity award agreement, 100% of such equity award will vest assuming the applicable performance criteria had been achieved at target levels for the relevant performance period(s).

- Reasonable outplacement services in accordance with any applicable policy of ours that is in effect as of the named executive officer's termination (or if no such policy is in effect, as determined by us), except that such outplacement services will be in no case less than the outplacement services provided under any applicable policy of ours that is in effect immediately prior to the applicable change of control.

The Severance Plan superseded the severance benefits provided to our named executive officers under the Company's previous existing forms of amended and restated employment and severance agreement. To receive the Severance Plan benefits, the named executive officer would also be required sign and not revoke a separation and release of claims agreement in a form reasonably satisfactory to us within the period set forth in the Severance Plan and be in compliance with any confidentiality, proprietary information and inventions assignment agreement and any other appropriate agreement between the named executive officer and us (together, the "Severance Conditions").

If any of the severance and other benefits provided for in the Severance Plan or otherwise payable to a named executive officer ("280G Payments") constitute "parachute payments" within the meaning of Section 280G of the Internal Revenue Code and could be subject to excise tax under Section 4999 of the Internal Revenue Code, then the 280G Payments will be delivered in full or delivered as to such lesser extent which would result in no portion of such benefits being subject to excise tax, whichever results in the greater amount of after-tax benefits to such named executive officer. The Severance Plan does not require us to provide any tax gross-up payment to any named executive officer participating in the Severance Plan.

Subject to earlier termination in accordance with the terms and conditions of the Severance Plan, the Severance Plan will automatically terminate 3 years following its adoption by the Compensation Committee, but if a change of control occurs, the expiration date of the Severance Plan will be extended automatically through the date 12 months following a change of control.

The following table describes the payments and benefits that each of our named executive officers would be entitled to receive pursuant to the Severance Plan, assuming that each of the following triggers occurred on December 31, 2018: (i) their employment was terminated for a reason other than for "cause" or the named executive officer's death or "disability" more than 3 months prior to or after 12 months following a “change of control” and (ii) their employment was terminated for a reason other than for “cause” or the named executive officer’s death or “disability” or by them for “good reason” within 3 months prior to or 12 months following a “change of control.”

	Employment Terminated for reason other than Cause, death, or Disability more than 3 months prior to, or more than 12 Months after, a Change of Control		Employment Terminated for reason other than “Cause,” death or Disability within 3 months prior to or 12 Months after a Change of Control[1]		
Name	**Severance Payments ($)**	**Health Care Benefits ($)**	**Equity Acceleration ($)[2]**	**Severance Payments ($)**	**Health Care Benefits ($)**
Stephen Christopher Linthwaite . .	1,129,440[3]	32,811[4]	2,624,762	1,920,048[5]	65,622[6]
Vikram Jog	271,706[7]	24,608[8]	811,423	774,360[9]	49,217[10]
Nicholas Khadder	260,603[7]	28,096[8]	817,559	742,719[9]	56,192[10]
Bradley Kreger	243,750[7]	27,947[8]	703,000	694,688[9]	55,894[10]
Steven C. McPhail	267,667[7]	24,608[8]	521,875	762,851[9]	49,217[10]

[1] Includes termination of the employee’s employment by the Company or its successor without “cause” and termination by the employee for “good reason.”

[2] We estimate the value of the acceleration of options and restricted stock units held by the named executive officer based on the closing stock price of our common stock of $8.62 per share on December 31, 2018, as reported on the Nasdaq Global Select Market, and the number of unvested in-the-money options and shares held by such named executive officer as of December 31, 2018.

[3] The amount shown is equal to 200% of Mr. Linthwaite’s annual base salary as of December 31, 2018.

[4] The amount shown is equal to the cost of covering Mr. Linthwaite and his eligible dependents under our benefit plans for a period of 12 months, assuming that such coverage is timely elected under COBRA.

[5] The amount shown is equal to 200% of the sum of (a) Mr. Linthwaite’s annual base salary as of December 31, 2018, plus (b) his annual target bonus as of December 31, 2018.

[6] The amount shown is equal to the cost of covering Mr. Linthwaite and his eligible dependents under our benefit plans for a period of 24 months, assuming that such coverage is timely elected under COBRA.

[7] The amount shown is equal to 75% of the named executive officer’s annual base salary as of December 31, 2018.

[8] The amount shown is equal to the cost of covering the named executive officer and his eligible dependents under our benefit plans for a period of nine months, assuming that such coverage is timely elected under COBRA for such U.S.-based named executive officer.

[9] The amount shown is equal to 150% of the sum of (a) the named executive’s annual base salary as of December 31, 2018, plus (b) his annual target bonus as of December 31, 2018.

[10] The amount shown is equal to the cost of covering the named executive officer and his eligible dependents under our benefit plans for a period of 18 months, assuming that such coverage is timely elected under COBRA for such U.S.-based named executive officer.

In addition to the benefits described above, our 2011 Equity Incentive Plan, 2009 Equity Incentive Plan, and 2017 Inducement Award Plan provide for full acceleration of all outstanding options in the event of a change of control of our Company where the successor company does not assume our outstanding options and other awards in connection with such acquisition transaction. We estimate the value of this benefit for each named executive officer to be equal to the amount listed above in the column labeled “Equity Acceleration.”

CEO PAY RATIO

Under SEC rules, we are required to provide the following information regarding the relationship between the annual total compensation of Mr. Linthwaite, our Chairman, President and Chief Executive Officer, and the median annual total compensation of our employees (other than Mr. Linthwaite) for fiscal 2018:

- Mr. Linthwaite's annual total compensation, as reported in the Summary Compensation Table included in this proxy statement, which was $2,585,213.

- The median of the annual total compensation of all employees (other than Mr. Linthwaite) of the Company (including our consolidated subsidiaries) was $93,638.

- Based on the above, for 2018, the ratio of Mr. Linthwaite's annual total compensation to the median of the annual total compensation of all employees was 28 to 1.

This pay ratio is a reasonable estimate calculated in a manner consistent with Item 402(u) of Regulation S-K under the Securities Act of 1933, as amended. In preparing this pay ratio disclosure, we exercised discretion permitted by the rule to rely on our 2017 identification of the median employee, upon concluding that our prior year identification remains relevant. Specifically, we concluded that:

- There have been no significant changes to our broad-based compensation arrangements that would reasonably be expected to result in a significant change to the compensation of our median employee. Specifically, the consistently applied compensation measure used to identify that employee for fiscal 2017 disclosure, which consisted of a reasonable measure of employees' annual base salary for salaried employees (or, for hourly employees, hourly rate multiplied by expected annual work schedule) and target incentive compensation and commissions, continues to be representative of the compensation arrangements of our employee population, and

- For purposes of this disclosure, there were no significant changes to our employee population that would be reasonably expected to result in a significant change in our median employee. specifically, as of December 31, 2018, we (including our consolidated subsidiaries) had 525 full-time, part-time, and temporary employees (excluding Mr. Linthwaite), consisting of 223 U.S. employees and 302 (or approximately 57% of our total employee population) employees located outside of the United States. This compares to, as of December 31, 2017, 512 full-time, part-time, and temporary employees (excluding Mr. Linthwaite), consisting of 215 U.S. employees and 297 (or approximately 58% of our total employee population) employees located outside of the United States. The totals provided above exclude employees based in Japan, who were excluded pursuant to the rule's de minimis exemption, totaling 9 and 7 employees as of December 31, 2018 and 2017, respectively.

Because the median employee for 2017 terminated prior to December 31, 2018, we exercised discretion permitted by the rule to substitute an employee with similar employment and compensation characteristics. The employee whose compensation is disclosed above for 2018 had compensation reasonably consistent with the compensation that would have been received for 2018 by the median employee that was the basis for our 2017 pay ratio disclosure.

EQUITY COMPENSATION PLAN INFORMATION

The following table summarizes the number of outstanding options and restricted stock units granted to our employees, consultants, and directors, as well as the number of shares of common stock remaining available for future issuance, under our equity compensation plans as of December 31, 2018.

	Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants and Rights (a)	Weighted Average Exercise Price of Outstanding Options, Warrants and Rights (b)	Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column (a))
Equity compensation plans approved by security holders			
2009 Equity Incentive Plan[1]	42,777	$6.56	—
2011 Equity Incentive Plan[2]	3,694,942	$8.04	2,022,429
2017 Employee Stock Purchase Plan[3]	—	—	697,855
Equity compensation plans not approved by security holders			
DVS Sciences, Inc 2010 Equity Incentive Plan[4]	38,125	$1.02	—
2017 Inducement Award Plan[5]	577,710	$6.23	1,422,290
Total	4,353,554	$7.56	4,142,574

[2] The 2009 Equity Incentive Plan was replaced by the 2011 Equity Incentive Plan in February 2011. A total of 55,423 shares remaining available for grant under the 2009 Equity Incentive Plan were transferred to the 2011 Equity Incentive Plan and the 2009 Equity Incentive Plan was terminated for any new grants.

[3] The 2011 Equity Incentive Plan provides that the number of shares available for issuance under the plan will include an annual increase on the first day of each fiscal year beginning in 2012, equal to the least of: (a) 1,000,000 shares; (b) 4.0% of the outstanding shares of common stock as of the last day of our immediately preceding fiscal year; or (c) such other amount as our Board of Directors may determine. Pursuant to the provision, an additional 1,000,000 shares became available for issuance under the 2011 Equity Incentive Plan effective January 1, 2019. This increase is not reflected in the table above.

[4] The 2017 Employee Stock Purchase Plan was approved by stockholders in July 2017. A total of 1,000,000 shares were reserved for issuance, of which 697,855 shares remained available for sale as of December 31, 2018.

[5] As of December 31, 2018, individual awards of options to purchase a total of 5,101 shares were outstanding pursuant to awards assumed in connection with our acquisition of DVS Sciences, Inc. and granted under DVS's 2010 Equity Incentive Plan at a weighted-average exercise price of $1.02.

[6] The Fluidigm 2017 Inducement Plan was approved by the Board in January 2017. As of December 31, 2018, a total of 1,422,290 shares of Fluidigm common stock remained available for issuance under the 2017 Inducement Plan and equity awards covering an aggregate of 577,710 shares were outstanding.

Material Features of the 2017 Inducement Award Plan

The 2017 Inducement Award Plan, or 2017 Inducement Plan, was established by the Board in January 2017 with the purpose of attracting, retaining and incentivizing employees in furtherance of Fluidigm's success. In accordance with Nasdaq rules, this plan is used to offer equity awards as material inducements for new employees to join Fluidigm. As of January 5, 2017, 2,000,000 shares of common stock were reserved solely for the granting of inducement stock options, restricted stock, restricted stock units and other awards to new employees. The 2017 Inducement Plan provides for the granting of stock options with exercise prices equal to the fair market value of our common stock on the date of grant. As of March 31, 2019, a total of 1,321,435 shares of Fluidigm common stock remained available for issuance under the 2017 Inducement Plan.

RELATED PERSON TRANSACTIONS AND SECTION 16(A) BENEFICIAL OWNERSHIP REPORTING COMPLIANCE

Related Person Transactions

None.

Policy Concerning Audit Committee Approval of Related Person Transactions

Our Board of Directors and Audit Committee have adopted a formal written policy that our executive officers, directors, holders of more than 5% of any class of our voting securities, and any member of the immediate family of any of the foregoing persons, are not permitted to enter into any transaction with us for which disclosure would be required under Item 404 of Regulation S-K, referred to as a related person transaction, without the review and approval or ratification of our Audit Committee, or other independent members of our Board of Directors if it is inappropriate for our Audit Committee to review such transaction due to a conflict of interest. Any related person transaction must be presented to our Audit Committee for review, consideration and approval or ratification. In approving or rejecting any such related person transaction, our Audit Committee is to consider the relevant facts and circumstances available and deemed relevant to the Audit Committee, including, but not limited to, whether the transaction is on terms no less favorable than terms generally available to an unaffiliated third party under the same or similar circumstances and the extent of the related person's interest in the transaction.

Section 16(a) Beneficial Ownership Reporting Compliance

Section 16(a) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, requires our directors, executive officers, and holders of more than 10% of our common stock to file with the SEC reports regarding their ownership and changes in ownership of our securities. We believe that our directors, executive officers, and 10% stockholders complied with all Section 16(a) filing requirements in 2018. In making these statements, we have relied upon examination of the filings made with the SEC and the written representations of our directors and executive officers.

SECURITY OWNERSHIP

Except as indicated by the footnotes below, the following table sets forth information as of April 8, 2019 concerning:

- Each person we believe to be the beneficial owner of more than five percent of our common stock;
- Each of our directors and nominees for the Board of Directors;
- Each of our named executive officers; and
- All of our directors and executive officers as a group.

Unless otherwise noted below, the address of each person listed on the table is c/o Fluidigm Corporation, 7000 Shoreline Court, Suite 100, South San Francisco, California 94080.

We have determined beneficial ownership in accordance with the rules of the SEC. Except as indicated by the footnotes below, we believe, based on the information furnished to us, that the persons and entities named in the table below have sole voting and investment power with respect to all shares of common stock that they beneficially own, subject to applicable community property laws.

Applicable percentage ownership is based on 68,997,806 shares of common stock outstanding at April 8, 2019. In computing the number of shares of common stock beneficially owned by a person and the percentage ownership of that person, we deemed outstanding shares of common stock subject to options held by that person that are currently exercisable, options held by that person that are exercisable within 60 days of April 8, 2019, and restricted stock units that are scheduled to vest within 60 days of April 8, 2019. We did not deem these shares outstanding, however, for the purpose of computing the percentage ownership of any other person.

The information provided in the table is based on our records, information filed with the SEC, and information provided to Fluidigm, except where otherwise noted.

Name of Beneficial Owner	Shares Beneficially Owned	Percent of Shares Beneficially Owned
5% Stockholders:		
Entities affiliated with Levin Easterly Partners LLC[1]	12,231,426	17.7%
Entities affiliated with PRIMECAP Management Company[2]	6,671,043	9.7%
Entities affiliated with Neuberger Berman Group LLC[3]	5,464,974	7.9%
Directors and Named Executive Officers:		
Stephen Christopher Linthwaite[4]	418,781	*
Nicolas M. Barthelemy[5]	69,062	*
Gerhard F. Burbach[6]	123,815	*
Laura M. Clague	—	*
Samuel D. Colella[7]	205,103	*
Patrick S. Jones[8]	128,700	*
Carlos V. Paya[9]	59,564	*
Vikram Jog[10]	160,252	*
Nicholas S. Khadder[11]	78,234	*
Bradley Kreger[12]	41,668	*
Steven C. McPhail[13]	89,241	*
All current directors, current executive officers, and named executive officers as a group (11 persons)[14]	1,374,420	2.0%

* Less than one percent.

(1) Based solely on the Schedule 13G filed with the SEC on April 8, 2019 by Levin Easterly Partners LLC ("Levin Easterly"), filing jointly with LE Partners Holdings LLC ("LEPH"), LE Partners Holdings II LLC ("LEPH II"), LE Partners Holdings III LLC ("LEPH III"), LE Partners Holdings IV LLC ("LEPH IV"), John ("Jack") Murphy, Darrell Crate, Avshalom Kalichstein, and Levin Capital Strategies, LP ("LCS"). Such Schedule 13G reported that (i) Levin Easterly, LEPH, LEPH II, LEPH III, LEPH IV, Mr. Crate, and Mr. Kalichstein shared voting and dispositive power with respect to 8,960,859 shares and 12,226,430 shares, respectively; (ii) Mr. Murphy shared voting and dispositive power with respect to 8,965,859 and 12,231,426 shares, respectively; (iii) LCS shared voting and dispositive power with respect to 4,996 shares; and (iv) that none of such parties held sole voting or dispositive power with respect to any of such shares. The address of Levin Easterly is 595 Madison Avenue, 17th Floor, New York, NY 10022.

(2) Based solely on the most recently available Schedule 13G/A filed with the SEC on February 8, 2019 by PRIMECAP Management Company ("PRIMECAP"). Such Schedule 13G/A reported sole voting power with respect to 4,666,832 shares, sole dispositive power with respect to 6,671,043 shares, and no shared voting or dispositive power. PRIMECAP is an investment advisor in accordance with Rule 13d-1(b). The address of PRIMECAP is 177 E. Colorado Blvd., 11th Floor, Pasadena, CA 91105.

(3) Based solely on the most recently available Schedule 13G/A filed with the SEC on February 14, 2019 by Neuberger Berman Group LLC, filing jointly with Neuberger Berman Investment Advisers LLC. Such Schedule 13G/A reported shared voting power with respect to 4,392,178 shares, shared dispositive power with respect to 5,464,974 shares, and no sole voting or dispositive power. The address of Neuberger Berman Group LLC is 1290 Avenue of the Americas, New York, NY 10104.

(4) Consists of 151,458 shares held by Stephen Christopher Linthwaite, options to purchase 254,761 shares of common stock that are exercisable within 60 days of April 8, 2019, and 12,562 restricted stock units scheduled to vest within 60 days of April 8, 2019.

(5) Consists of 36,862 shares held by the Barthelemy 2001 Trust, of which Mr. Barthelemy is a trustee, options to purchase 26,100 shares of common stock that are exercisable within 60 days of April 8, 2019, and 6,100 restricted stock units that are scheduled to vest within 60 days of April 8, 2019.

(6) Consists of 8,000 shares held by Gerhard F. Burbach, options to purchase 85,600 shares of common stock that are exercisable within 60 days of April 8, 2019, and 30,215 restricted stock units that are vested or scheduled to vest within 60 days of April 8, 2019 and with respect to which Mr. Burbach has deferred settlement as described in "*Compensation of Directors — RSUs in Lieu of Cash and RSU Deferral.*"

(7) Consists of 95,771 shares held by Samuel D. Colella, 5,561 shares held by The Colella Family Partners, L.P., of which Mr. Colella is the general partner, 53,395 shares held by the Colella Family Exempt Marital Deduction Trust dated 9/21/ 1992 of which Mr. Colella is a trustee, 3,326 shares held by the Colella Family Non-Exempt Marital Deduction Trust dated 9/21/1992 of which Mr. Colella is a trustee, options to purchase 40,950 shares of common stock that are exercisable within 60 days of April 8, 2019, and 6,100 restricted stock units that are scheduled to vest within 60 days of April 8, 2019.

(8) Consists of 13,000 shares held by Patrick S. Jones, options to purchase 109,600 shares of common stock that are exercisable within 60 days of April 8, 2019, and 6,100 restricted stock units that are scheduled to vest within 60 days of April 8, 2019.

(9) Consists of 27,364 shares held by Carlos V. Paya, options to purchase 26,100 shares of common stock that are exercisable within 60 days of April 8, 2019, and 6,100 restricted stock units that are scheduled to vest within 60 days of April 8, 2019.

(10) Consists of 35,411 shares held by Vikram Jog, 52,061 shares held by the Vikram and Pratima Jog Family Trust U/A dated June 23, 2009, of which Mr. Jog is a trustee, options to purchase 68,029 shares of common stock that are exercisable within 60 days of April 8, 2019, and 4,751 restricted stock units scheduled to vest within 60 days of April 8, 2019.

(11) Consists of 34,824 shares held by Nicholas Khadder, options to purchase 38,509 shares of common stock that are exercisable within 60 days of April 8, 2019, and 4,901 restricted stock units scheduled to vest within 60 days of April 8, 2019.

(12) Consists of options to purchase 29,168 shares of common stock that are exercisable within 60 days of April 8, 2019 and 12,500 restricted stock units scheduled to vest within 60 days of April 8, 2019.

(13) Consists of 57,112 shares held by Steven C. McPhail, options to purchase 28,409 shares of common stock that are exercisable within 60 days of April 8, 2019, and 3,720 restricted stock units scheduled to vest within 60 days of April 8, 2019.

(14) Consists of 574,145 shares beneficially owned by current directors, current executive officers, and named executive officers, options held by current directors and executive officers to purchase 707,226 shares of common stock that are exercisable within 60 days of April 8, 2019, 68,934 restricted stock units held by current directors and executive officers that are scheduled to vest within 60 days of April 8, 2019, and 24,115 vested restricted stock units with respect to which settlement has been deferred.

OTHER MATTERS

We know of no other matters to be submitted at the 2019 Annual Meeting. If any other matters properly come before the 2019 Annual Meeting, it is the intention of the persons named in the proxy to vote the shares they represent as the Board of Directors may recommend. Discretionary authority with respect to such other matters is granted by a properly submitted proxy.

It is important that your shares be represented at the 2019 Annual Meeting, regardless of the number of shares that you hold. You are, therefore, urged to vote as promptly as possible to ensure your vote is recorded.

THE BOARD OF DIRECTORS

South San Francisco, California
April 23, 2019

Exhibit I

FLUIDIGM CORPORATION

2011 EQUITY INCENTIVE PLAN

(As amended and restated, subject to, and contingent upon, stockholder approval at the 2019 Annual Meeting of Stockholders)

1. Purposes of the Plan. The purposes of this Plan are (a) to attract and retain the best available personnel for positions of substantial responsibility, (b) to provide additional incentive to Employees, Directors and Consultants, and (c) to promote the success of the Company's business. The Plan permits the grant of Incentive Stock Options, Nonstatutory Stock Options, Restricted Stock, Restricted Stock Units, Stock Appreciation Rights, Performance Units and Performance Shares.

2. Definitions. As used herein, the following definitions will apply:

(a) "Administrator" means the Board or any of its Committees as may administer the Plan in accordance with Section 4 hereof.

(b) "Applicable Laws" means the requirements relating to the administration of equity-based awards under U.S. state corporate laws, U.S. federal and state securities laws, the Code, any stock exchange or quotation system on which the Common Stock is listed or quoted and the applicable laws of any foreign country or jurisdiction where Awards are, or will be, granted under the Plan.

(c) "Award" means, individually or collectively, a grant under the Plan of Options, Stock Appreciation Rights, Restricted Stock, Restricted Stock Units, Performance Units or Performance Shares.

(d) "Award Agreement" means the written or electronic agreement setting forth the terms and provisions applicable to each Award granted under the Plan. The Award Agreement is subject to the terms and conditions of the Plan.

(e) "Board" means the Board of Directors of the Company.

(f) "Change in Control" means the occurrence of any of the following events:

(i) A change in the ownership of the Company which occurs on the date that any one person, or more than one person acting as a group ("Person"), acquires ownership of the stock of the Company that, together with the stock held by such Person, constitutes more than 50% of the total voting power of the stock of the Company; provided, however, that for purposes of this subsection (i), the acquisition of additional stock by any one Person, who is considered to own more than 50% of the total voting power of the stock of the Company will not be considered a Change in Control; or

(ii) A change in the effective control of the Company which occurs on the date that a majority of members of the Board is replaced during any twelve (12) month period by Directors whose appointment or election is not endorsed by a majority of the members of the Board prior to the date of the appointment or election. For purposes of this clause (ii), if any Person is considered to be in effective control of the Company, the acquisition of additional control of the Company by the same Person will not be considered a Change in Control; or

(iii) A change in the ownership of a substantial portion of the Company's assets which occurs on the date that any Person acquires (or has acquired during the twelve (12) month period ending on the date of the most recent acquisition by such person or persons) assets from the Company that have a total gross fair market value equal to or more than 50% of the total gross fair market value of all of the assets of the Company immediately prior to such acquisition or acquisitions; provided, however, that for purposes of this subsection (iii), the following will not constitute a change in the ownership of a substantial portion of the Company's assets: (A) a transfer to an entity that is controlled by the Company's stockholders immediately after the transfer, or (B) a transfer of assets by the Company to: (1) a stockholder of the Company (immediately before the asset transfer) in exchange for or with respect to the Company's stock, (2) an entity, 50% or more of the total value or voting power of which is owned, directly or indirectly, by the Company, (3) a Person, that owns, directly or indirectly, 50% or more of the total value or voting power of all the outstanding stock of the Company, or (4) an entity, at least 50% of the total value or voting power of which is owned, directly or indirectly, by a Person described in this subsection (iii)(B)(3). For purposes of this subsection (iii), gross fair market value means the value of the assets of the Company, or the value of the assets being disposed of, determined without regard to any liabilities associated with such assets.

For purposes of this definition, persons will be considered to be acting as a group if they are owners of a corporation that enters into a merger, consolidation, purchase or acquisition of stock, or similar business transaction with the Company.

Notwithstanding the foregoing, a transaction will not be deemed a Change in Control unless the transaction qualifies as a change in control event within the meaning of Code Section 409A, as it has been and may be amended from time to time, and any proposed or final Treasury Regulations and Internal Revenue Service guidance that has been promulgated or may be promulgated thereunder from time to time.

Further and for the avoidance of doubt, a transaction will not constitute a Change in Control if: (i) its sole purpose is to change the state of the Company's incorporation, or (ii) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held the Company's securities immediately before such transaction.

(g) "Code" means the Internal Revenue Code of 1986, as amended. Reference to a specific section of the Code or regulation thereunder shall include such section or regulation, any valid regulation promulgated under such section, and any comparable provision of any future legislation or regulation amending, supplementing or superseding such section or regulation.

(h) "Committee" means a committee of Directors or of other individuals satisfying Applicable Laws appointed by the Board in accordance with Section 4 hereof.

(i) "Common Stock" means the common stock of the Company.

(j) "Company" means Fluidigm Corporation, a Delaware corporation, or any successor thereto.

(k) "Consultant" means any person, including an advisor, engaged by the Company or a Parent or Subsidiary to render services to such entity.

(l) "Director" means a member of the Board.

(m) "Disability" means total and permanent disability as defined in Section 22(e)(3) of the Code, provided that in the case of Awards other than Incentive Stock Options, the Administrator in its discretion may determine whether a permanent and total disability exists in accordance with uniform and non-discriminatory standards adopted by the Administrator from time to time.

(n) "Employee" means any person, including Officers and Directors, employed by the Company or any Parent or Subsidiary of the Company. Neither service as a Director nor payment of a director's fee by the Company will be sufficient to constitute "employment" by the Company.

(o) "Exchange Act" means the Securities Exchange Act of 1934, as amended.

(p) "Exchange Program" means a program under which (i) outstanding Awards are surrendered or cancelled in exchange for Awards of the same type (which may have higher or lower exercise prices and different terms), Awards of a different type, and/or cash, (ii) Participants would have the opportunity to transfer any outstanding Awards to a financial institution or other person or entity selected by the Administrator, and/or (iii) the exercise price of an outstanding Award is increased or reduced. The Administrator will determine the terms and conditions of any Exchange Program in its sole discretion.

(q) "Fair Market Value" means, as of any date, the value of Common Stock determined as follows:

(i) If the Common Stock is listed on any established stock exchange or a national market system, including without limitation the Nasdaq Global Select Market, the Nasdaq Global Market or the Nasdaq Capital Market of The Nasdaq Stock Market, its Fair Market Value will be the closing sales price for such stock (or the closing bid, if no sales were reported) as quoted on such exchange or system on the day of determination, as reported in *The Wall Street Journal* or such other source as the Administrator deems reliable. If there are no trades on such date, the closing price on the latest preceding business day upon which trades occurred shall be the Fair Market Value.

(ii) If the Common Stock is regularly quoted by a recognized securities dealer but selling prices are not reported, the Fair Market Value of a Share will be the mean between the high bid and low asked prices for the Common Stock on the day of determination, as reported in *The Wall Street Journal* or such other source as the Administrator deems reliable.

(iii) In the absence of an established market for the Common Stock, the Fair Market Value will be determined in good faith by the Administrator.

(r) "Fiscal Year" means the fiscal year of the Company.

(s) "Incentive Stock Option" means an Option intended to qualify as an incentive stock option within the meaning of Section 422 of the Code and the regulations promulgated thereunder.

(t) "Inside Director" means a Director who is an Employee.

(u) "Nonstatutory Stock Option" means an Option that by its terms does not qualify or is not intended to qualify as an Incentive Stock Option.

(v) "Officer" means a person who is an officer of the Company within the meaning of Section 16 of the Exchange Act and the rules and regulations promulgated thereunder.

(w) "Option" means a stock option granted pursuant to the Plan.

(x) "Outside Director" means a Director who is not an Employee.

(y) "Parent" means a "parent corporation," whether now or hereafter existing, as defined in Section 424(e) of the Code.

(z) "Participant" means the holder of an outstanding Award.

(aa) "Performance Share" means an Award denominated in Shares which may be earned in whole or in part upon attainment of performance goals or other vesting criteria as the Administrator may determine pursuant to Section 10.

(bb) "Performance Unit" means an Award which may be earned in whole or in part upon attainment of performance goals or other vesting criteria as the Administrator may determine and which may be settled for cash, Shares or other securities or a combination of the foregoing pursuant to Section 10.

(cc) "Period of Restriction" means the period during which the transfer of Shares of Restricted Stock are subject to restrictions and therefore, the Shares are subject to a substantial risk of forfeiture. Such restrictions may be based on the passage of time, the achievement of target levels of performance, or the occurrence of other events as determined by the Administrator.

(dd) "Plan" means this 2011 Equity Incentive Plan, as amended and restated at the 2019 Annual Meeting of Stockholders.

(ee) "Restatement Effective Date" means the date of the Company's 2019 Annual Meeting of Stockholders.

(ff) "Restricted Stock" means Shares issued pursuant to a Restricted Stock award under Section 7 of the Plan, or issued pursuant to the early exercise of an Option.

(gg) "Restricted Stock Unit" means a bookkeeping entry representing an amount equal to the Fair Market Value of one Share, granted pursuant to Section 8. Each Restricted Stock Unit represents an unfunded and unsecured obligation of the Company.

(hh) "Rule 16b-3" means Rule 16b-3 of the Exchange Act or any successor to Rule 16b-3, as in effect when discretion is being exercised with respect to the Plan.

(ii) "Section 16(b)" means Section 16(b) of the Exchange Act.

(jj) "Service Provider" means an Employee, Director or Consultant.

(kk) "Share" means a share of the Common Stock, as adjusted in accordance with Section 13 of the Plan.

(ll) "Stock Appreciation Right" means an Award, granted alone or in connection with an Option, that pursuant to Section 9 is designated as a Stock Appreciation Right.

(mm) "Subsidiary" means a "subsidiary corporation," whether now or hereafter existing, as defined in Section 424(f) of the Code.

3. Stock Subject to the Plan.

(a) Stock Subject to the Plan. Subject to the provisions of Section 13 of the Plan, the maximum aggregate number of Shares that may be issued under the Plan as of the Restatement Effective Date is (i) 4,950,644 Shares, plus (ii) any Shares that, as of immediately prior to the Restatement Effective Date, were available for grant under the pre-existing version of the 2011 Equity Incentive Plan (prior to this amendment and restatement) (the "Existing Plan"), with the maximum number of Shares to be added to the Plan pursuant to clause (ii) equal to 1,396,356 Shares. The Shares may be authorized, but unissued, or reacquired Common Stock.

(b) Lapsed Awards. If an Award expires or becomes unexercisable without having been exercised in full or, with respect to Restricted Stock, Restricted Stock Units, Performance Units or Performance Shares, is forfeited to or repurchased by the Company due to failure to vest, the unpurchased Shares (or for Awards other than Options or Stock Appreciation Rights the forfeited or repurchased Shares) which were subject thereto will become available for future grant or sale under the Plan (unless the Plan has terminated). With respect to Stock Appreciation Rights, only Shares actually issued (i.e., the net Shares issued) pursuant to a Stock Appreciation Right will cease to be available under the Plan; all remaining Shares under Stock Appreciation Rights will remain available for future grant or sale under the Plan (unless the Plan has terminated). Shares that have actually been issued under the Plan under any Award will not be returned to the Plan and will not become available for future distribution under the Plan; provided, however, that if Shares issued pursuant to Awards of Restricted Stock, Restricted Stock Units, Performance Shares or Performance Units are repurchased by the Company or are forfeited to the Company, such Shares will become available for future grant under the Plan. Shares used to pay the exercise price of an Award or to satisfy the tax withholding obligations related to an Award will become available for future grant or sale under the Plan. To the extent an Award under the Plan is paid out in cash rather than Shares, such cash payment will not result in reducing the number of Shares available for issuance under the Plan. Notwithstanding the foregoing and, subject to adjustment as provided in Section 13, the maximum number of Shares that may be issued upon the exercise of Incentive Stock Options will equal the aggregate Share number stated in Section 3(a), plus, to the extent allowable under Section 422 of the Code and the Treasury Regulations promulgated thereunder, any Shares that become available for issuance under the Plan pursuant to Sections 3(b) and 3(c).

(c) Share Reserve. The Company, during the term of this Plan, will at all times reserve and keep available such number of Shares as will be sufficient to satisfy the requirements of the Plan.

4. Administration of the Plan.

(a) Procedure.

(i) Multiple Administrative Bodies. Different Committees may administer the Plan with respect to different groups of Service Providers.

(ii) Rule 16b-3. To the extent desirable to qualify transactions hereunder as exempt under Rule 16b-3, such transactions will be structured to satisfy the requirements for exemption under Rule 16b-3.

(iii) Other Administration. Other than as provided above, the Plan will be administered by (A) the Board or (B) a Committee constituted to satisfy Applicable Laws.

(b) Powers of the Administrator. Subject to the provisions of the Plan, and in the case of a Committee, subject to the specific duties delegated by the Board to such Committee, the Administrator will have the authority, in its discretion:

(i) to determine the Fair Market Value;

(ii) to select the Service Providers to whom Awards may be granted hereunder;

(iii) to determine the number of Shares to be covered by each Award granted hereunder;

(iv) to approve forms of Award Agreements for use under the Plan;

(v) to determine the terms and conditions, not inconsistent with the terms of the Plan, of any Award granted hereunder. Such terms and conditions include, but are not limited to, the exercise price, the time or times when Awards may be exercised (which may be based on performance criteria), any vesting acceleration or waiver of forfeiture restrictions, and any restriction or limitation regarding any Award or the Shares relating thereto, based in each case on such factors as the Administrator will determine;

(vi) to construe and interpret the terms of the Plan and Awards granted pursuant to the Plan;

(vii) to prescribe, amend and rescind rules and regulations relating to the Plan, including rules and regulations relating to sub-plans established for the purpose of satisfying applicable foreign laws or for qualifying for favorable tax treatment under applicable foreign laws;

(viii) to modify or amend each Award (subject to Section 18 of the Plan), including but not limited to the discretionary authority to extend the post-termination exercisability period of Awards and to extend the maximum term of an Option (subject to Section 6(b) of the Plan);

(ix) to allow Participants to satisfy tax withholding obligations in such manner as prescribed in Section 14 of the Plan;

(x) to authorize any person to execute on behalf of the Company any instrument required to effect the grant of an Award previously granted by the Administrator;

(xi) to allow a Participant to defer the receipt of the payment of cash or the delivery of Shares that would otherwise be due to such Participant under an Award; and

(xii) to make all other determinations deemed necessary or advisable for administering the Plan.

(c) Effect of Administrator's Decision. The decisions, determinations, and interpretations of the Administrator will be final and binding on all Participants and any other holders of Awards.

(d) Limitations on Administrative Authority. Notwithstanding anything herein to the contrary, the Administrator shall be limited as follows:

(i) Exchange Program. The Administrator may not implement an Exchange Program.

(ii) No Dividends or Dividend Equivalents Paid on Unvested Awards. No dividends or dividend equivalents shall be paid on any unvested Awards. Any dividends or dividend equivalents may be declared or accrue on unvested Awards, but shall not be paid until the vesting of such Awards.

(iii) Outside Director Limitations. No Outside Director may be paid, issued or granted, in any Fiscal Year, Awards with an aggregate value greater than $400,000 (with the value of each Award based on its grant date fair value (determined in accordance with U.S. generally accepted accounting principles)), except that such limit will be increased to $500,000 in the Fiscal Year of his or her initial service as an Outside Director. Any Awards granted to an individual for his or her services as an Employee, or for his or her services as a Consultant (other than as an Outside Director), will not count for purposes of the limitation under this Section 4(d)(iii).

5. Eligibility. Nonstatutory Stock Options, Stock Appreciation Rights, Restricted Stock, Restricted Stock Units, Performance Shares and Performance Units may be granted to Service Providers. Incentive Stock Options may be granted only to Employees.

6. Stock Options.

(a) Limitations. Each Option will be designated in the Award Agreement as either an Incentive Stock Option or a Nonstatutory Stock Option. However, notwithstanding such designation, to the extent that the aggregate Fair Market Value of the Shares with respect to which Incentive Stock Options are exercisable for the first time by the Participant during any calendar year (under all plans of the Company and any Parent or Subsidiary) exceeds one hundred thousand dollars ($100,000), such Options will be treated as Nonstatutory Stock Options. For purposes of this Section 6(a), Incentive Stock Options will be taken into account in the order in which they were granted. The Fair Market Value of the Shares will be determined as of the time the Option with respect to such Shares is granted.

(b) Term of Option. The term of each Option will be stated in the Award Agreement. In the case of any Option (whether Incentive Stock Option or Nonstatutory Stock Option), the maximum term will be ten (10) years from the date of grant or such shorter term as may be provided in the Award Agreement. Moreover, in the case of an Incentive Stock Option granted to a Participant who, at the time the Incentive Stock Option is granted, owns stock representing more than ten percent (10%) of the total combined voting power of all classes of stock of the Company or any Parent or Subsidiary, the term of the Incentive Stock Option will be five (5) years from the date of grant or such shorter term as may be provided in the Award Agreement.

(c) Option Exercise Price and Consideration.

(i) Exercise Price. The per share exercise price for the Shares to be issued pursuant to exercise of an Option will be determined by the Administrator, subject to the following:

(1) In the case of an Incentive Stock Option

a) granted to an Employee who, at the time the Incentive Stock Option is granted, owns stock representing more than ten percent (10%) of the voting power of all classes of stock of the Company or any Parent or Subsidiary, the per Share exercise price will be no less than one hundred ten percent (110%) of the Fair Market Value per Share on the date of grant.

b) granted to any Employee other than an Employee described in paragraph (A) immediately above, the per Share exercise price will be no less than one hundred percent (100%) of the Fair Market Value per Share on the date of grant.

(2) In the case of a Nonstatutory Stock Option, the per Share exercise price will be no less than one hundred percent (100%) of the Fair Market Value per Share on the date of grant.

(3) Notwithstanding the foregoing, Options may be granted with a per Share exercise price of less than one hundred percent (100%) of the Fair Market Value per Share on the date of grant pursuant to a transaction described in, and in a manner consistent with, Section 424(a) of the Code.

(ii) Waiting Period and Exercise Dates. At the time an Option is granted, the Administrator will fix the period within which the Option may be exercised and will determine any conditions that must be satisfied before the Option may be exercised.

(iii) Form of Consideration. The Administrator will determine the acceptable form of consideration for exercising an Option, including the method of payment. In the case of an Incentive Stock Option, the Administrator will determine the acceptable form of consideration at the time of grant. Such consideration may consist entirely of: (1) cash; (2) check; (3) other Shares, provided that such Shares have a Fair Market Value on the date of surrender equal to the aggregate exercise price of the Shares as to which such Option will be exercised and provided that accepting such Shares will not result in any adverse accounting consequences to the Company, as the Administrator may determine in its sole discretion; (4) consideration received by the Company under a broker-assisted (or other) cashless exercise program (whether through a broker or otherwise) implemented by the Company in connection with the Plan; (5) by net exercise; (6) such other consideration and method of payment for the issuance of Shares to the extent permitted by Applicable Laws; or (7) any combination of the foregoing methods of payment.

(d) Exercise of Option.

(i) Procedure for Exercise; Rights as a Stockholder. Any Option granted hereunder will be exercisable according to the terms of the Plan and at such times and under such conditions as determined by the Administrator and set forth in the Award Agreement. An Option may not be exercised for a fraction of a Share.

An Option will be deemed exercised when the Company receives: (i) notice of exercise (in such form as the Administrator may specify from time to time) from the person entitled to exercise the Option, and (ii) full payment for the Shares with respect to which the Option is exercised (together with applicable withholding taxes). Full payment may consist of any consideration and method of payment authorized by the Administrator and permitted by the Award Agreement and the Plan. Shares issued upon exercise of an Option will be issued in the name of the Participant or, if requested by the Participant, in the name of the Participant and his or her spouse. Until the Shares are issued (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company), no right to vote or receive dividends or any other rights as a stockholder will exist with respect to the Shares subject to an Option, notwithstanding the exercise of the Option. The Company will issue (or cause to be issued) such Shares promptly after the Option is exercised. No adjustment will be made for a dividend or other right for which the record date is prior to the date the Shares are issued, except as provided in Section 13 of the Plan.

Exercising an Option in any manner will decrease the number of Shares thereafter available, both for purposes of the Plan and for sale under the Option, by the number of Shares as to which the Option is exercised.

(ii) Termination of Relationship as a Service Provider. If a Participant ceases to be a Service Provider, other than upon the Participant's termination as the result of the Participant's death or Disability, the Participant may exercise his or her Option within such period of time as is specified in the Award Agreement to the extent that the Option is vested on the date of termination (but in no event later than the expiration of the term of such Option as set forth in the Award Agreement). In the absence of a specified time in the Award Agreement, the Option will remain exercisable for three (3) months following the Participant's termination. Unless otherwise provided by the Administrator, if on the date of termination the Participant is not vested as to his or her entire Option, the Shares covered by the unvested portion of the Option will revert to the Plan. If after termination the Participant does not exercise his or her Option within the time specified by the Administrator, the Option will terminate, and the Shares covered by such Option will revert to the Plan.

(iii) Disability of Participant. If a Participant ceases to be a Service Provider as a result of the Participant's Disability, the Participant may exercise his or her Option within such period of time as is specified in the Award Agreement to the extent the Option is vested on the date of termination (but in no event later than the expiration of the term of such Option as set forth in the Award Agreement). In the absence of a specified time in the Award Agreement, the Option will remain exercisable for twelve (12) months following the Participant's termination. Unless otherwise provided by the Administrator, if on the date of termination the Participant is not vested as to his or her entire Option, the Shares covered by the unvested portion of the Option will revert to the Plan. If after termination the Participant does not exercise his or her Option within the time specified herein, the Option will terminate, and the Shares covered by such Option will revert to the Plan.

(iv) Death of Participant. If a Participant dies while a Service Provider, the Option may be exercised following the Participant's death within such period of time as is specified in the Award Agreement to the extent that the Option is vested on the date of death (but in no event may the option be exercised later than the expiration of the term of such Option as set forth in the Award Agreement), by the Participant's designated beneficiary, provided such beneficiary has been designated prior to Participant's death in a form acceptable to the Administrator. If no such beneficiary has been designated by the Participant, then such Option may be exercised by the personal representative of the Participant's estate or by the person(s) to whom the Option is transferred pursuant to the Participant's will or in accordance with the laws of descent and distribution. In the absence of a specified time in the Award Agreement, the Option will remain exercisable for twelve (12) months following Participant's death. Unless otherwise provided by the Administrator, if at the time of death Participant is not vested as to his or her entire Option, the Shares covered by the unvested portion of the Option will immediately revert to the Plan. If the Option is not so exercised within the time specified herein, the Option will terminate, and the Shares covered by such Option will revert to the Plan.

7. Restricted Stock.

(a) Grant of Restricted Stock. Subject to the terms and provisions of the Plan, the Administrator, at any time and from time to time, may grant Shares of Restricted Stock to Service Providers in such amounts as the Administrator, in its sole discretion, will determine.

(b) Restricted Stock Agreement. Each Award of Restricted Stock will be evidenced by an Award Agreement that will specify the Period of Restriction, the number of Shares granted, and such other terms and conditions as the Administrator, in its sole discretion, will determine. Unless the Administrator determines otherwise, the Company as escrow agent will hold Shares of Restricted Stock until the restrictions on such Shares have lapsed.

(c) Transferability. Except as provided in this Section 7 or in the Award Agreement, Shares of Restricted Stock may not be sold, transferred, pledged, assigned, or otherwise alienated or hypothecated until the end of the applicable Period of Restriction.

(d) Other Restrictions. The Administrator, in its sole discretion, may impose such other restrictions on Shares of Restricted Stock as it may deem advisable or appropriate.

(e) Removal of Restrictions. Except as otherwise provided in this Section 7, Shares of Restricted Stock covered by each Restricted Stock grant made under the Plan will be released from escrow as soon as practicable after the last day of the Period of Restriction or at such other time as the Administrator may determine. The Administrator, in its discretion, may accelerate the time at which any restrictions will lapse or be removed.

(f) Voting Rights. During the Period of Restriction, Service Providers holding Shares of Restricted Stock granted hereunder may exercise full voting rights with respect to those Shares, unless the Administrator determines otherwise.

(g) Dividends and Other Distributions. During the Period of Restriction, Service Providers holding Shares of Restricted Stock will be entitled to receive all dividends and other distributions paid with respect to such Shares, unless the Administrator provides otherwise, subject to Section 4(d)(ii). If any such dividends or distributions are paid in Shares, the Shares will be subject to the same restrictions on transferability and forfeitability as the Shares of Restricted Stock with respect to which they were paid.

(h) Return of Restricted Stock to Company. On the date set forth in the Award Agreement, the Restricted Stock for which restrictions have not lapsed will revert to the Company and again will become available for grant under the Plan.

8. Restricted Stock Units.

(a) Grant. Restricted Stock Units may be granted at any time and from time to time as determined by the Administrator. After the Administrator determines that it will grant Restricted Stock Units under the Plan, it will advise the Participant in an Award Agreement of the terms, conditions, and restrictions related to the grant, including the number of Restricted Stock Units.

(b) Vesting Criteria and Other Terms. The Administrator will set vesting criteria in its discretion, which, depending on the extent to which the criteria are met, will determine the number of Restricted Stock Units that will be paid out to the Participant. The Administrator may set vesting criteria based upon the achievement of Company-wide, business unit, or individual goals (including, but not limited to, continued employment), or any other basis determined by the Administrator in its discretion.

(c) Earning Restricted Stock Units. Upon meeting the applicable vesting criteria, the Participant will be entitled to receive a payout as determined by the Administrator. Notwithstanding the foregoing, at any time after the grant of Restricted Stock Units, the Administrator, in its sole discretion, may reduce or waive any vesting criteria that must be met to receive a payout.

(d) Form and Timing of Payment. Payment of earned Restricted Stock Units will be made as soon as practicable after the date(s) determined by the Administrator and set forth in the Award Agreement. The Administrator, in its sole discretion, may only settle earned Restricted Stock Units in cash, Shares, or a combination of both.

(e) Cancellation. On the date set forth in the Award Agreement, all unearned Restricted Stock Units will be forfeited to the Company.

9. Stock Appreciation Rights.

(a) Grant of Stock Appreciation Rights. Subject to the terms and conditions of the Plan, a Stock Appreciation Right may be granted to Service Providers at any time and from time to time as will be determined by the Administrator, in its sole discretion.

(b) Number of Shares. The Administrator will have complete discretion to determine the number of Stock Appreciation Rights granted to any Service Provider.

(c) Exercise Price and Other Terms. The per share exercise price for the Shares to be issued pursuant to exercise of a Stock Appreciation Right will be determined by the Administrator and will be no less than one hundred percent (100%) of the Fair Market Value per Share on the date of grant. Otherwise, subject to Section 6(a) of the Plan, the Administrator, subject to the provisions of the Plan, will have complete discretion to determine the terms and conditions of Stock Appreciation Rights granted under the Plan; provided, that the maximum term of any Stock Appreciation Right will be ten (10) years from the date of grant.

(d) Stock Appreciation Right Agreement. Each Stock Appreciation Right grant will be evidenced by an Award Agreement that will specify the exercise price, the term of the Stock Appreciation Right, the conditions of exercise, and such other terms and conditions as the Administrator, in its sole discretion, will determine.

(e) Expiration of Stock Appreciation Rights. A Stock Appreciation Right granted under the Plan will expire upon the date determined by the Administrator, in its sole discretion, and set forth in the Award Agreement. Notwithstanding the foregoing, the rules of Section 6(b) relating to the maximum term and Section 6(d) relating to exercise also will apply to Stock Appreciation Rights.

(f) Payment of Stock Appreciation Right Amount. Upon exercise of a Stock Appreciation Right, a Participant will be entitled to receive payment from the Company in an amount determined by multiplying (i) the difference between the Fair Market Value of a Share on the date of exercise over the exercise price times (ii) the number of Shares with respect to which the Stock Appreciation Right is exercised. At the discretion of the Administrator, the payment upon exercise of a Stock Appreciation Right may be made in cash, in Shares of equivalent value, or in some combination thereof.

10. Performance Units and Performance Shares.

(a) Grant of Performance Units/Shares. Performance Units and Performance Shares may be granted to Service Providers at any time and from time to time, as will be determined by the Administrator, in its sole discretion. The Administrator will have complete discretion in determining the number of Performance Units and Performance Shares granted to each Participant.

(b) Value of Performance Units/Shares. Each Performance Unit will have an initial value that is established by the Administrator on or before the date of grant. Each Performance Share will have an initial value equal to the Fair Market Value of a Share on the date of grant.

(c) Performance Objectives and Other Terms. The Administrator will set performance objectives or other vesting provisions (including, without limitation, continued status as a Service Provider) in its discretion which, depending on the extent to which they are met, will determine the number or value of Performance Units/Shares that will be paid out to the Service Providers. The time period during which the performance objectives or other vesting provisions must be met will be called the "Performance Period." Each Award of Performance Units/Shares will be evidenced by an Award Agreement that will specify the Performance Period, and such other terms and conditions as the Administrator, in its sole discretion, will determine. The Administrator may set performance objectives based upon the achievement of Company-wide, divisional, or individual goals, applicable federal or state securities laws, or any other basis determined by the Administrator in its discretion.

(d) Earning of Performance Units/Shares. After the applicable Performance Period has ended, the holder of Performance Units/Shares will be entitled to receive a payout of the number of Performance Units/Shares earned by the Participant over the Performance Period, to be determined as a function of the extent to which the corresponding performance objectives or other vesting provisions have been achieved. After the grant of a Performance Unit/Share, the Administrator, in its sole discretion, may reduce or waive any performance objectives or other vesting provisions for such Performance Unit/Share.

(e) Form and Timing of Payment of Performance Units/Shares. Payment of earned Performance Units/Shares will be made as soon as practicable after the expiration of the applicable Performance Period. The Administrator, in its sole discretion, may pay earned Performance Units/Shares in the form of cash, in Shares (which have an aggregate Fair Market Value equal to the value of the earned Performance Units/Shares at the close of the applicable Performance Period) or in a combination thereof.

(f) Cancellation of Performance Units/Shares. On the date set forth in the Award Agreement, all unearned or unvested Performance Units/Shares will be forfeited to the Company, and again will be available for grant under the Plan.

11. Leaves of Absence/Transfers Between Locations. Unless the Administrator provides otherwise, vesting of Awards granted hereunder will be suspended during any unpaid leave of absence. A Participant will not cease to be an Employee in the case of (i) any leave of absence approved by the Company or (ii) transfers between locations of the Company or between the Company, its Parent, or any Subsidiary. For purposes of Incentive Stock Options, no such leave may exceed three (3) months, unless reemployment upon expiration of such leave is guaranteed by statute or contract. If reemployment upon expiration of a leave of absence approved by the Company is not so guaranteed, then six (6) months following the first day of such leave any Incentive Stock Option held by the Participant will cease to be treated as an Incentive Stock Option and will be treated for tax purposes as a Nonstatutory Stock Option.

12. Transferability of Awards. Unless determined otherwise by the Administrator, an Award may not be sold, pledged, assigned, hypothecated, transferred, or disposed of in any manner other than by will or by the laws of descent or distribution and may be exercised, during the lifetime of the Participant, only by the Participant. If the Administrator makes an Award transferable, such Award will contain such additional terms and conditions as the Administrator deems appropriate; provided that no Award shall be transferred for value or consideration.

13. Adjustments; Dissolution or Liquidation; Merger or Change in Control.

(a) Adjustments. In the event that any dividend or other distribution (whether in the form of cash, Shares, other securities, or other property), recapitalization, stock split, reverse stock split, reorganization, merger, consolidation, split-up, spin-off, combination, repurchase, or exchange of Shares or other securities of the Company, or other change in the corporate structure of the Company affecting the Shares occurs, the Administrator, in order to prevent diminution or enlargement of the benefits or potential benefits intended to be made available under the Plan, will adjust the number and class of Shares that may be delivered under the Plan and/or the number, class, and price of Shares covered by each outstanding Award, and the numerical Share limits in Section 3 of the Plan.

(b) Dissolution or Liquidation. In the event of the proposed dissolution or liquidation of the Company, the Administrator will notify each Participant as soon as practicable prior to the effective date of such proposed transaction. To the extent it has not been previously exercised, an Award will terminate immediately prior to the consummation of such proposed action.

(c) Change in Control. In the event of a merger or Change in Control, each outstanding Award will be treated in accordance with this Section 13(c) or as provided in an Award Agreement, including, without limitation, that each Award be assumed or an equivalent option or right substituted by the successor corporation or a Parent or Subsidiary of the successor corporation. The Administrator will not be required to treat all Awards similarly in the transaction.

In the event that the successor corporation does not assume or substitute for the Award, the Participant will fully vest in and have the right to exercise all of his or her outstanding Options and Stock Appreciation Rights, including Shares as to which such Awards would not otherwise be vested or exercisable, all restrictions on Restricted Stock and Restricted Stock Units will lapse, and, with respect to Awards with performance-based vesting, all performance goals or other vesting criteria will be deemed achieved at one hundred percent (100%) of target levels and all other terms and conditions met. In addition, if an Option or Stock Appreciation Right is not assumed or substituted in the event of a Change in Control, the Administrator will notify the Participant in writing or electronically that the Option or Stock Appreciation Right will be exercisable for a period of time determined by the Administrator in its sole discretion, and the Option or Stock Appreciation Right will terminate upon the expiration of such period.

For the purposes of this subsection (c), an Award will be considered assumed if, following the Change in Control, the Award confers the right to purchase or receive, for each Share subject to the Award immediately prior to the Change in Control, the consideration (whether stock, cash, or other securities or property) received in the Change in Control by holders of Common Stock for each Share held on the effective date of the transaction (and if holders were offered a choice of consideration, the type of consideration chosen by the holders of a majority of the outstanding Shares); provided, however, that if such consideration received in the Change in Control is not solely common stock of the successor corporation or its Parent, the Administrator may, with the consent of the successor corporation, provide for the consideration to be received upon the exercise of an Option or Stock Appreciation Right or upon the payout of a Restricted Stock Unit, Performance Unit or Performance Share, for each Share subject to such Award, to be solely common stock of the successor corporation or its Parent equal in fair market value to the per share consideration received by holders of Common Stock in the Change in Control.

Notwithstanding anything in this Section 13(c) to the contrary, an Award that vests, is earned or paid-out upon the satisfaction of one or more performance goals will not be considered assumed if the Company or its successor modifies any of such performance goals without the Participant's consent; provided, however, a modification to such performance goals only to reflect the successor corporation's post-Change in Control corporate structure will not be deemed to invalidate an otherwise valid Award assumption.

(d) Outside Director Awards. With respect to Awards granted to an Outside Director that are assumed or substituted for, if on the date of or following such assumption or substitution the Participant's status as a Director or a director of the successor corporation, as applicable, is terminated other than upon a voluntary resignation by the Participant (unless such resignation is at the request of the acquirer), then the Participant will fully vest in and have the right to exercise Options and/or Stock Appreciation Rights as to all of the Shares underlying such Award, including those Shares which would not otherwise be vested or exercisable, all restrictions on Restricted Stock and Restricted Stock Units will lapse, and, with respect to Performance Units and Performance Shares, all performance goals or other vesting criteria will be deemed achieved at one hundred percent (100%) of target levels and all other terms and conditions met.

14. Tax.

(a) Withholding Requirements. Prior to the delivery of any Shares or cash pursuant to an Award (or exercise thereof), the Company will have the power and the right to deduct or withhold, or require a Participant to remit to the Company, an amount sufficient to satisfy federal, state, local, foreign or other taxes (including the Participant's FICA obligation) required to be withheld with respect to such Award (or exercise thereof).

(b) Withholding Arrangements. The Administrator, in its sole discretion and pursuant to such procedures as it may specify from time to time, may permit a Participant to satisfy such tax withholding obligation, in whole or in part by (without limitation) (a) paying cash, (b) electing to have the Company withhold otherwise deliverable cash or Shares having a fair market value not in excess of the maximum statutory amount required to be withheld, or (c) delivering to the Company already-owned Shares having a fair market value not in excess of the maximum statutory amount required to be withheld. The fair market value of the Shares to be withheld or delivered will be determined as of the date that the taxes are required to be withheld.

(c) Compliance With Code Section 409A. Awards will be designed and operated in such a manner that they are either exempt from the application of, or comply with, the requirements of Code Section 409A such that the grant, payment, settlement or deferral will not be subject to the additional tax or interest applicable under Code Section 409A, except as otherwise determined in the sole discretion of the Administrator. The Plan and each Award Agreement under the Plan is intended to meet the requirements of Code Section 409A and will be construed and interpreted in accordance with such intent, except as otherwise determined in the sole discretion of the Administrator. To the extent that an Award or payment, or the settlement or deferral thereof, is subject to Code Section 409A the Award will be granted, paid, settled or deferred in a manner that will meet the requirements of Code Section 409A, such that the grant, payment, settlement or deferral will not be subject to the additional tax or interest applicable under Code Section 409A.

15. No Effect on Employment or Service. Neither the Plan nor any Award will confer upon a Participant any right with respect to continuing the Participant's relationship as a Service Provider with the Company, nor will they interfere in any way with the Participant's right or the Company's right to terminate such relationship at any time, with or without cause, to the extent permitted by Applicable Laws.

16. Date of Grant. The date of grant of an Award will be, for all purposes, the date on which the Administrator makes the determination granting such Award, or such other later date as is determined by the Administrator. Notice of the determination will be provided to each Participant within a reasonable time after the date of such grant.

17. Term of Plan. Subject to Section 22 of the Plan, the Plan will become effective upon the Restatement Effective Date. It will continue in effect for a term of ten (10) years from the date adopted by the Board, unless terminated earlier under Section 18 of the Plan.

18. Amendment and Termination of the Plan.

(a) Amendment and Termination. The Board may at any time amend, alter, suspend or terminate the Plan.

(b) Stockholder Approval. The Company will obtain stockholder approval of any Plan amendment to the extent necessary and desirable to comply with Applicable Laws.

(c) Effect of Amendment or Termination. No amendment, alteration, suspension or termination of the Plan will impair the rights of any Participant, unless mutually agreed otherwise between the Participant and the Administrator, which agreement must be in writing and signed by the Participant and the Company. Termination of the Plan will not affect the Administrator's ability to exercise the powers granted to it hereunder with respect to Awards granted under the Plan prior to the date of such termination.

19. Conditions Upon Issuance of Shares.

(a) Legal Compliance. Shares will not be issued pursuant to the exercise of an Award unless the exercise of such Award and the issuance and delivery of such Shares will comply with Applicable Laws and will be further subject to the approval of counsel for the Company with respect to such compliance.

(b) Investment Representations. As a condition to the exercise of an Award, the Company may require the person exercising such Award to represent and warrant at the time of any such exercise that the Shares are being purchased only for investment and without any present intention to sell or distribute such Shares if, in the opinion of counsel for the Company, such a representation is required.

20. Inability to Obtain Authority. The inability of the Company to obtain authority from any regulatory body having jurisdiction, which authority is deemed by the Company's counsel to be necessary to the lawful issuance and sale of any Shares hereunder, will relieve the Company of any liability in respect of the failure to issue or sell such Shares as to which such requisite authority will not have been obtained.

21. Forfeiture Events.

(a) All Awards under the Plan will be subject to recoupment under the Company's current Clawback Policy and any clawback policy that the Company is required to adopt pursuant to the listing standards of any national securities exchange or association on which the Company's securities are listed or as is otherwise required by the Dodd-Frank Wall Street Reform and Consumer Protection Act or other Applicable Laws. In addition, the Administrator may impose such other clawback, recovery or recoupment provisions in an Award Agreement as the Administrator determines necessary or appropriate, including but not limited to a reacquisition right regarding previously acquired Shares or other cash or property. Unless this Section 21(a) is specifically mentioned and waived in an Award Agreement or other document, no recovery of compensation under a clawback policy or otherwise will be an event that triggers or contributes to any right of a Participant to resign for "good reason" or "constructive termination" (or similar term) under any agreement with the Company or a Subsidiary, Parent, or affiliate of the Company.

(b) The Administrator may specify in an Award Agreement that the Participant's rights, payments, and benefits with respect to an Award will be subject to reduction, cancellation, forfeiture, or recoupment upon the occurrence of specified events, in addition to any otherwise applicable vesting or performance conditions of an Award. Such events may include, but will not be limited to, termination of such Participant's status as Service Provider for cause or any specified action or inaction by a Participant, whether before or after such termination of service, that would constitute cause for termination of such Participant's status as a Service Provider.

22. Stockholder Approval. This amendment and restatement of the Plan is subject to, and contingent upon, stockholder approval at the 2019 Annual Meeting of Stockholders. Such stockholder approval will be obtained in the manner and to the degree required under Applicable Laws.

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BOARD OF DIRECTORS AND MANAGEMENT

Directors

Samuel D. Colella, *Chairman*
Managing Director, Versant Ventures; General Partner, Institutional Venture Partners

Nicolas Barthelemy
Former President and Chief Executive Officer, Biotheranostics, Inc.

Gerhard F. Burbach
Former President, Chief Executive Officer, and Director, Thoratec Corporation

Laura M. Clague
Senior Vice President and Chief Financial Officer, Retrophin, Inc.

Patrick S. Jones
Private investor

Stephen Christopher Linthwaite
President and Chief Executive Officer

Carlos Paya, M.D., Ph.D.
Chief Executive Officer, President and Director, Immune Design Corp.

Executive Officers

Stephen Christopher Linthwaite
President and Chief Executive Officer

Vikram Jog
Chief Financial Officer

Nicholas Khadder
Senior Vice President, General Counsel, and Corporate Secretary

Bradley Kreger
Senior Vice President, Global Operations

CORPORATE INFORMATION

Corporate Headquarters

Fluidigm Corporation
7000 Shoreline Court
Suite 100
South San Francisco, California 94080

Annual Meeting

Fluidigm's 2019 Annual Meeting of Stockholders will take place on Monday, June 3, 2019 at 8:30 a.m., Pacific time, at the Company's offices located at 7000 Shoreline Court, Suite 100, South San Francisco, California 94080.

Independent Auditors

PricewaterhouseCoopers, LLP
San Jose, California

Legal Counsel

Wilson Sonsini Goodrich & Rosati, P.C.
Palo Alto, California

Stockholder Services

You may contact our transfer agent by writing Computershare at 462 South 4th Street, Suite 1600 Louisville, KY 40202. You may also contact our transfer agent by calling (800) 662-7232 or (781) 575-2879 or via its Investor Center at www-us.computershare.com/Investor/Contact.

Stock Exchange Information

Our common stock is traded on the Nasdaq Global Select Market under the symbol FLDM.

Internet Address Information

Visit us online at www.fluidigm.com for more information about us and our products and services. The 2018 Annual Report and the 2019 Proxy Statement are available online by visiting www.viewproxy.com/fluidigm/2019 and typing in the control number as set forth either on the proxy card as to stockholders of record, or on the voting instruction form as to individuals who hold shares through a broker, bank, trustee, or other nominee.

ANNUAL REPORT ON FORM 10-K

Stockholders may receive a copy of our annual report on Form 10-K, including the financial statements and the financial statement schedules, free of charge upon written request. Please send such requests to Fluidigm Corporation, 7000 Shoreline Court, Suite 100, South San Francisco, California 94080, Attention: Corporate Secretary.

Special Note Regarding Forward-Looking Statements

This Annual Report and the accompanying CEO letter contain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or Exchange Act, that are based on our management's beliefs and assumptions and on information currently available to our management. The forward-looking statements are contained principally in the sections of our Annual Report entitled "Business," "Risk factors," and "Management's discussion and analysis of financial condition and results of operations." Forward-looking statements include information concerning our possible or assumed future cash flow, revenue, sources of revenue and results of operations, cost of product revenue and product margin, operating and other expenses, unit sales and the selling prices of our products, business strategies, financing plans, expansion of our business, competitive position, industry environment, potential growth opportunities, market growth expectations, and the effects of competition. Forward-looking statements include statements that are not historical facts and can be identified by terms such as "anticipates," "believes," "could," "seeks," "estimates," "expects," "intends," "may," "plans," "potential," "predicts, "projects," "should," "will," "would," or similar expressions and the negatives of those terms.

Forward-looking statements are subject to numerous risks and uncertainties that could cause our actual results, performance, or achievements to be materially different from any future results, performance, or achievements expressed or implied by the forward-looking statements. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Factors that could materially affect our future results, performance, or achievements include, but are not limited to, challenges inherent in developing, manufacturing, launching, marketing, and selling new products; risks relating to reliance on sales of capital equipment for a significant proportion of revenues in each quarter; potential product performance and quality issues; the possible loss of key employees, customers, or suppliers; intellectual property risks; competition; uncertainties in contractual relationships; Fluidigm research and development, sales, marketing, and distribution plans and capabilities; reduction in research and development spending or changes in budget priorities by customers; interruptions or delays in the supply of components or materials for, or manufacturing of, our products; seasonal variations in customer operations; unanticipated increases in costs or expenses; and risks associated with international operations. In addition, investors in Fluidigm should review the more detailed discussions of additional risks and uncertainties and other information affecting our business described under the caption "Risk factors" in our Annual Report on Form 10-K filed with the Securities and Exchange Commission on March 18, 2019 and in our subsequent Quarterly Reports on Form 10-Q.

Except as required by law, we assume no obligation to update these forward-looking statements publicly, or to update the reasons actual results could differ materially from those anticipated in these forward-looking statements, even if new information becomes available in the future.

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