UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(Mark One)

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

For the fiscal year ended December 31, 2021

Or

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

For the transition period from to

Commission File Number 001-34899

Pacific Biosciences of California, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**16-1590339**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
1305 O'Brien Drive Menlo Park, CA 94025	**94025**
(Address of principal executive offices)	**(Zip Code)**

(Registrant's telephone number, including area code)

(650) 521-8000

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

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common Stock, par value $0.001 per share	**PACB**	**The NASDAQ Stock Market LLC**

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. Yes x No o

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes o No x

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 x No o

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 (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes x No o

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. (Check one):

Large accelerated filer	x	Accelerated filer	o
Non-accelerated filer	o	Smaller reporting company	o
		Emerging growth company	o

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. o

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. Yes x No o

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

Aggregate market value of registrant's common stock held by non-affiliates of the registrant on June 30, 2021, based upon the closing price of Common Stock on such date as reported by NASDAQ Global Select Market, was approximately $6,791,088,144. Shares of voting stock held by each officer and director have been excluded in that such persons may be deemed to be affiliates. This assumption regarding affiliate status is not necessarily a conclusive determination for other purposes.

Number of shares outstanding of the issuer's common stock as of January 31, 2022: 221,182,457

DOCUMENTS INCORPORATED BY REFERENCE:

Portions of the registrant's definitive Proxy Statement relating to its 2022 Annual Meeting of Stockholders are incorporated by reference into Part III of this Annual Report on Form 10-K where indicated. Such Proxy Statement will be filed with the U.S. Securities and Exchange Commission within 120 days after the end of the fiscal year to which this report relates.

Pacific Biosciences of California, Inc.

Annual Report on Form 10-K

For the Fiscal Year Ended December 31, 2021

Table of Contents

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K, including the sections titled "Business," "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations" contain or may contain forward-looking statements that are based on the beliefs and assumptions of the management of Pacific Biosciences of California, Inc. (the "Company," "we," "us," or "our") and on information currently available to our management. The statements contained in this Annual Report on Form 10-K that are not purely historical are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and include, but are not limited to:

- the attributes and sequencing advantages of SMRT® technology;
- our current and future products;
- market opportunities, strategic and commercial plans, including strategy for our business and related financing;
- expectations regarding the conversion of backlog to revenue and the pricing and gross margin for products;
- manufacturing plans including developing and scaling of manufacturing and delivery of our products;
- research and development plans;
- product development including, among other things, statements relating to future uses, quality or performance of, or benefits of using, products or technologies, updates or improvements of our products;
- intentions regarding seeking regulatory approval for our products;
- competition;
- expectations regarding unrecognized income tax benefits;
- expectations regarding the impact of an increase in market rates on the value of our investment portfolio;
- the sufficiency of cash, cash equivalents and investments to fund projected operating requirements;
- the effects of recent accounting pronouncements on our financial statements; and
- other future events.

Forward-looking statements can be identified by words such as: "anticipates," "believes," "could," "estimates," "expects," "intends," "may," "plans," "potential," "predicts," "projects," "seeks," "should," "target," "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.

Factors that could cause or contribute to such differences include, but are not limited to, those discussed under the heading "Risk Factors" in this report and in other documents we file with the Securities and Exchange Commission ("SEC"). Given these risks and uncertainties, you should not place undue reliance on forward-looking statements. Also, forward-looking statements represent management's beliefs and assumptions as of the date of this report. Except as required by law, we assume no obligation to update 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.

This Annual Report on Form 10-K also contains estimates, projections and other information concerning our industry, our business, and the markets for our products, including data regarding the estimated size and estimated growth for those markets. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained this industry, business, market and other data from reports, research surveys, studies and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data and similar sources.

ITEM 1. BUSINESS

Overview

We are a premier life science technology company that is designing, developing and manufacturing advanced sequencing solutions to help scientists and clinical researchers resolve genetically complex problems. Our products and technology under development stem from two highly differentiated core technologies focused on accuracy, quality and completeness which include our existing HiFi long read sequencing technology and our emerging short read Sequencing by Binding (SBB®) technology. Our products address solutions across a broad set of applications including human germline sequencing, plant and animal sciences, infectious disease and microbiology, oncology, and other emerging applications. Our focus is on providing our customers with advanced sequencing technologies with higher throughput and improved workflows that we believe will enable dramatic advancements in routine healthcare. Our customers include academic and governmental research institutions, commercial testing and service laboratories, genome centers, public health labs, hospitals and clinical research institutes, contract research organizations (CROs), pharmaceutical companies and agricultural companies.

Our Mission and Impact

Our mission is to enable the promise of genomics to better human health. Genomics is core to all biological processes, and our advanced genomics tools provide scientists and clinical researchers the insights to better understand biology and health. The "promise of genomics" postulates that medicine, agriculture, public health, drug development, and other disciplines will be fundamentally transformed with the incorporation of routine genomic information over the coming decades. We see early progress toward this transformation in the applied use of genomics in areas such as genetic disease, oncology, and sustainable food production. However, legacy genomics technologies have fundamental limitations in progressing these fields toward the promise of genomics. We believe that unleashing the full potential of genomics will require a level of accuracy and completeness that is inaccessible to legacy technologies. Accuracy and completeness are central to our product development strategy, and thus we have created some of the most innovative, high-quality, genomics solutions on the market.

The Underlying Science

Genetic inheritance in living systems is conveyed through a naturally occurring information storage system known as deoxyribonucleic acid, or DNA. DNA stores information in linear chains of the chemical bases adenine, cytosine, guanine and thymine, represented by the symbols A, C, G and T respectively.

In humans, the genome is comprised of approximately three billion DNA base-pairs, which are divided into 23 chromosomes ranging in size from 50 million to 250 million bases. There are approximately 23,000 smaller regions within these chromosomes, called genes, which contain the blueprints for protein production. The proteins synthesized from these blueprints essentially underlie the operation of all biological systems.

Genome sequencing reads the bases of long fragments of nucleic acids. Initial genome sequencing studies have shown that mutations in these DNA base pairs play a critical role in human disease, contributing to the burgeoning field of genomics. Since then, recent discoveries have highlighted additional complexities of DNA and ribonucleic acid, or RNA. These include the presence of modified bases such as methylation, and post-translational modification or the processing of RNA molecules after they are transcribed from the genome, both of which can affect protein synthesis.

Our Principal Markets

Researchers utilize our solutions in human germline sequencing, plant and animal sciences, infectious disease and microbiology, oncology, and other emerging applications.

Human Germline Sequencing: Improving rare disease research and understanding

According to a World Health Organization publication, it is estimated that 400 million people worldwide are affected by up to 8,000 distinct rare diseases, with 80% of these believed to be genetic in nature. Other sequencing technologies applied

to rare disease diagnosis are technologically limited to interrogating small variants, representing only a subset of possible genomic variation. Consequently, most genetic disease cases are undiagnosed, leaving families on multi-year diagnostic odysseys. Sequencing the human genome with long and accurate reads enables the potential detection of all known classes of disease-causing variation. In addition, the ability of PacBio's long-read sequencing technology to detect 5-Methylcytosine, an epigenetic factor shown to alter gene behavior, may enable further advances in research and development in genetic disease diagnosis.

Infectious Disease and Microbiology: Understanding and tracking microbes and pathogens in support of global public health

Our technology has increased the scientific community's understanding of microorganism and viruses and their malignancy, transmission, and potential resistance to antibiotics or vaccines. Our sequencing technology delivers some of the most comprehensive and complete genomes available, enabling federal agencies, public health organizations, and healthcare providers the ability to conduct wide-ranging research and surveillance activities to:

- Generate high quality, complete genome assemblies, revealing variants of all known types, to gain a deeper understanding of community-acquired and hospital-associated infections and transmissions;
- Identify and characterize pathogens to inform regional, national and global public health agencies for preparation and response to rapidly evolving microorganism; and
- Characterize complex microbial communities to understand their role in human, animal, and environmental health.

Oncology: Enable the discoveries of underlying causes of cancer, progression and relapse

Understanding the cellular and molecular complexity of tumor cells is critical in developing more effective targeted cancer therapies. Advancements in single-cell analyses have previously been recognized by *Nature Methods* magazine as the "method of the year" in 2019. Single-cell transcriptomics is particularly impactful in defining cellular identity and function; however, other technologies only sequence a portion of RNAs, missing critical information. Our long-read RNA sequencing method, single-cell Iso-Seq (scIso-Seq), accurately detects molecular events such as RNA isoforms and expressed mutations and provides gene expression information at the single-cell level. We believe scIso-Seq is uniquely positioned to enable discoveries by researchers of the underlying causes of cancer initiation, progression, and relapse, as well as the discovery by researchers of novel diagnostic, prognostic and predictive biomarkers that may inform future clinical tests.

As novel discoveries continue to be made using our long sequencing technology, we believe our SBB short-read sequencing technology will enable us to meet the demands of customers in the expanding non-invasive testing market in oncology. Due to the small amounts of circulating tumor DNA (ctDNA) present in the blood of early-stage cancer patients and those with minimal residual disease (MRD), the presence of cancer often goes undetected and a more sensitive assay will be required. Based on internal testing, we believe our SBB technology has the potential to offer higher accuracy than competitor sequencing technologies, which may in the future support our customers' development of more sensitive tests for the purpose of earlier detection and more robust monitoring of cancer.

Plant and Animal Sciences: Helping scientists answer biological questions across a broad range of plant and animal sciences

There are hundreds of thousands of distinct plant and animal species. Our technology is used to build de novo reference genomes for these organisms across several global initiatives which are dedicated to preserving, monitoring and cataloging biodiversity with actionable and accurate genomic data.

Our Technology, Products and Solutions

We have developed HiFi long-read sequencing combined with highly accurate Single Molecule Real-Time (SMRT) technology, which enables single-molecule, real-time detection of nucleic acid sequences for long-read applications. We are also expanding our genomic solutions with our short read Sequencing by Binding (SBB®) chemistry which offers sensitive sequencing for short read applications. Upon launch of the SBB platform, we believe we will be the only company offering both native long read and native short read technologies into the market.

Our sales consist of sales of instruments, chips and reagents based on our SMRT technology as well as services we perform for customers and we are developing products based on our nanobind technology.

HiFi Long*-read *Sequencing

Our HiFi long-read sequencing protocol was built upon our HiFi sequencing systems, including consumables and software, and offers customized end-to-end workflows for different SMRT sequencing applications. Highly accurate, long sequence reads simplify and accelerate data analysis algorithms, reducing the needs for error correction steps and/or assembly aspects, depending on the application.

Customers use our HiFi long read sequencing platforms in a wide range of sequencing applications, including whole genome sequencing and *de novo* genome assembly, long-range phasing, targeted sequencing, full-length RNA and single-cell sequencing, characterization of metagenomic communities and other mixed DNA samples, viral genome sequencing, and others. Our technology is also capable of detecting epigenetic markers simultaneously by analyzing the kinetics of DNA polymerization which is affected, and thereby detectable, by epigenetic markers such as 5-methylcytosine or N^6-methyladenine, and we anticipate such capability to become commercially available in April 2022.

SMRT Technology

Our proprietary SMRT Technology enables the observation of DNA synthesis as it occurs in real time by harnessing the natural process of DNA replication, which in nature is a highly efficient and accurate process actuated by DNA polymerases. DNA polymerases attach to a strand of DNA to be replicated, examine the individual base at the point it is attached, and then determine which of the four building blocks, or nucleotides (A, C, G, or T), is required to complement that individual base. After determining which nucleotide is required, the polymerases incorporate that nucleotide into the growing strand being produced.

SMRT Sequencing is based on following the activity of DNA polymerase on individual DNA molecules in real time which occurs on our SMRT cells that are monitored and analyzed within our Sequel I, II, and IIe systems. Carried out on SMRTbell templates, which attach hairpin adapters to the ends of double-stranded DNA molecules to be sequenced, SMRT sequencing allows for the successive sequencing of both the forward and reverse strands of the individual DNA molecule occurring multiple times, thereby allowing for the same base of the same molecule to be sequenced more than once in a sequencing run. According to research we performed in collaboration with other researchers subsequently published in Nature Biotechnology in 2019, the base calls from the resulting subreads can be processed to generate the final base call in an analytical procedure called circular consensus sequencing, leading to what we have defined as our HiFi sequence reads which have high accuracy typically being defined as having greater than 99% read accuracy, but often exceeding greater than 99.9% accuracy according to research we performed in collaboration with other researchers, subsequently published in Nature Biotechnology in 2019. While HiFi reads have been utilized routinely for DNA inserts in the kilobase (1000 bases) range for applications such as full-length RNA sequencing or amplicon sequencing, advancements made a few years ago to increase the number of bases covered by the polymerase to greater than ~50,000 bases has allowed us to routinely increase the size of DNA fragments that can be subjected to HiFi sequencing, ranging currently to up to 25 kilobases in size providing sufficient read length with our accuracy to support a multitude of applications across human health, plant and animal, and microbiology, according to research we performed in collaboration with other researchers, subsequently published by Scientific Data in 2020. The ability to generate single-DNA molecule sequence reads that are both long and highly accurate allows researchers to obtain more contiguous, complete and accurate genomic data, thereby allowing for greater insights into the complexity of biological systems.

Sequel, Sequel II and Sequel IIe Instruments

Our Sequel, Sequel II and Sequel IIe instruments conduct, monitor, and analyze single molecule biochemical reactions in real time. The instruments use extremely sensitive imaging systems to collect the light pulses emitted by fluorescent reagents allowing the observation of biological processes. Computer algorithms are used to translate the information that is captured by the optics system. Using the recorded information, light pulses are converted into either an A, C, G or T base call with associated quality metrics. Once sequencing is started, the real-time data is delivered to the system's primary analysis pipeline, which outputs base identity and quality values.

Consumables

Customers purchase proprietary consumable products to run their PacBio systems. Our consumable products include our proprietary SMRT Cells and reagent kits. One SMRT Cell is consumed per sequencing reaction, and scientists can choose the number of SMRT Cells they use per experiment.

We offer several reagent kits, each designed to address a specific step in the core sequencing workflow. A template preparation kit is used to convert DNA into SMRTbell® double-stranded DNA library formats and includes typical molecular biology reagents, such as ligase, buffers and exonucleases. Our binding kits include our modified DNA polymerase, and are used to bind SMRTbell libraries to the polymerase in preparation for sequencing. Our core sequencing kits contain reagents required for on-instrument, real-time sequencing, including the phospholinked nucleotides.

In addition, we offer HiFiViral for SARS-CoV-2, our first fit-for-purpose, end-to-end solution for COVID-19 genome sequencing. This solution uses a differentiated molecular inversion probe (MIPs) design which is robust to the emergence of new variants in the COVID-19 genome and allows for detection of all known classes of variation across the entire viral genome. Both of these characteristics are required for efficient and effective public health surveillance programs battling the COVID-19 pandemic. The solution also includes fit-for-purpose software that enables automated variant calling and preparation of files for submission into public databases tracking the evolution of the COVID-19 genome.

SBB Short-read Sequencing

In contrast to SMRT sequencing, Sequencing by Binding (SBB®) reads short fragments of DNA (hundreds of bases instead of kilobases) in a massively parallel manner, thereby achieving higher throughput and lower price per datapoint relative to long read solutions. Current short-read next generation sequencing technologies available in the market incur various rates of errors in results. Researchers deploy multiple tactics to try to mitigate these effects, including oversampling or implementing complex library preparation methods, yet still face challenges, including missing rare variants.

We believe our proprietary SBB approach will enable researchers to address the gap in detecting rare variants, especially in complex heterogenous samples. Employing a two-phase sequencing chemistry, the SBB approach binds a dye-labeled nucleotide without incorporation into the DNA chain, then removes that base, then blocks and extends with a terminated nucleotide. Using nucleotides with single modifications, we incorporate more native bases, avoiding potential scarring due to fluorescent linker presence. This design helps avoid raw errors and we believe can help us develop a product with substantially greater accuracy than currently marketed short read sequencing products. SBB enables simplified upfront library preparation, redefines coverage requirements and reduces bioinformatic workload for downstream analysis. The accuracy of our novel sequencing approach has the potential to advance translational cancer research, drive higher fidelity single-cell applications, and broadly enable clinical sequencing—even in regions of the genome prone to sequencing errors with other short-read sequencing technologies.

Our Strategy for Growth

To enable the promise of genomics, our strategy includes the following key elements:

- Continue to drive commercial adoption and utilization of our current generation Sequel II/IIe platform
- Drive clinical utility of HiFi long-read sequencing by completing development of our next generation higher throughput HiFi long-read sequencing platform
- Complete development of our SBB short-read sequencing platform
- Develop applications that expand existing applications for our sequencing solutions
- Create an ecosystem of customers, partners and collaborators whose expertise and offerings complement and enhance the capabilities and utility of our technology and increase genomic data available on our platforms

Marketing, Sales, Service and Support

We market our products through a direct sales force in North America and parts of Europe and through distribution partners in Asia, certain other parts of Europe, the Middle East and Africa, and Latin America. We plan to continue to invest in growing our marketing, sales, service and support resources as we drive continued adoption of products, launch new products and expand our customer base.

Our business is subject to seasonal trends. See the *Risk Factors* section, specifically the risk factor titled *Seasonality may cause fluctuations in our revenue and results of operations* for additional information.

Customers

Our customers include academic and governmental research institutions, commercial testing and service laboratories, genome centers, public health labs, hospitals and clinical research institutes, contract research organizations (CROs), pharmaceutical companies and agricultural companies. In general, our customers will isolate, prepare and analyze genetic samples using PacBio sequencing systems in their own laboratories, or they will send their genetic samples to third party service providers who in turn will sequence the samples with PacBio systems and provide the sequence data back to the customer for further analysis. For example, customers in academic research institutions may have bacteria, animal, or human DNA samples isolated from various sources while agricultural biology companies may have DNA samples isolated from different strains of rice, corn or other crops. For the years ended December 31, 2021, 2020 and 2019, one customer, Gene Company Limited, our primary distributor for China and Hong Kong, accounted for approximately 13%, 14% and 17% of our total revenue, respectively.

We believe that the majority of our current customers are early adopters of sequencing technology. By focusing our efforts on high-value applications, and developing whole product solutions around these applications, we seek to drive the adoption of our products across a broader customer base and into numerous large-scale projects. In general, the broader adoption of new technologies by mainstream customers can take a number of years.

Backlog

As of December 31, 2021, our instrument backlog was approximately $2.0 million, compared to $10.1 million as of December 31, 2020. We define backlog as purchase orders or signed contracts from our customers which we believe are firm and for which we have not yet recognized revenue. We expect to convert this backlog to revenue during 2022; however, our ability to do so is subject to customers who may seek to cancel or delay their orders even if we are prepared to fulfill them.

Manufacturing

We manufacture sequencing instruments, SMRT cells and reagents. Our key manufacturing and service facility in Menlo Park, California has received ISO 13485 and ISO 9001 certifications for the design, development, manufacture, distribution, installation, and servicing of its nucleic acid sequencing platforms. We utilize subcontract manufacturers for components of the manufacturing process. We purchase both custom and off-the-shelf components from a large number of suppliers and subject them to significant quality specifications. We periodically conduct quality audits of most critical suppliers and

have established a supplier certification program. Some of the components required in our products are currently either sole sourced or single sourced.

Research and Development

We have historically made and plan to continue to make significant investments in research and development. Our research and development efforts focus on programs to develop new and existing platforms, as well as increase throughput and decrease costs on behalf of our customers. We are currently developing higher throughput platforms that encompass our HiFI long read sequencing. We also have a mid-throughput short read Sequencing by Binding platform that is currently under development. In addition to platform development, we also innovate across end-to-end workflows to improve usability, as well as develop new applications for the advancement of human health.

Intellectual Property

Developing and maintaining a strong intellectual property position is an important element of our business. We have sought, and will continue to seek, patent protection for our SMRT technology, for improvements to our SMRT technology, as well as for any of our other technologies where we believe such protection will be advantageous.

Our current patent portfolio, including patents exclusively licensed to us, is directed to various technologies, including SMRT nucleic acid sequencing and other methods for analyzing biological samples, ZMW arrays, surface treatments, phospholinked nucleotides and other reagents for use in nucleic acid sequencing, optical components and systems, processes for identifying nucleotides within nucleic acid sequences and processes for analysis and comparison of nucleic acid sequence data. With the acquisition of Omniome and Circulomics, we have further obtained patent applications related to short read nucleic acid sequencing and nucleic acid preparation and purification. Some of the patents and applications that we own, as well as some of the patents and applications that we have licensed from other parties, are subject to U.S. government march-in rights, whereby the U.S. government may disregard our exclusive patent rights on its own behalf or on behalf of third parties by imposing licenses in certain circumstances, such as if we fail to achieve practical application of the U.S. government funded technology, because action is necessary to alleviate health or safety needs, to meet requirements of federal regulations, or to give preference to U.S. industry. In addition, U.S. government funded inventions must be reported to the government and U.S. government funding must be disclosed in any resulting patent applications.

As of December 31, 2021, we own or hold exclusive licenses to 392 issued U.S. patents, 107 pending U.S. patent applications, 343 granted foreign patents and 150 pending foreign patent applications, including foreign counterparts of U.S. patent and patent applications. The full term of the issued U.S. patents will expire between 2022 and 2040. We also have non-exclusive patent licenses with various third parties to supplement our own large and robust patent portfolio.

Of our exclusively licensed patent applications, 6 issued U.S. patents are licensed to us by the Cornell Research Foundation, which manages technology transfers on behalf of Cornell University.

Other Sequencing Solutions

There are a significant number of companies offering nucleic acid sequencing equipment or consumables. These include, but are not limited to, Illumina, Inc. (“Illumina”), BGI Genomics, Thermo Fisher Scientific Inc. (“Thermo”), Oxford Nanopore Technologies Ltd. (“ONT Ltd.”), Roche, Qiagen N.V. (“Qiagen”), Element Biosciences, Inc. (“Element”), Bionano Genomics, Inc. (“Bionano”), and Singular Genomics Systems, Inc. (“Singular”). These companies may have different levels of financial, technical, manufacturing, administrative and support resources available to them. We expect the competition to intensify within the overall nucleic acid sequencing market as there are also several companies developing new sequencing technologies, products and/or services. Increased competition may result in pricing pressures, which could harm our sales, profitability or share of supply.

In order for us to maintain and increase our sales, we will need to demonstrate that our products deliver superior performance and value as a result of our key differentiators. Our HiFi long-read sequencing will need to continue to deliver very high consensus accuracy and long read lengths and include single molecule, real-time resolution, with the ability to detect real-time kinetic information, fast time to result and flexibility, as well as support the breadth and depth of current and future applications.

Government Regulation

The development, testing, manufacturing, marketing, postmarket surveillance, distribution, advertising and labeling of certain medical devices, including in vitro diagnostic products and laboratory-developed tests, are subject to regulation in the United States by the Center for Devices and Radiological Health of the U.S. Food and Drug Administration (FDA) under the Federal Food, Drug, and Cosmetic Act (FDCA) and comparable state and foreign regulatory agencies. FDA defines a medical device as an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent or other similar or related article, including any component part or accessory, which is (i) intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, in man or other animals, or (ii) intended to affect the structure or any function of the body of man or other animals and which does not achieve any of its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the achievement of any of its primary intended purposes. Medical devices to be commercially distributed in the United States must receive from the FDA either clearance of a premarket notification, known as 510(k), or premarket approval pursuant to the FDC Act prior to marketing, unless subject to an exemption.

We intend to label and sell our products for research use only ("RUO") and expect to sell them to research customers in various settings, including academic institutions, life sciences and research laboratories that conduct research, and biopharmaceutical and biotechnology companies for non-diagnostic and non-clinical purposes. Our current RUO 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, we believe our products, as we intend to market them, are not subject to regulation by FDA. Rather, while FDA regulations require that RUO products be labeled for research use only and to market and distribute RUO products in accordance with the FDA RUO guidance, the regulations do not subject RUO products to the FDA's jurisdiction or the broader pre- and postmarket controls for medical devices. However, in the future, certain of our products or related applications, such as those that may be developed for clinical uses, could be subject to FDA regulation, or the FDA's regulatory jurisdiction could be expanded to include our products. If we wish to label and expand product lines to address the diagnosis of disease, regulation by governmental authorities in the United States and other countries will become an increasingly significant factor in development, testing, production, and marketing. In the future, products that we may develop in the molecular diagnostic markets, depending on their intended use, may be regulated as medical devices or in vitro diagnostic products ("IVDs") by the FDA and comparable agencies in other countries. In the U.S., if we market our products for use in performing clinical diagnostics, such products would be subject to regulation by the FDA under premarket and postmarket control as medical devices, unless an exemption applies, and we would be required to obtain either prior 510(k) clearance or prior premarket approval from the FDA before commercializing the product. Obtaining the requisite regulatory approvals can be expensive and may involve considerable delay. Some countries have regulatory review processes that are substantially longer than U.S. processes. Failure to obtain regulatory approval in a timely manner and meet all of the local regulatory requirements including language and specific safety standards in any foreign country in which we plan to market our products could prevent us from marketing products in such countries or subject us to sanctions and fines. Changes to the current regulatory framework, including the imposition of additional or new regulations, could arise at any time during the development or marketing of our products.

In November 2013, the FDA issued a final guidance on products labeled RUO, which, among other things, reaffirmed that a company may not make any clinical or diagnostic claims about an RUO product, 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 indicates 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. If FDA were to determine, based on the totality of circumstances, that our products labeled and marketed for RUO are intended for diagnostic purposes, they would be considered medical devices that will require clearance or approval prior to commercialization. Further, sales of devices for diagnostic purposes may subject us to additional healthcare regulation. We continue to monitor the changing legal and regulatory landscape to ensure our compliance with any applicable rules, laws and regulations.

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 premarket notification requesting FDA clearance for commercial distribution pursuant to Section 510(k) of the FDCA. 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 premarket approval applications ("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. If no legally marketed predicate can be identified for a new device to enable the use of the 510(k) pathway, the device is automatically classified under the FDCA as Class III, which generally requires premarket approval, or PMA approval. However, FDA can reclassify or use "de novo classification" for a device that meets the FDCA standards for a Class II device, permitting the device to be marketed without a PMA approval. To grant such a reclassification, FDA must determine that the FDCA's general controls alone, or general controls and special controls together, are sufficient to provide a reasonable assurance of the device's safety and effectiveness. The de novo classification route is generally less burdensome than the PMA approval process.

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. All clinical studies of investigational medical devices to determine safety and effectiveness must be conducted in accordance with FDA's investigational device exemption ("IDE") regulations, including the requirement for the study sponsor to submit an IDE application to FDA, unless exempt, which must become effective prior to commencing human 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 premarket 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.

All medical devices, including IVDs, that are regulated by the FDA are also subject to the quality system regulation. Obtaining the requisite regulatory approvals, including the FDA quality system inspections that are required for PMA approval, can be expensive and may involve considerable delay. The regulatory approval process for such products may be significantly delayed, may be significantly more expensive than anticipated, and may conclude without such products being approved by the FDA. Without timely regulatory approval, we will not be able to launch or successfully commercialize such diagnostic products. Changes to the current regulatory framework, including the imposition of additional or new regulations, could arise at any time during the development or marketing of our products. This may negatively affect our ability to obtain or maintain FDA or comparable regulatory clearance or approval of our products in the future. In addition, regulatory agencies may introduce new requirements that may change the regulatory requirements for us or our customers, or both.

As noted above, although our products are currently labeled and sold for research purposes only, the regulatory requirements related to marketing, selling, and supporting such products could be uncertain and depend on the totality of circumstances. This uncertainty exists even if such use by our customers occurs without our consent. If the FDA or other regulatory authorities assert that any of our RUO products are subject to regulatory clearance or approval, our business, financial condition, or results of operations could be adversely affected.

For example, in some cases, our customers, including laboratories that offer services as part of our certified service provider program, may use our RUO products in their own laboratory-developed tests ("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. More recently, the FDA has issued warning letters to genomics labs for illegally marketing genetic tests that claim to predict patients' responses to specific medications, noting that the FDA has not created a legal "carve-out" for LDTs and retains discretion to take action when appropriate, such as when certain genomic tests raise significant public health concerns. As laboratories and manufacturers develop more complex genetic tests and diagnostic software, FDA may increase its regulation of LDTs. 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 premarket approval. If our products become subject to FDA regulation as medical devices, we would need to invest significant time and resources to ensure ongoing compliance with FDA quality system regulations and other postmarket regulatory requirements.

If our products become subject to FDA regulation as medical devices, the regulatory clearance or approval and the maintenance of continued and postmarket regulatory compliance for such products will be expensive, time-consuming, and uncertain both in timing and in outcome. Commercialization of such regulated medical devices can increase our exposure under additional laws. For example, medical device companies are subject to additional healthcare regulation and enforcement by the federal government and by authorities in the states and foreign jurisdictions in which they conduct their business and may constrain the financial arrangements and relationships through which we research, as well as sell, market and distribute any medical products for which we obtain marketing authorization. Such laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, data privacy and security, and transparency laws and regulations related to payments and other transfers of value made to physicians and other healthcare providers. If our operations are found to be in violation of any of such laws or any other governmental regulations that apply, we may be subject to penalties, including, without limitation, administrative, civil and criminal penalties, damages, fines, disgorgement, the curtailment or restructuring of operations, integrity oversight and reporting obligations, exclusion from participation in federal and state healthcare programs and imprisonment.

In the future, to the extent we develop any clinical diagnostic assays, we may pursue payment for such products through a diverse and broad range of channels and seek coverage and reimbursement by government health insurance programs and commercial third-party payors for such products. In the United States, there is no uniform coverage for clinical laboratory tests. The extent of coverage and rate of payment for covered services or items vary from payor to payor. Obtaining coverage and reimbursement for such products can be uncertain, time-consuming, and expensive, and, even if favorable coverage and reimbursement status were attained for our tests, to the extent applicable, less favorable coverage policies and reimbursement rates may be implemented in the future. Changes in healthcare regulatory policies could also increase our costs and subject us to additional regulatory requirements that may interrupt commercialization of our products, decrease our revenue and adversely impact sales of, and pricing of and reimbursement for, our products.

International sales of medical devices are subject to foreign government regulations, which vary substantially from country to country. In the future, if we decide to distribute or market our diagnostic products as IVDs in Europe, such products will be subject to regulation under the European Union (“EU”) IVD Medical Device Regulation (“IVDR”) EU 2017/746. 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 a quality system, standards and regulations in each country may vary substantially which can affect timelines of introduction.

We are committed to the protection of our employees and the environment. Our operations require the use of hazardous materials that subject us to various federal, state, and local environmental and safety laws and regulations. We believe that we are in material compliance with current applicable laws and regulations. However, we could be held liable for damages and fines should contamination of the environment or individual exposures to hazardous substances occur. In addition, we cannot predict how changes in these laws and regulations, or the development of new laws and regulations, will affect our business operations or the cost of compliance.

Additionally, we must comply with complex foreign and U.S. laws and regulations, such as the U.S. Foreign Corrupt Practices Act, the U.K. Bribery Act, and other local laws prohibiting corrupt payments to governmental officials, anti-competition regulations and sanctions imposed by the U.S. Office of Foreign Assets Control and other similar laws and regulations. Violations of these laws and regulations could result in fines and penalties, criminal sanctions, restrictions on our business conduct and on our ability to offer our products in one or more countries, and could also materially affect our brand, our ability to attract and retain employees, our international operations, our business and our operating results. Although we have implemented policies and procedures designed to ensure compliance with these laws and regulations, there can be no assurance that our employees, contractors, or agents will not violate our policies.

As we continue to expand our business into multiple international markets, our success will depend, in large part, on our ability to anticipate and effectively manage these and other risks associated with our international operations. Any of these risks could harm our international operations and negatively impact our sales, adversely affecting our business, results of operations, financial condition and growth prospects.

Human Capital

As of December 31, 2021, we had 728 full-time employees. Of these employees, 342 were in research and development, 101 were in operations and service, 178 were in marketing, sales and customer support, and 107 were in general and administration. With the exception of our field-based sales, marketing and service teams, the majority of our employees are in California. None of our employees are represented by labor unions or are covered by a collective bargaining agreement with respect to their employment. We have not experienced any work stoppages, and we consider our relationship with our employees to be good.

Talent Acquisition and Retention

We recognize that our employees largely contribute to our success. To this end, we support business growth by seeking to attract and retain best-in-class talent. Our talent acquisition team uses internal and external resources to recruit highly skilled candidates globally. In 2021, we were successful in hiring key positions throughout the organization that will help advance our growth. This includes an appointment of a new Chief Commercial Officer, Chief Operating Officer, and Chief Accounting Officer. We continue to attract and retain superior talent as measured by our minimal turnover rate and high employee service tenure.

Total Rewards

Our total rewards philosophy has been to invest in our workforce by offering competitive and fair compensation and benefits packages. We provide employees with compensation packages that include base salary, short-term incentives such as annual bonuses and commissions, and long-term equity awards. We also offer comprehensive employee benefits, which vary by country and region, such as life, disability, and health insurance, health savings and flexible spending accounts, paid time off, paid parental leave, Employee Stock Purchase Program, and a 401(k) plan. It is our expressed intent to be an employer of choice in our industry by providing market-competitive compensation and benefits packages.

Health, Safety, and Wellness

The health, safety, and wellness of our employees is a priority in which we have always invested and will continue to do so. We provide our employees and their families with access to a variety of innovative, flexible, and convenient health and wellness programs. Program benefits are intended to provide protection and security, so employees can have peace of mind concerning events that may require time away from work or that may impact their financial well-being. These programs are highlighted regularly in our monthly human resources newsletters.

We continue our investments in and the prioritization of employee health, safety, and wellness in light of the COVID-19 pandemic. To protect and support our essential team members, we have implemented health and safety measures that included a mandatory vaccination policy for our U.S.-based employees, maximizing personal workspaces, changing shift schedules, providing personal protective equipment (PPE), instituting mandatory screening before accessing buildings and performing asymptomatic COVID-19 testing regularly for employees who work on site. We have also supported access to testing by holding on-site testing clinics available to employees and their family members. We continue to monitor this evolving situation and will continue to seek programs to educate and assist employees whenever possible.

Diversity, Equity, and Inclusion

We believe a diverse workforce is critical to our success. Our mission is to value differences in races, ethnicities, religions, nationalities, genders, ages, sexual orientations, as well as education, skill sets and experience. We offer training programs on diversity awareness to help employees understand, recognize, respond, and prevent bias throughout the employee lifecycle. We are focused on inclusive hiring practices, fair and equitable treatment, organizational flexibility, and training and resources.

Training and Development

We believe in encouraging employees in becoming lifelong learners by providing ongoing learning and leadership training opportunities. We provide a scaled learning platform of on-demand and virtual classroom learning focused on personal and

professional development. While we strive to provide real-time recognition of employee performance, we have a formal annual review process not only to determine pay and equity adjustments tied to individual contributions, but to identify areas where training and development may be needed.

Available Information

Our website is located at www.pacb.com. The information posted on or that can be accessed through our website is not incorporated by reference into this Annual Report on Form 10-K, and the inclusion of our website address is an inactive textual reference only. Our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 10-K and amendments to reports filed or furnished pursuant to Sections 13(a) and 15(d) of the Securities Exchange Act of 1934, as amended, are available free of charge through the "Investors" section of our website as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. The SEC also maintains a website that contains our SEC filings. The address of the site is www.sec.gov.

Additionally, we use our website (including the blog section of our website) as well as our Twitter account (@pacbio) as a channel of distribution for important company information and to comply with our disclosure obligations under Regulation FD. Important information, including press releases, analyst presentations and financial information regarding us, as well as corporate governance information, is routinely posted and accessible on the "Investor Relations" section of the website, which is accessible by clicking on the tab labeled "About Us - Investors" on our website home page. In addition, important information is routinely posted and accessible on the blog section of our website, which is accessible through our website at www.pacb.com/blog, as well as our Twitter account (@pacbio). The contents of our website and our Twitter account are not incorporated by reference into this Annual Report on Form 10-K or in any other report or document we file with the SEC, and any references to our website or Twitter account are intended to be inactive textual references only.

ITEM 1A. RISK FACTORS

You should consider carefully the risks and uncertainties described below, together with all of the other information in our public filings with the Securities and Exchange Commission, which could materially affect our business, financial condition, results of operations and prospects. The risks described below are not the only risks facing us. Risks and uncertainties not currently known to us or that we currently deem to be immaterial also may materially affect our business, financial condition, results of operations and prospects. In addition, the impact of the COVID-19 pandemic and any worsening of the economic environment may exacerbate the risks described below, any of which could have a material impact on us. This situation is changing rapidly and additional impacts may arise that we are not aware of currently.

Summary Risk Factors

The following is a summary of the principal risks that could adversely affect our business, operations and financial results. Such risks are discussed more fully below and include, but are not limited to, risks related to:

- The potential adverse impact of health epidemics, including the ongoing COVID-19 pandemic;
- Our ability to successfully market, commercialize, and sell current and future products and related maintenance services;
- Our ability to achieve profitability for our business;
- Our ability to successfully leverage and integrate our acquisitions and future acquisitions;
- Our ability to successfully research, develop and timely manufacture our current and future products;
- Management of new product introductions and transitions, resultant costs, and ability of new products to generate promised performance;
- Recent significant changes to our leadership team and resultant disruptions to our business;
- Retention, recruitment, and training of senior management, key personnel, scientists and engineers;
- Our ability to further penetrate nucleic acid sequencing applications, as well as grow product demand;
- Our reliance on outsourcing to other companies for manufacturing certain components and sub-assemblies, some of which are sole-sourced;
- Our ability to consistently manufacture our instruments and consumables to meet customers' specifications, quantity, cost, or performance requirements;
- The high amount of competition we face in our industry;
- Our ability to attract customers and increase sales of current and future products;
- Reliance on a limited number of customers for a significant portion of our revenues, including academic, research and government institutions;
- The complexity of our products giving rise to defects or errors;
- Our unpredictable and lengthy sales cycle;
- Our business, financial condition and results of operations could be adversely affected by the political and economic tensions between the United States and other countries, including China;
- Securing and maintaining patent or other intellectual property protection for our products and related improvements;
- Current and future legal proceedings filed against us claiming intellectual property infringement;
- Governmental regulations that burden operations or narrow the market for our products;

- Evolving ethical, legal, privacy, social, and regulatory concerns regarding genetic testing;
- Volatility of the price of our common stock; and
- Our stock price falling as a result of future offerings or sales.

Risks Related to Our Business

Our business may be adversely affected by health epidemics, including the ongoing COVID-19 pandemic.

Our business could be adversely impacted by the effects of COVID-19 or other epidemics or pandemics. As a result of the ongoing COVID-19 pandemic, our financial results continue to be impacted negatively as our customers in multiple regions around the world suspended or curtailed their normal operations in efforts to curb the spread of COVID-19. While a significant number of our customer sites that shut down due to COVID-19 have re-opened, a significant number of our customers had delayed purchases of capital assets due to the negative impact of the pandemic on their businesses. This dynamic continues to negatively impact the recognition of revenue related to the sale of our Sequel and Sequel II/IIe instruments and the associated consumables and software. The inability to receive or accept shipments of orders for our products on a timely basis, or at all, the delay or possible cancellation of orders for our products or related maintenance and support services, and the reduced utilization of our products has negatively affected and may negatively affect in the future our operations and revenues. In response to local stay-at-home orders and in alignment with CDC recommendations, we limited our manufacturing and commercial operations based in Menlo Park, California. We will, however, continue to provide consumables and support to scientists at government, academic, and commercial labs that remain open. To aid in containing the spread of COVID-19, we have implemented remote-work options and are limiting employee travel. We are continuing to monitor this evolving situation.

Our manufacturing partners and suppliers have been and could continue to be disrupted by conditions related to COVID-19 or other epidemics or pandemics, possibly resulting in disruption to the production of our products. If our manufacturing partners or suppliers are unable or fail to fulfill their obligations to us for any reason, we may not be able to manufacture our products and satisfy customer demand or our obligations under sales agreements in a timely manner, and our business could be harmed as a result. There is significant uncertainty relating to the long-term effect of COVID-19 on our business. Infections may resurge or become more widespread and the limitation on our ability to travel and timely sell and distribute our products, as well as any closures or supply disruptions, may be extended for longer periods of time, which could have a negative impact on our business, financial condition and operating results. For example, because our semiconductor manufacturers are located in a region where immunization rates in certain communities may be low, the Omicron variant of COVID-19, as well as any future variants that evolve, could impact workforce availability at those locations and disrupt supply.

Even after the COVID-19 pandemic has subsided, we may continue to experience an adverse impact to our business as a result of its global economic impact, including any recession that has occurred or may occur in the future. Specifically, difficult macroeconomic conditions, such as decreases in discretionary capital expenditure spending, changes to the government funding environment, increased and prolonged unemployment or a decline in consumer confidence as a result of the COVID-19 pandemic, as well as limited or significantly reduced points of access of our products, could have a continuing adverse effect on the demand for some of our products and, consequently, related maintenance and support services. The degree of impact of COVID-19 on our business will depend on several factors, such as the duration and the extent of the pandemic, as well as actions taken by governments, businesses and consumers in response to the pandemic, all of which continue to evolve and remain uncertain at this time.

The commercialization and sales of our current or future products may be unsuccessful or less successful than anticipated. While we plan to continue pursuing new products and expand into adjacent markets, we have limited experience in managing and selling multiple products and, as a result, may face challenges selling in new markets and fail to successfully carry out these initiatives, which may adversely impact our business, financial condition or results of operation.

In September 2015, we launched the PacBio Sequel® System, and concurrently began phasing out production of PacBio RS II instruments, and, in April 2019 we announced the commercial launch of the Sequel II System. In October 2020, we

launched the Sequel IIe System, which has increased computational capacity, and is designed to enable customers to generate PacBio HiFi reads more efficiently. In April 2021, we released a new HiFi sequencing workflow allowing for more accurate HiFi reads with limited sample quantities. We placed 374 Sequel II/IIe systems during the year ended December 31, 2021, and we expect the number of Sequel II/IIe placements to continue to grow during 2022.

We have made and expect to continue making substantial investments to develop new products and enhance our existing products through our acquisitions and research and development efforts. For example, we are developing a SBB short read sequencing platform. However, due to challenges we may experience in developing and marketing our existing products and launching new products, we may not be able to effectively:

- manage the timeliness of our new product introductions and the rate at which sales of our new products may cannibalize sales of our older products or manage sales and marketing of multiple sequencing platforms;
- drive adoption of our current and future products, including the Sequel II/IIe Systems and products under development related to our emerging SBB technology;
- maintain our competitive position by continuing to attract and retain customers for our products;
- provide appropriate levels of customer training and support for our products;
- implement an effective marketing strategy to promote awareness of our products;
- develop and implement an effective sales and distribution strategy for our current and future products;
- develop, manufacture and commercialize new products or achieve an acceptable return on our manufacturing or research and development efforts and expenses;
- comply with regulatory requirements applicable to our products;
- anticipate and adapt to changes in our market;
- accommodate customer expectations and demands with respect to our products, increase product adoption by our existing customers or develop new customer relationships;
- deliver our future products in a timely manner to our customers;
- grow our share by marketing and selling our products for new and additional applications;
- manage the significant burdens that expanding our existing or future products into current and new markets may impose on marketing, compliance, and other administrative and managerial resources;
- maintain and develop strategic relationships with vendors, manufacturers and other industry partners to acquire necessary materials for the production of, and to develop, manufacture and commercialize, our existing or future products;
- adapt or scale our manufacturing activities to meet performance specifications and potential demand at a reasonable cost;
- avoid infringement and misappropriation of third-party intellectual property;
- obtain and maintain any necessary licenses to third-party intellectual property on commercially reasonable terms;
- obtain valid and enforceable patents that give us a competitive advantage or enforce existing patents;
- protect our proprietary technology; and
- attract, retain and motivate qualified personnel.

The risks noted above, especially with respect to the marketing, sales, and commercialization of our products, may be heightened by the impact of the COVID-19 pandemic. In addition, a high percentage of our expenses is and will continue to be fixed. Accordingly, if we do not generate revenue as and when anticipated, we could suffer a material adverse effect on our business, financial conditions, results of operations and prospects.

We have incurred losses to date, and we expect to continue to incur significant losses as we develop our business and may never achieve profitability.

Except for the quarters ended September 30, 2015 (as a result of a one-time gain on lease amendments), March 31, 2020 (as a result of the recognition of a gain relating to the Continuation Advances), December 31, 2020 (as a result of recognition of gain relating to the Reverse Termination Fee), September 30, 2021 (as a result of the recognition of a one-time income tax benefit from business acquisitions), and the year ended December 31, 2020 (as a result of recognition of gain relating to the Reverse Termination Fee and gain relating to the Continuation Advances), we have incurred net losses since inception and we cannot be certain if or when we will produce sufficient revenue from our operations to support our costs. Even if profitability is achieved in the future, we may not be able to sustain profitability on a consistent basis. We expect to continue to incur substantial losses and negative cash flow from operations for the foreseeable future.

Our net losses since inception and our expectation of incurring substantial losses and negative cash flow for the foreseeable future could:

- make it more difficult for us to satisfy our obligations;
- increase our vulnerability to general adverse economic and industry conditions;
- limit our ability to fund future working capital, capital expenditures, research and development and other business opportunities;
- increase the volatility of the price of our common stock;
- limit our flexibility to react to changes in our business and the industry in which we operate;
- place us at a disadvantage to other companies that offer nucleic acid sequencing equipment or consumables; and
- limit our ability to borrow additional funds.

Any or all of the foregoing may have a material adverse effect on our business, operations, financial condition, and prospects.

We are not cash flow positive and may not have sufficient cash to make required payments under the terms of our debt or fund our long term planned operations.

Our operations have consumed substantial amounts of cash since inception, and we expect to continue to incur substantial losses and negative cash flow from operations for the foreseeable future. Additional funds may not be available on terms acceptable to us or at all. We have incurred and may further incur additional debt, including the debt incurred through issuance of $900.0 million in aggregate principal amount of 1.50% Convertible Senior Notes due 2028. We may not have sufficient cash to make required payments under the terms of this debt, and, should this occur, debt holders have rights senior to common stockholders to make claims on our assets. We may not be able to issue equity securities due to unacceptable terms and conditions to us in the capital markets. To the extent that we intend to raise additional funds through the sale of our common stock, downward fluctuations in our stock price could adversely affect such fundraising efforts. Furthermore, equity financings normally involve shares sold at a discount to the current market price and fundraising through sales of additional shares of common stock or other equity securities will have a dilutive effect on our existing investors. The shares may also be sold at a time when the market price for our common stock is low because we are in need of the funds, which will further dilute existing holders more than if the market price for our common stock was higher.

We believe that our growth will depend, in part, on our ability to fund our commercialization efforts and our efforts to develop new products, including any improvements to the SMRT Cell 8M and Sequel II/IIe Systems and our planned development of a SBB short read sequencing platform. To the extent our existing resources are not sufficient, it may require us to delay, or even not allow us to conduct any or all of these activities that we believe would be beneficial for our future growth. We may need to raise additional funds through public or private debt or equity financing or alternative financing arrangements, which may include collaborations or licensing arrangements. If we are unable to raise funds on favorable terms, or at all, we may have to reduce our cash burn rate and may not be able to support our commercialization efforts and launching of new products, operations or to increase or maintain the level of our research and development activities.

If we are unable to generate sufficient cash flows or to raise adequate funds to finance our forecasted expenditures, we may have to make significant changes to our operations, including delaying or reducing the scope of, or eliminating some or all of, our development programs. We also may have to reduce sales, marketing, engineering, customer support or other resources devoted to our existing or new products, or we may need to cease operations. Any of these actions could materially impede our ability to achieve our business objectives and could materially harm our operating results. If our cash, cash equivalents and investments are insufficient to fund our projected operating requirements and we are unable to raise capital, it could have a material adverse effect on our business, financial condition and results of operations and prospects.

We have made acquisitions and, in the future, may continue to acquire businesses, technologies or assets, form joint ventures or make other strategic investments with companies that could harm our operating results, dilute our stockholders' ownership, or cause us to incur debt or significant expense.

As part of our business strategy, we have acquired and expect to continue to pursue acquisitions of complementary businesses, technologies or assets. We may also pursue technology license arrangements, strategic alliances or investments that complement our business. For example, we entered into a multi-year Development and Commercialization Agreement with Invitae, whereby Invitae provides us with funding to develop certain products relating to production-scale high-throughput sequencing. In July 2021, we acquired Circulomics and in September 2021, we acquired Omniome.

Acquisitions involve numerous risks, any of which could harm our business and negatively affect our financial condition and results of operations, including:

- intense competition for suitable acquisition targets, which could increase prices and adversely affect our ability to consummate deals on favorable or acceptable terms;
- failure or material delay in closing a transaction;
- transaction-related lawsuits or claims;
- difficulties in integrating the technologies, operations, existing contracts, and personnel of an acquired company;
- difficulties in retaining key employees or business partners of an acquired company;
- difficulties in retaining suppliers, partners or customers of an acquired company;
- challenges with integrating the brand identity of an acquired company with our own;
- diversion of financial and management resources from existing operations or alternative acquisition opportunities;
- failure to realize the anticipated benefits or synergies of a transaction;
- difficulties in developing technology post-acquisition;
- failure to identify the problems, liabilities, or other shortcomings or challenges of an acquired company or technology, including issues related to intellectual property, regulatory compliance practices, litigation, revenue recognition or other accounting practices, or employee or user issues;
- risks that regulatory bodies may enact new laws or promulgate new regulations that are adverse to an acquired company or business;
- risks that regulatory bodies do not approve our acquisitions or business combinations or delay such approvals;
- theft of our trade secrets or confidential information that we share with potential acquisition candidates;
- risk that an acquired company or investment in new services cannibalizes a portion of our existing business; and
- adverse market reaction to an acquisition.

To finance any acquisitions or other strategic investments, we may raise additional funds, which could adversely affect our existing stockholders and our business. If the price of our common stock is low or volatile, we may not be able to acquire other companies for stock. In addition, our stockholders may experience substantial dilution as a result of additional securities we may issue for acquisitions. Open market sales of substantial amounts of our common stock issued to

stockholders of companies we acquire could also depress our stock price. Additional funds may not be available on terms that are favorable to us, or at all.

If we fail to address the foregoing risks or other problems encountered in connection with past or future acquisitions of businesses, new technologies, services, and other assets and strategic investments, or if we fail to successfully integrate such acquisitions or investments, our business, financial condition, and results of operations could be adversely affected.

If we are unable to successfully develop and timely manufacture our current and future products, including with respect to SMRT Cell Sequel II/IIe Systems, the SBB products under development, and related products, our business may be adversely affected.

In light of the highly complex technologies involved in our products, there can be no assurance that we will be able to manufacture and commercialize our current and future products on a timely basis or continue providing adequate support for our existing products. The commercial success of our products, including the Sequel and Sequel II/IIe Systems, depends on a number of factors, including performance and reliability of the system, our anticipating and effectively addressing customer preferences and demands, the success of our sales and marketing efforts, effective forecasting and management of product demand, purchase commitments and inventory levels, effective management of manufacturing and supply costs, and the quality of our products, including consumables such as SMRT Cells and reagents. Should we face delays in or discover unexpected defects during the further development or manufacturing process of instruments or consumables related to our products, including with respect to SMRT Cells, reagents, Sequel II/IIe Systems, SBB products under development, and including any delays or defects in software development or product functionality, the timing and success of the continued rollout and scaling of our products may be significantly impacted, which may materially and negatively impact our revenue and gross margin. The ability of our customers to successfully utilize our products will also depend on our ability to deliver high quality SMRT Cells and reagents, including with respect to the SMRT Cell 8M. We have designed SMRT Cells and other consumables specifically for the Sequel and Sequel II/IIe Systems, and may need to develop in the future, other customized SMRT Cells and consumables for our future products. Our production of the SMRT Cells for the Sequel and Sequel II/IIe Systems has been and may in the future be below desired levels and yields, and we have experienced and may experience in the future manufacturing delays, product or quality defects, SMRT Cell variability, and other issues. For example, the COVID–19 pandemic outbreak has impacted and could result in more pronounced impacts to our manufacturing and our ability to supply products. The performance of our consumables is critical to our customers' successful utilization of our products, and any defects or performance issues with our consumables would adversely affect our business. All of the foregoing could materially negatively impact our ability to sell our products or result in other material adverse effects on our business, operations, financial condition, operations and prospects.

The development of our products is complex and costly. Problems in the design or quality of our products may have a material and adverse effect on our brand, business, financial condition, and operating results, and could result in us losing our certifications from the International Organization for Standardization ("ISO"). If we were to lose ISO certification, then our customers might choose not to purchase products from us and this could adversely impact our ability to develop products approved for clinical uses. Unanticipated problems with our products could divert substantial resources, which may impair our ability to support our new and existing products, and could substantially increase our costs. If we encounter development challenges or discover errors in our products late in our development cycle, we may be forced to delay product shipments or the scaling of manufacturing or supply. In particular, if the continued rollout of our current and future products, including with respect to the SMRT Cell 8M and Sequel II/IIe Systems, is delayed or is not successful or less successful than anticipated, then we may not be able to achieve an acceptable return, if any, on our substantial research and development efforts, and our business may be materially and adversely affected. The expenses or losses associated with delayed or unsuccessful product development or lack of market acceptance of our existing and new products, including the SMRT Cell 8M and Sequel II/IIe Systems, could materially and adversely affect our business, operations, financial condition, and prospects.

Our research and development efforts may not result in the benefits that we anticipate, and our failure to successfully market, sell, and commercialize our current and future products could have a material adverse effect on our business, financial condition and results of operations.

We have dedicated significant resources to developing our current products, including sequencing systems and consumables based on our proprietary SMRT sequencing technology and our Sequel and Sequel II/IIe Systems. We are also engaged in substantial and complex research and development efforts, which, if successful, may result in the introduction of new products in the future, including in connection with the SMRT Cell 8M and the Sequel II/IIe Systems. Our research and development efforts are complex and require us to incur substantial expenses. We may not be able to develop, manufacture and commercialize new products, obtain regulatory approval if necessary, or achieve an acceptable return, if any, on our research and development efforts and expenses or joint research and development efforts with partners. Our joint research and development efforts with partners require significant management attention and operational resources. If we are unable to successfully manage such joint research and development efforts, our future results may be adversely impacted. In January 2021, we entered into a multi-year collaboration with Invitae to begin development of a production-scale high-throughput sequencing platform; in certain termination circumstances of this collaboration, we may be obligated to refund all or a portion of the development funds advanced by Invitae and/or we may owe Invitae a share of the revenue generated from the sale of the program products. Furthermore, we need to continue to expand our internal capabilities or seek new partnerships or collaborations, or both, in order to successfully develop, market, sell and commercialize our products for and in the markets we seek to reach. If we are unable to do so or are delayed, then this could materially and adversely affect our business, operations, financial condition and prospects.

We must successfully manage new product introductions and transitions, including with respect to the SMRT Cell 8M and Sequel II/IIe Systems, and the development of our proposed SBB short read sequencing platform, and we may incur significant costs during these transitions and development, and these efforts may not result in the benefits we anticipate.

If our products and services fail to deliver the performance, scalability or results expected by our current and future customers, or are not delivered on a timely basis, our reputation and credibility may suffer, our current and future sales and revenue may be materially harmed and our business may not succeed. For instance, if we are not able to realize the benefits we anticipate from the development and commercialization of the SMRT Cell 8M and Sequel II/IIe Systems, our proposed SBB short read sequencing platform, and any future products that may be developed for medical and clinical uses, it could have a material adverse effect on our business, financial condition and results of operations. In addition, the introduction of future products, including with respect to future long-read and short-read products, and related consumables, has and may in the future lead to our limiting or ceasing development of further enhancements to our existing products as we focus our resources on new products, and has resulted and could in the future result in reduced marketplace acceptance and loss of sales of our existing products, materially adversely affecting our revenue and operating results. The introduction of new products has had and may in the future also have a negative impact on our revenue in the near-term as our current and future customers have delayed or cancelled and may in the future delay or cancel orders of existing products in anticipation of new products and we may also be pressured to decrease prices for our existing products. Further, we have experienced, and may in the future experience, difficulty in managing or forecasting customer reactions, purchasing decisions or transition requirements with respect to newly launched products. We have incurred and may continue to incur significant costs in completing these transitions, including costs of write-downs of our products, as current or future customers transition to new products. If we do not successfully manage these product transitions, including with respect to the SMRT Cell 8M and Sequel II/IIe System, our business, operations, financial condition, and prospects may be materially and adversely affected.

Significant changes to our leadership team and the resulting management transitions might harm our future operating results.

We have experienced significant changes to our leadership team. Our President and Chief Executive Officer Christian O. Henry was appointed effective September 14, 2020, succeeding Dr. Michael Hunkapiller who retired on December 31, 2020. Our Chief Financial Officer Susan G. Kim was appointed effective September 28, 2020, succeeding Susan K. Barnes who retired on August 7, 2020. Our Chief Operating Officer, Mark Van Oene, and our Chief Commercial Officer, Peter Fromen, were each appointed effective January 8, 2021. Also, our Vice President and Chief Accounting Officer Michele Farmer was appointed effective May 17, 2021, and our Chairman of the Board Dr. John F. Milligan was appointed effective September 14, 2020.

Although we believe these leadership transitions are in the best interest of our stakeholders, these transitions may result in the loss of personnel with deep institutional or technical knowledge. Further, the transition could potentially disrupt our operations and relationships with employees, suppliers, partners and customers due to added costs, operational inefficiencies, decreased employee morale and productivity and increased turnover. We must successfully recruit and integrate our new leadership team members within our organization to achieve our operating objectives; as such, the leadership transition may temporarily affect our business performance and results of operations while the new members of our leadership team become familiar with our business. In addition, our competitors may seek to use this transition and the related potential disruptions to gain a competitive advantage over us. Furthermore, these changes increase our dependency on the other members of our leadership team that remain with us, who are not contractually obligated to remain employed with us and may leave at any time. Any such departure could be particularly disruptive given that we are already experiencing leadership transitions and, to the extent we experience additional management turnover, competition for top management is high such that it may take some time to find a candidate that meets our requirements. Our future operating results depend substantially upon the continued service of our key personnel and in significant part upon our ability to attract and retain qualified management personnel. If we are unable to mitigate these or other similar risks, our business, results of operations and financial condition may be materially and adversely affected.

We depend on the continuing efforts of our senior management team and other key personnel. If we lose members of our senior management team or other key personnel or are unable to successfully retain, recruit and train qualified scientists, engineers, sales personnel and other employees, our ability to maintain, develop and commercialize our products could be harmed and we may be unable to achieve our goals.

Our success depends upon the continuing services of members of our senior management team and scientific and engineering personnel. In particular, our scientists and engineers are critical to our technological and product innovations and we will need to hire additional qualified personnel. Our industry, particularly in the San Francisco Bay Area, is characterized by high demand and intense competition for talent, and the turnover rate can be high. We compete for qualified management and scientific personnel with other life science companies, academic institutions and research institutions, particularly those focusing on genomics. In addition, we will need to continue to recruit, hire and retain sales personnel to support the commercialization of our products. Our employees could leave our company with little or no prior notice and would be free to work for a competitor. In addition, changes to U.S. immigration policies, particularly to H-1B and other visa programs, could restrain the flow of technical and professional talent into the U.S. and may inhibit our ability to hire qualified personnel. If one or more of our senior executives or other key personnel were unable or unwilling to continue in their present positions, we may not be able to replace them easily or at all, and other senior management may be required to divert attention from other aspects of the business. In addition, we do not have “key person” life insurance policies covering any member of our management team or other key personnel. Further, our vaccination and return to office protocols related to COVID-19 may also impact the recruitment and retention of key employees. The loss of any of these individuals or any inability to attract or retain qualified personnel, including scientists, engineers, sales personnel and others, could prevent us from pursuing collaborations and materially and adversely affect our support of existing products, product development and introductions, business growth prospects, results of operations and financial condition.

Our success is highly dependent on our ability to further penetrate nucleic acid sequencing applications as well as on the growth and expansion of the demand for our products. If our products fail to achieve and sustain sufficient market acceptance, we will not generate expected revenue and our business may not succeed.

Although nucleic acid sequencing technology is well-established, our SMRT Sequencing technology is relatively new and evolving. We cannot be sure that our current or future products will gain acceptance in the marketplace at levels sufficient to support our costs. Our success depends, in part, on our ability to expand overall demand for nucleic acid sequencing to include new applications that are not practicable with other current technologies and to introduce new products that capture a larger share of growing overall demand for sequencing. To accomplish this, we must successfully commercialize, and continue development of, our proprietary SMRT Sequencing technology for use in a variety of life science and other research applications, including uses by academic, government and clinical laboratories, as well as pharmaceutical, diagnostic, biotechnology and agriculture companies, among others. However, we may be unsuccessful in these efforts and the sale and commercialization of the SMRT Cell 8M and Sequel II/IIe Systems, and related products may not grow sufficiently to cover our costs.

There can be no assurance that we will be successful in adding new products or securing additional customers for our current and future products, including with respect to the SMRT Cell 8M and Sequel II/IIe Systems and products related to our recent Circulomics and Omniome acquisitions. If we are unable to develop SBB technology and sell acquired technology product, we may fail to achieve our strategic commercial initiatives in connection with the planned release of new products and anticipated entry into new markets. Our ability to further penetrate existing applications and any new applications depends on a number of factors, including the cost, performance and perceived value associated with our products, as well as customers' willingness to adopt a different approach to nucleic acid sequencing. Potential customers may have already made significant investments in other sequencing technologies and may be unwilling to invest in new technologies. We are experiencing pricing pressures caused by industry competition and increased demand for lower-priced instruments and lower operational costs. We have limited experience commercializing and selling products outside of the academic and research settings, and we cannot guarantee success in acquiring additional customers. Furthermore, we cannot guarantee that our products will be satisfactory to potential customers or that our products will perform in accordance with customer expectations.

Nucleic acid sequencing applications are new and dynamic, and there can be no assurance that they will develop as quickly as we anticipate, that they will reach their full potential or that our products will be appropriate competitive for these applications. As a result, we may be required to refocus our marketing efforts, and we may have to make changes to the specifications of our products to enhance our ability to enter particular applications more quickly. We may also need to delay full-scale commercial deployment of new products as we develop them in order to perform quality control and early access user testing. Even if we are able to implement our technology successfully, we and/or our sales and distribution partners may fail to achieve or sustain market acceptance of our current or future products across the full range of our intended life science and other applications. We need to continue to expand and update our internal capabilities or to collaborate with other partners, or both, in order to successfully expand sales of our products in the applications that we seek to reach, which we may be unable to do at the scale required to support our business.

If the demand for our products grows more slowly than anticipated, if we are unable to successfully scale or otherwise ensure sufficient manufacturing capacity for new products to meet demand, if we are not able to successfully market and sell our products, if competitors develop better or more cost-effective products, if our product launches and commercialization are not successful, or if we are unable to further grow our customer base or do not realize the growth with existing customers that we are expecting, our current and future sales and revenue may be materially and adversely harmed and our business may not succeed.

We rely on other companies for the manufacture of certain components and sub-assemblies and intend to outsource additional sub-assemblies in the future, some of which are sole sources. We may not be able to successfully scale the manufacturing process necessary to build and test multiple products on a full commercial basis, which could materially harm our business.

Our products are complex and involve a large number of unique components, many of which require precise manufacturing. The nature of our products requires customized components that are currently available only from a limited number of sources, and in some cases, single sources. We have chosen to source certain critical components from a single source, including suppliers for our SMRT Cells, reagents and instruments. We cannot assure you that product supplies will not be limited or interrupted, especially with respect to our sole source third-party manufacturing and supply collaborators, or that product supplies will be of satisfactory quality or continue to be available at acceptable prices. In particular, any replacement of our manufacturers could require significant effort and expertise because there may be a limited number of qualified replacements. We may be unable to negotiate binding agreements with our current and future sole source third-party manufacturing and supply collaborators or, in the event that such collaborators' services become interrupted for any reason, find replacement manufacturers to support our development and commercial activities at commercially reasonable terms. We do not always have arrangements in place for a redundant or second-source supply for our sole source vendors in the event they cease to provide their products or services to us or fail to provide sufficient quantities in a timely manner. If we are required to purchase these components from alternative sources, it could take several months or longer to qualify the alternative sources. If we are unable to secure a sufficient supply of these product components on a timely basis, or if these components do not meet our expectations or specifications for quality and functionality, our operations and manufacturing would be materially and adversely affected, we could be unable to meet customer demand and our business and results of operations may be materially and adversely affected.

The operations of our third-party manufacturing partners and suppliers have been and could continue to be disrupted by conditions unrelated to our business or operations or that are beyond our control, including but not limited to international trade restrictions, inflation, supply chain disruptions, and conditions related to COVID-19 or other epidemics. If our manufacturing partners or suppliers are unable or fail to fulfill their obligations to us for any reason, we may not be able to manufacture our products and satisfy customer demand or our obligations under sales agreements in a timely manner, and our business could be harmed as a result. For example, the global shortage of semiconductors, which has been reported since early 2021, has caused challenges for us in our supply chain and resulted in some cost increases that have and may continue to adversely impact margins. During these periods of shortages or delays, the price of components may increase, or the components may not be available at all. We may not be able to secure enough components at reasonable prices or of acceptable quality to build new products in a timely manner in the quantities or configurations needed. Accordingly, our revenue and gross margins could suffer until other sources can be developed.

In addition, because our semiconductor suppliers are in regions that may have communities with low vaccination rates, the Omicron variant of COVID-19, or any variants that evolve in the future, could lead to increased infections among workers that could further disrupt the supply chain. Our current manufacturing process is characterized by long lead times between the placement of orders for and delivery of our products. If we do not accurately anticipate our needs or if we receive insufficient components to manufacture our products on a timely basis to meet customer demand, our sales and our gross margin may be adversely affected and our business could be materially harmed. If we are unable to reduce our manufacturing costs and establish and maintain reliable, high-volume manufacturing suppliers as we scale our operations, our business, operations, financial condition, and prospects could be materially and adversely harmed.

We may be unable to consistently manufacture our instruments and consumables, including SMRT Cells and reagents, to the necessary specifications or in quantities necessary to meet demand at an acceptable cost or at an acceptable performance level.

In order to successfully generate revenue from our products, we need to supply our customers with products that meet their expectations for quality and functionality in accordance with established specifications. Our customers have experienced variability in the performance of our products. We have experienced and may continue to experience delays, quality issues or other difficulties leading to customer dissatisfaction with our products. Our production of SMRT Cells and reagents involves a long and complex manufacturing process, and has been and may in the future be below desired yields and resulting output levels. We have experienced and may experience in the future manufacturing delays, product defects, variability in the performance of SMRT Cells and other products, inadequate reserves for inventory, or other issues.

There is no assurance that we will be able to manufacture our products so that they consistently achieve the product specifications and quality that our customers expect, including any products developed for clinical uses. Problems in the design or quality of our products, including low manufacturing yields of SMRT Cells, or sub-performing reagent lots may have a material adverse effect on our brand, business, financial condition, and operating results, and could result in us losing our ISO certifications. If we were to lose our ISO certifications, then our customers might choose not to purchase products from us. There is also no assurance that we will be able to increase manufacturing yields and decrease costs, or that we will be successful in forecasting customer demand or manufacturing and supply costs, or that product supplies, including reagents or integrated chips, will not be limited or interrupted, or will be of satisfactory quality or continue to be available at acceptable prices. Furthermore, while we are undertaking efforts to increase our manufacturing scale and capability, we may not be able to increase manufacturing to meet anticipated demand or may experience downtime in our manufacturing facilities, including, for example, if we experience increased cases of COVID-19 among our employees, or if our suppliers are unable to meet our increased demand at a time when the supply chain is under duress due to potential dislocations and disruptions in product and employee availability due to COVID-19. An inability to manufacture products and components that consistently meet specifications, in necessary quantities and at commercially acceptable costs, will have a negative impact, and may have a material adverse effect on our business, product development timelines, financial condition and results of operations.

Rapidly changing technology in life sciences and research diagnostics could make our products obsolete unless we continue to develop, manufacture and commercialize new and improved products and pursue new opportunities.

Our industry is characterized by rapid and significant technological changes, frequent new product introductions and enhancements and evolving industry standards. Our future success depends on our ability to continually improve our products, to develop and introduce new products that address the evolving needs of our customers on a timely and cost-

effective basis and to pursue new opportunities. These new opportunities may be outside the scope of our proven expertise or in areas where demand is unproven, and new products and services developed by us may not gain market acceptance or may not adequately perform in order to capture market share. Our inability to develop and introduce new products and to gain market acceptance of our existing and new products could harm our future operating results. Unanticipated difficulties or delays in replacing existing products with new products or in commercializing our existing or new products in sufficient quantities and of acceptable quality to meet customer demand, including with respect to the SMRT Cell 8M and Sequel II/IIe Systems, could diminish future demand for our products and may materially and adversely harm our future operating results.

Increased market adoption of our products by customers may depend on the availability of sample preparation and informatics tools, some of which may be developed by third parties.

Our commercial success may depend in part upon the development of sample preparation and software and informatics tools by third parties for use with our products. We cannot guarantee that product supplies, including reagents, will not be limited or interrupted, or will be of satisfactory quality or continue to be available at acceptable prices, or that third parties will develop tools that our current and future customers will find useful with our products, or that customers will adopt such third-party tools on a timely basis or at all. A lack of complementary sample preparation and informatics tools, or delayed updates of such tools, may impede the adoption of our products and may materially and adversely impact our business.

We operate in a highly competitive industry and if we are not able to compete effectively, our business and operating results will likely be harmed.

There are a significant number of companies offering nucleic acid sequencing products and/or services, including Illumina, BGI Genomics, Thermo, Oxford Nanopore Technologies Ltd. (“ONT Ltd.”), Roche, and Qiagen. Many of these companies currently have greater name recognition, more substantial intellectual property portfolios, longer operating histories, significantly greater financial, technical, research and/or other resources, more experience in new product development, larger and more established manufacturing capabilities and marketing, sales and support functions, and/or more established distribution channels to deliver products to customers than we do. These companies may be able to respond more quickly and effectively than we can to new or changing opportunities, technologies, standards or customer requirements.

There are also several companies that are in the process of developing or have already developed and commercialized new, competing or potentially competing technologies, products and/or services, including ONT Ltd. and its subsidiaries, against whom we have filed complaints for patent infringement in the U.S. District Court for the District of Delaware and, previously, with the U.S. International Trade Commission, in the High Court of England and Wales and in the District Court of Mannheim, Germany. ONT Ltd. previously filed claims against us in the High Court of England and Wales and the District Court of Mannheim, Germany, also for patent infringement, and its subsidiary, Oxford Nanopore Technologies, Inc. (“ONT Inc.”), filed counterclaims against us in the U.S. District Court for the District of Delaware seeking declaratory judgements of non-infringement, invalidity and unenforceability of the asserted patents, as well as antitrust, false advertising and unfair competition counterclaims that were subsequently dismissed by that court. Roche is developing potentially competing sequencing products. Increased competition may result in pricing pressures, which could harm our sales, profitability or market share. Our failure to further enhance our existing products and to introduce new products to compete effectively could materially and adversely affect our business, operations, financial condition and prospects.

We may be unable to successfully increase sales of our current products or market and sell our future products.

Our ability to achieve profitability depends on our ability to attract customers for our current and future products, and we may be unable to effectively market or sell our products, or find appropriate partners to do so. To perform sales, marketing, distribution and customer support functions successfully, we face a number of risks, including:

- our ability to attract, retain and manage qualified sales, marketing and service personnel necessary to expand market acceptance for our technologies;
- the performance and commercial availability expectations of our existing and potential customers with respect to new and existing products;

- availability of potential sales and distribution partners to sell our technologies, and our ability to attract and retain such sales and distribution partners;
- the time and cost of maintaining and growing a specialized sales, marketing and service force for a particular application, which may be difficult to justify in light of the revenue generated; and
- our sales, marketing and service force may be unable to execute successful commercial activities.

We have enlisted and may continue to enlist third parties to assist with sales, distribution and customer support. There is no guarantee that we will be successful in attracting desirable sales and distribution partners, that we will be able to enter into arrangements with such partners on terms favorable to us or that we will be able to retain such partners on a going-forward basis. If our sales and marketing efforts, or those of any of our third-party sales and distribution partners, are not successful, or our products do not perform in accordance with customer expectations, our technologies and products may not gain market acceptance, which could materially and adversely impact our business, operations, financial condition and prospects.

Large purchases by a limited number of customers represent a significant portion of our revenue, and any loss or delay of expected purchases has resulted, and in the future could result, in material quarter-to-quarter fluctuations of our revenue or otherwise adversely affect our results of operations.

We receive a significant portion of our revenue from a limited number of customers. For example, for the fiscal years ended December 31, 2021, 2020 and 2019, one of our customers, Gene Company Limited, accounted for approximately 13%, 14% and 17% of our total revenue, respectively. Gene Company Limited is our primary distributor in China. Many of these customers make large purchases on a purchase-order basis rather than pursuant to long-term contracts. As a consequence of the concentrated nature of our customer base and their purchasing behavior, our quarterly revenue and results of operations have fluctuated, and may fluctuate in the future, from quarter to quarter and are difficult to forecast. For example, the cancellation of orders or acceleration or delay in anticipated product purchases or the acceptance of shipped products by our larger customers has materially affected, and in the future could materially affect, our revenue and results of operations in any quarterly period. We have been, and may be in the future be, unable to sustain or increase our revenue from our larger customers, or offset any discontinuation or decrease of purchases by our larger customers with purchases by new or other existing customers. To the extent one or more of our larger customers experience significant financial difficulty, bankruptcy or insolvency, this could have a material adverse effect on our sales and our ability to collect on receivables, which could materially and adversely harm our financial condition and results of operations.

In addition, many of our customers, including some of our larger customers, have negotiated, or may in the future negotiate, volume-based discounts or other more favorable terms from us or our sales and distribution partners, which can and have had a negative effect on our gross margins or revenue.

We expect that such concentrated purchases will continue to contribute materially to our revenue for the foreseeable future and that our results of operations may fluctuate materially as a result of such larger customers' buying patterns. In addition, we may see consolidation of our customer base. The loss of one of our larger customers, a significant delay or reduction in its purchases, or any volume-based discount or other more favorable terms that we or our sales and distribution partner(s) may agree to provide, in light of the aggregated purchase volume or buying power resulting from such consolidation, has harmed, and in the future could harm, our business, financial condition, results of operations and prospects.

Our products are highly complex, have recurring support requirements and could have unknown defects or errors, which may give rise to claims against us or divert application of our resources from other purposes.

Products using our SMRT sequencing technology are highly complex and may develop or contain undetected defects or errors. Our customers have experienced and may continue to experience reliability issues with our existing and future products, including the Sequel System and the Sequel II/IIe Systems. Despite testing, defects or errors may arise in our products, which could result in a failure to obtain, maintain or increase market acceptance of our products, diversion of development resources, injury to our reputation and increased warranty, service and maintenance costs. New products, including the SMRT Cell 8M and Sequel II/IIe Systems, or enhancements to our existing products in particular may contain undetected errors or performance problems that are discovered only after delivery to customers. If our products have

reliability or other quality issues or require unexpected levels of support in the future, the market acceptance and utilization of our products may not grow to levels sufficient to support our costs and our reputation and business could be harmed. Low utilization rates of our products could cause our revenue and gross margins to be adversely affected. We generally ship our sequencing instruments with one year of service included in the purchase price with an option to purchase one or more additional years of service. We also provide a warranty for our consumables, which is generally limited to replacing, or at our option, giving credit for any consumable with defects in material or workmanship. Defects or errors in our products may also discourage customers from purchasing our products. The costs incurred in correcting any defects or errors may be substantial and could materially and adversely affect our operating margins. If our service and support costs increase, our business and operations may be materially and adversely affected.

In addition, such defects or errors could lead to the filing of product liability claims against us or against third parties who we may have an obligation to indemnify against such claims, which could be costly and time-consuming to defend and result in substantial damages. Although we have product liability insurance, any product liability insurance that we have or procure in the future may not protect our business from the financial impact of a product liability claim. Moreover, we may not be able to obtain adequate insurance coverage on acceptable terms. Any insurance that we have or obtain will be subject to deductibles and coverage limits. A product liability claim could have a material adverse effect on our business, financial condition and results of operations.

A significant portion of our sales depends on customers' spending budgets that may be subject to significant and unexpected variation which could have a negative effect on the demand for our products.

Our instruments represent significant capital expenditures for our customers in research applications. Current and potential customers for our current or future products include academic and government institutions, genome centers, medical research institutions, clinical laboratories, pharmaceutical, agricultural, biotechnology, diagnostic and chemical companies. Their spending budgets can have a significant effect on the demand for our products. Spending budgets are based on a wide variety of factors, including the allocation of available resources to make purchases, funding from government sources which is highly uncertain and subject to change, the spending priorities among various types of research equipment, policies regarding capital expenditures during economically uncertain periods and the impact of COVID-19. Any decrease in capital spending or change in spending priorities of our current and potential customers could significantly reduce the demand for our products. Any delay or reduction in purchases by current or potential customers or our inability to forecast fluctuations in demand could materially and adversely harm our future operating results.

We may not be able to convert our orders in backlog into revenue.

Our backlog represents product orders from our customers that we have confirmed but have not been able to fulfill, and, accordingly, for which we have not yet recognized revenue. We may not receive revenue from these orders, and any order backlog we report may not be indicative of our future revenue.

Many events can cause an order to be delayed or not completed at all, some of which may be out of our control, including the potential impacts from COVID-19 and our suppliers, especially our sole source suppliers, not being able to provide us with products or components. If we delay fulfilling customer orders or if customers reconsider their orders, those customers may seek to cancel or modify their orders with us. Customers may otherwise seek to cancel or delay their orders even if we are prepared to fulfill them. If our orders in backlog do not result in sales, our operating results may suffer.

Our sales cycle is unpredictable and lengthy, which makes it difficult to forecast revenue and may increase the magnitude of quarterly or annual fluctuations in our operating results.

The sales cycle for our sequencing instruments is lengthy because they represent a major capital expenditure and generally require the approval of our customers' senior management. This may contribute to substantial fluctuations in our quarterly or annual operating results, particularly during the periods in which our sales volume is low. Factors that may cause fluctuations in our quarterly or operating results include, without limitation, market acceptance for our products; our ability to attract new customers; publications of studies by us, competitors or third parties; the timing and success of new product introductions by us or our competitors or other changes in the competitive dynamics of our industry, such as consolidation; the amount and timing of our costs and expenses; changes in our pricing policies or those of our competitors; general economic, industry and market conditions; the effects of seasonality; the regulatory environment; expenses associated

with warranty costs or unforeseen product quality issues; the hiring, training and retention of key employees, including our ability to grow our sales organization; litigation or other claims against us for intellectual property infringement or otherwise; our ability to obtain additional financing as necessary; changes or trends in new technologies and industry standards; and the impact of COVID-19. Because of these fluctuations, it is likely that in some future quarters our operating results will fall below the expectations of securities analysts or investors. If that happens, the market price of our stock would likely decrease. Past fluctuations in our quarterly and annual operating results have resulted in decreases in our stock price. Such fluctuations also mean that investors may not be able to rely on our operating results in any particular period as an indication of future performance. Sales to existing customers and the establishment of a business relationship with other potential customers is a lengthy process, generally taking several months and sometimes longer. Following the establishment of the relationship, the negotiation of purchase terms can be time-consuming, and a potential customer may require an extended evaluation and testing period. In anticipation of product orders, we may incur substantial costs before the sales cycle is complete and before we receive any customer payments. As a result, in the event that a sale is not completed or is canceled or delayed, we may have incurred substantial expenses, making it more difficult for us to become profitable or otherwise negatively impacting our financial results. Furthermore, because of our lengthy sales cycle, the realization of revenue from our selling efforts may be substantially delayed, our ability to forecast our future revenue may be more limited and our revenue may fluctuate significantly from quarter to quarter.

Because some of our customers and suppliers are based in China, our business, financial condition and results of operations could be adversely affected by the political and economic tensions between the United States and China.

We are subject to risks associated with political conflicts between the U.S. and China. A significant portion of our revenue is generated from China. For example, for the fiscal years ended December 31, 2021, 2020 and 2019, Gene Company Limited, our primary distributor in China, accounted for approximately 13%, 14% and 17% of our total revenue, respectively. In addition, certain components, some of which are critical components, of our products are manufactured in China. These components are either sourced directly from companies in China or indirectly from third parties that source from companies in China.

The imposition of tariffs or other trade barriers between the U.S. and China, including the tariffs previously implemented and additional tariffs that have been proposed by the U.S. government on various imports from China and by the Chinese government on certain U.S. goods, the scope and duration of which, if implemented, remain uncertain. Beginning in September 2018, the U.S. Trade Representative (the "USTR") enacted various tariffs of 7.5%, 10%, 15% and 25% on the import of Chinese products, including non-U.S. components and materials that may be used in our products. These tariffs could raise our costs. Additionally, in November 2018, the U.S. Commerce Department's Bureau of Industry and Security ("BIS") released an advance notice of proposed rulemaking to control the export of emerging technologies. This notice included "[b]iotechnology, including nanobiology; synthetic biology; genomic and genetic engineering; or neurotech" as possible areas of increased export controls. Therefore, it is possible that our ability to export our products to China may be restricted in the future. China also has imposed tariffs on imports into China from the United States. Given the relatively fluid regulatory environment in China and the United States and uncertainty how the U.S. or foreign governments will act with respect to tariffs, international trade agreements and policies, there could be additional tax or other regulatory changes in the future. Any such changes could directly and adversely impact our financial results and results of operations.

Other risks could include:

- interruptions to operations in China as a result of the COVID-19 pandemic or other disease outbreaks and natural catastrophic events, which have in the past and can result in the future in business closures, transportation restrictions, import and export complications and cause shortages in the supply of raw materials or disruptions in manufacturing;
- product supply disruptions and increased costs as a result of heightened exposure to changes in the policies of the Chinese government, political unrest or unstable economic conditions in China; and
- the nationalization or other expropriation of private enterprises or intellectual property by the Chinese government.

Difficulties in this relationship may require us to take actions adverse to our business to comply with governmental restrictions on business and trade with China.

In addition, our consumable chips are partly manufactured by a company based in Taiwan. Accordingly, there is a risk that current political tensions between China and Taiwan may lead to circumstances that negatively affect the availability of such consumable chips to us, which could lead to an increase in our supply costs if we cannot find a similar cost alternative supplier, resulting in an adverse impact to our financial results and results of operations.

Seasonality may cause fluctuations in our revenue and results of operations.

We operate on a December 31st year-end and believe that there are significant seasonal factors which may cause sales of our products, and particularly our sequencing instruments, to vary on a quarterly or yearly basis, contribute to the lengthy sales cycle for our sequencing instruments, and increase the magnitude of quarterly or annual fluctuations in our operating results. We believe that this seasonality results from a number of factors, including the procurement and budgeting cycles of many of our customers, especially government-funded customers, which often coincide with government fiscal year ends. For example, the U.S. government's fiscal year-end occurs in our third quarter and may result in increased sales of our products during this quarter if government-funded customers have unused funds that may be forfeited, or future budgets that may be reduced if funds remain unspent at fiscal year-end. Furthermore, Lunar New Year celebrations, which occur during our first quarter, and may last for a week or longer, resulting in closure of many of our customers' offices in China and across the Asia-Pacific region have caused, and may in the future cause, decreased sales of our consumables during our first quarter. These factors have contributed, and may contribute in the future, to substantial fluctuations in our quarterly operating results. Because of these fluctuations, it is possible that in some quarters our operating results will fall below the expectations of securities analysts or investors. If that happens, the market price of our stock would likely decrease. These fluctuations, among other factors, also mean that our operating results in any particular period may not be relied upon as an indication of future performance. Seasonal or cyclical variations in our sales have in the past, and may in the future, become more or less pronounced over time, and have in the past materially affected, and may in the future materially affect, our business, financial condition, results of operations and prospects.

Our ability to use net operating losses to offset future taxable income may be subject to substantial limitations, and changes to U.S. tax laws may cause us to make adjustments to our financial statements.

Under Section 382 of the Internal Revenue Code, a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its pre-change net operating losses ("NOLs") to offset future taxable income. We believe that we have had one or more ownership changes, as a result of which our existing NOLs are currently subject to limitation. Future changes in our stock ownership could result in additional ownership changes under Section 382. We may not be able to utilize a material portion of our NOLs even if we attain profitability. Furthermore, the changes to deductions, credits and expense recognition resulting from the Tax Cuts and Jobs Act of 2018 enacted on December 22, 2017, have materially impacted the value of our deferred tax assets and liabilities, and could adversely affect our future taxable income and effective tax rate.

Our facilities in California are located near earthquake faults, and the occurrence of an earthquake or other catastrophic disaster could cause damage to our facilities and equipment, which could require us to cease or curtail operations.

Our facilities in the San Francisco Bay Area are located near earthquake fault zones and are vulnerable to damage from earthquakes. We are also vulnerable to damage from other types of disasters, including fire, floods, power loss, communications failures and similar events. If any disaster were to occur, our ability to operate our business at our facilities would be seriously, or potentially completely, impaired. In addition, the nature of our activities could cause significant delays in our research programs and commercial activities and make it difficult for us to recover from a disaster. The insurance we maintain may not be adequate to cover our losses resulting from disasters or other business interruptions. Accordingly, an earthquake or other disaster could materially and adversely harm our ability to conduct business.

Risks Related to Our Intellectual Property

Failure to secure patent or other intellectual property protection for our products and improvements to our products may reduce our ability to maintain any technological or competitive advantage over our current and potential competitors.

Our ability to protect and enforce our intellectual property rights is uncertain and depends on complex legal and factual questions. Our ability to establish or maintain a technological or competitive advantage over our competitors may be diminished because of these uncertainties. For example:

- we or our licensors might not have been the first to make the inventions covered by each of our pending patent applications or issued patents;
- we or our licensors might not have been the first to file patent applications for these inventions;
- it is possible that neither our pending patent applications nor the pending patent applications of our licensors will result in issued patents;
- the scope of the patent protection we or our licensors obtain may not be sufficiently broad to prevent others from practicing our technologies, developing competing products, designing around our patented technologies or independently developing similar or alternative technologies;
- our and our licensors' patent applications or patents have been, are and may in the future be, subject to interference, opposition or similar administrative proceedings, which could result in those patent applications failing to issue as patents, those patents being held invalid or the scope of those patents being substantially reduced;
- our enforcement of patents and proprietary rights in other countries may be problematic or unpredictable;
- we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions;
- we or our partners may not adequately protect our trade secrets;
- we may not develop additional proprietary technologies that are patentable; or
- the patents of others may limit our freedom to operate and prevent us from commercializing our technology in accordance with our plans.

The occurrence of any of these events could impair our ability to operate without infringing upon the proprietary rights of others or prevent us from establishing or maintaining a competitive advantage over our competitors.

Variability in intellectual property laws may adversely affect our intellectual property position.

Intellectual property laws, and patent laws and regulations in particular, have been subject to significant variability either through administrative or legislative changes to such laws or regulations or changes or differences in judicial interpretation, and it is expected that such variability will continue to occur. Additionally, intellectual property laws and regulations differ by country. Variations in the patent laws and regulations or in interpretations of patent laws and regulations in the United States and other countries may diminish the value of our intellectual property and may change the impact of third-party intellectual property on us. Accordingly, we cannot predict the scope of the patents that may be granted to us with certainty, the extent to which we will be able to enforce our patents against third parties or the extent to which third parties may be able to enforce their patents against us.

Some of the intellectual property that is important to our business is owned by other companies or institutions and licensed to us, and changes to the rights we have licensed may adversely impact our business.

We license from third parties some of the intellectual property that is important to our business. If the third parties who license intellectual property to us fail to maintain the intellectual property that we have licensed, or lose rights to that intellectual property, the rights we have licensed may be reduced or eliminated, which would eliminate barriers against our competition. Termination of these licenses or reduction or elimination of our licensed rights may result in our having to negotiate new or reinstated licenses with less favorable terms, or could subject us to claims of intellectual property

infringement or contract breach in litigation or other administrative proceedings that could result in damage awards against us and injunctions that could prohibit us from selling our products. In addition, some of our licenses from third parties limit the field in which we can use the licensed technology. Therefore, in order for us to use such licensed technology in potential future applications that are outside the licensed field of use, we may be required to negotiate new licenses with our licensors or expand our rights under our existing licenses. We cannot be certain that we will be able to obtain such licenses or expanded rights on reasonable terms or at all. In the event a dispute with our licensors were to occur, our licensors may seek to renegotiate the terms of our licenses, increase the royalty rates that we pay to obtain and maintain those licenses, limit the field or scope of the licenses, or terminate the license agreements. In addition, we have limited rights to participate in the prosecution and enforcement of the patents and patent applications that we have licensed. If we fail to meet our obligations under these licenses, or if we have a dispute regarding the terms of the licenses, these third parties could terminate the licenses, which could subject us to claims of intellectual property infringement. As a result, we cannot be certain that these patents and applications will be prosecuted and enforced in a manner consistent with the best interests of our business. Further, because of the rapid pace of technological change in our industry, we may need to rely on key technologies developed or licensed by third parties, and we may not be able to obtain licenses and technologies from these third parties at all or on reasonable terms. The occurrence of these events may have a material adverse effect on our business, financial condition or results of operations.

The measures that we use to protect the security of and enforce our intellectual property and other proprietary rights may not be adequate, which could result in the loss of legal protection for, and thereby diminish the value of, such intellectual property and other rights.

In addition to patents, we also rely upon trademarks, trade secrets, copyrights and unfair competition laws, as well as license agreements and other contractual provisions, to protect our intellectual property and other proprietary rights. Despite these measures, any of our intellectual property rights could be challenged, invalidated, circumvented or misappropriated. In addition, we attempt to protect our intellectual property and proprietary information by requiring our employees and consultants to enter into confidentiality and assignment of inventions agreements, and by entering into confidentiality agreements with our third-party development, manufacturing, sales and distribution partners, who may also acquire, develop and/or commercialize alternative or competing products or provide services to our competitors. For example, Roche had certain access to our trade secrets and other proprietary information pursuant to our agreement with them, subject to the confidentiality provisions thereof (certain of which provisions survive the termination of the agreement); however, Roche is developing potentially competing sequencing products. There can be no assurance that our measures have provided or will provide adequate protection for our intellectual property and proprietary information. These agreements may be breached, and we may not have adequate remedies for any such breach. In addition, our trade secrets and other proprietary information may be disclosed to others, or others may gain access to or disclose our trade secrets and other proprietary information. Enforcing a claim that a third party illegally obtained and is using our trade secrets is expensive and time consuming, and the outcome is unpredictable. Additionally, others may independently develop proprietary information and techniques that are substantially equivalent to ours. The occurrence of these events may have a material adverse effect on our business, financial condition or results of operations.

Our intellectual property may be subject to challenges in the United States or foreign jurisdictions that could adversely affect our intellectual property position.

Our pending, issued and granted U.S. and foreign patents and patent applications have been, are and may in the future be, subject to challenges by ONT Ltd., ONT Inc. and Metrichor, Ltd. (“Metrichor” and, together with ONT Ltd. and ONT Inc., “ONT”) in addition to other parties asserting prior invention by others or invalidity on various grounds, through proceedings, such as interferences, reexaminations or opposition proceedings. Addressing these challenges to our intellectual property has been, and any future challenges can be, costly and distract management’s attention and resources. For example, we previously incurred significant legal expenses to litigate and settle a complaint seeking review of a patent interference decision of the U.S. Patent and Trademark Office. Additionally, ONT previously requested that the U.S. Patent and Trademark Office institute *inter partes* reviews of certain patents that we have asserted against ONT Inc. and ONT Ltd. in litigation proceedings for patent infringement. While none of the *inter partes* reviews requested by ONT were instituted by the U.S. Patent and Trademark Office, challenges of this nature in the future could result in determinations that our patents or pending patent applications are unpatentable to us, or are invalidated or unenforceable in whole or in part and could require us to expend significant time, funds, and other resources in litigating such challenges. Accordingly, adverse rulings

in such proceedings could negatively impact the scope of our intellectual property protection for our products and technology, and could materially and adversely affect our business.

Some of our technology is subject to "march-in" rights by the U.S. government.

Some of our patented technology was developed with U.S. federal government funding. When new technologies are developed with U.S. government funding, the government obtains certain rights in any resulting patents, including a nonexclusive license authorizing the government to use the invention for non-commercial purposes. These rights may permit the government to disclose our confidential information to third parties and to exercise "march-in" rights to use or allow third parties to use our patented technology. The government can exercise its march-in rights if it determines that such action is necessary to (i) achieve practical application of the U.S. government-funded technology, (ii) alleviate health or safety needs, (iii) meet requirements of federal regulations, or (iv) give preference to U.S. industry. In addition, U.S. government-funded inventions must be reported to the government and such government funding must be disclosed in any resulting patent applications. Furthermore, our rights in such inventions are subject to government license rights and foreign manufacturing restrictions. The U.S. government has generally denied requests to exercise its march-in rights, even to provide access to potentially life-saving medications; however, if the U.S. government were to exercise its march-in rights to our patent technologies funded by the U.S. government, particularly for the benefit of one of more of our competitors, that may have a material adverse effect on our business.

We are involved in legal proceedings to enforce our intellectual property rights.

Our intellectual property rights involve complex factual, scientific and legal questions. We operate in an industry characterized by significant intellectual property litigation. Even though we may believe that we have a valid patent on a particular technology, other companies have from time to time taken, and may in the future take, actions that we believe violate our patent rights. For example, we are involved in legal proceedings for patent infringement and related matters in the United States with PGI, and we were previously involved in other legal proceedings with ONT and Harvard University in several United States and European jurisdictions. We have in the past received adverse rulings against us with respect to our complaint with the United States International Trade Commission for one of these proceedings. Legal actions to enforce our patent rights have been, and will continue to be, expensive, and may divert significant management time and resources. Adverse parties from previous legal actions have brought, and they and others may in the future bring, claims against us and/or our intellectual property. Litigation is a significant ongoing expense, recognized in sales, general and administrative expense, with an uncertain outcome, and has been, and may in the future be, a material expense for us. Our enforcement actions may not be successful, have given rise to legal claims against us and could result in some of our intellectual property rights being determined to be invalid or not enforceable. Furthermore, an adverse determination or judgement could lead to an award of damages against us, or the issuance of an injunction against us or our products that could prevent us from selling any products found to be infringing the intellectual property rights of another party.

We have been, are currently, and could in the future be, subject to legal proceedings with third parties who may claim that our products infringe or misappropriate their intellectual property rights.

Our products are based on complex, rapidly developing technologies. We may not be aware of issued or previously filed patent applications that belong to third parties that mature into issued patents that cover some aspect of our products or their use. In addition, because patent litigation is complex and the outcome inherently uncertain, our belief that our products do not infringe third-party patents of which we are aware or that such third-party patents are invalid and unenforceable may be determined to be incorrect. As a result, third parties have claimed, and may in the future claim, that we infringe their patent rights and have filed, and may in the future file lawsuits or engage in other proceedings against us to enforce their patent rights. For example, ONT Ltd. and Harvard University have, in the past, filed claims against us in the High Court of England and Wales and the District Court of Mannheim, Germany for patent infringement, and Personal Genomics of Taiwan, Inc. ("PGI") has filed claims against us in the U.S. District Court for the District of Delaware and in the Wuhan People's Court in China. We are aware of other issued patents and patent applications owned by third parties that could be construed to read on our products, and related maintenance and support services. Although we do not believe that our products or services infringe any valid issued patents, the third-party owners of these patents and applications may in the future claim that we infringe their patent rights and file lawsuits against us. In addition, as we enter new markets, our competitors and other third parties may claim that our products infringe their intellectual property rights as part of a business strategy to impede our successful entry into those markets. Furthermore, parties making claims against us may be able to obtain injunctive or other relief, which effectively could block our ability to further develop or commercialize products or services, and could result in the award of substantial damages against us. Patent litigation between competitors in our industry is common. Additionally, we have certain obligations to many of our customers and suppliers to indemnify and defend them against claims by third parties that our products or their use infringe any intellectual property of these third parties. In defending ourselves against any of these claims, we have in the past incurred, and could in the future incur, to defend ourselves or our customers, substantial costs, and the attention of our management and technical personnel could be diverted. For example, we previously incurred significant legal expenses to litigate and settle a complaint alleging patent infringement. Even if we have an agreement that indemnifies us against such costs, the indemnifying party may be unable to uphold its contractual obligations. To avoid or settle legal claims, it may be necessary or desirable in the future to obtain licenses relating to one or more products or relating to current or future technologies, which could negatively affect our gross margins. We may not be able to obtain these licenses on commercially reasonable terms, or at all. We may be unable to modify our products so that they do not infringe the intellectual property rights of third parties. In some situations, the results of litigation or settlement of claims may require us to cease allegedly infringing activities which could prevent us from selling some or all of our products. The occurrence of these events may have a material adverse effect on our business, financial condition or results of operations.

In addition, in the course of our business, we may from time to time have access or be alleged to have access to confidential or proprietary information of others, which, though not patented, may be protected as trade secrets. Others could bring claims against us asserting that we improperly used their confidential or proprietary information, or that we misappropriated their technologies and incorporated those technologies into our products. A determination that we illegally used the confidential or proprietary information or misappropriated technologies of others in our products could result in us paying substantial damage awards or being prevented from further developing or selling some or all of our products, which could materially and adversely affect our business.

We have not yet registered some of our trademarks in all of our potential markets, and failure to secure those registrations could adversely affect our business.

Some of our trademark applications may not be allowed for registration, and our registered trademarks may not be maintained or enforced. In addition, in the U.S. Patent and Trademark Office and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings.

Our use of "open source" software could adversely affect our ability to sell our products and subject us to possible litigation.

A portion of the products or technologies developed and/or distributed by us incorporate "open source" software, and we may incorporate open source software into other products or technologies in the future. Some open source software

licenses require that we disclose the source code for any modifications to such open source software that we make and distribute to one or more third parties, and that we license the source code for such modifications to third parties, including our competitors, at no cost. We monitor the use of open source software in our products to avoid uses in a manner that would require us to disclose or grant licenses under our source code that we wish to maintain as proprietary; however, there can be no assurance that such efforts have been or will be successful. In some circumstances, distribution of our software that includes or is linked with open source software could require that we disclose and license some or all of our proprietary source code in that software, which could include permitting the use of such software and source code at no cost to the user. Open source license terms are often ambiguous and there is little legal precedent governing the interpretation of these licenses. Successful claims made by the licensors of open source software that we have violated the terms of these licenses could result in unanticipated obligations, including being subject to significant damages, being enjoined from distributing products that incorporate open source software and being required to make available our proprietary source code pursuant to an open source license, which could substantially help our competitors develop products that are similar to or better than ours or otherwise materially and adversely affect our business.

Risks Related to Regulation

We are, and may become, subject to governmental regulations that may impose burdens on our operations, and the markets for our products may be narrowed.

We are subject, both directly and indirectly, to the adverse impact of government regulation of our operations and markets. For example, export of our instruments may be subject to strict regulatory control in a number of jurisdictions. We have expanded and are continuing to expand the international jurisdictions into which we supply products, which increase the risks surrounding governmental regulations relating to our business. The failure to satisfy export control criteria or to obtain necessary clearances could delay or prevent shipment of products, which could materially and adversely affect our revenue and profitability. Moreover, the life sciences industry, which is expected to continue to be one of the primary markets for our technology, has historically been heavily regulated. There are, for example, laws in several jurisdictions restricting research in genetic engineering, which may narrow our markets. Given the evolving nature of this industry, legislative bodies or regulatory authorities may adopt additional regulations that may adversely affect our market opportunities. Additionally, if ethical and other concerns surrounding the use of genetic information, diagnostics or therapies become widespread, there may be less demand for our products.

Our business is also directly affected by a wide variety of government regulations applicable to business enterprises generally and to companies operating in the life science industry in particular. Failure to comply with government regulations or obtain or maintain necessary permits and licenses could result in a variety of fines or other censures or an interruption in our business operations which may have a negative impact on our ability to generate revenue and the cost of operating our business. In addition, changes to laws and government regulations could cause a material adverse effect on our business as we will need to adapt our business to comply with such changes. For example, a governmental prohibition on the use of human *in vitro* diagnostics or other regulations that negatively impact the research and development activities of our customers would adversely impact our commercialization of products on which we have expended significant research and development resources, which would in turn have a material adverse impact on our business and prospects.

Our products could become subject to government regulation as medical devices by the U.S. Food and Drug Administration or other domestic and international regulatory agencies even if we do not elect to seek regulatory clearance or approval to market our products for diagnostic purposes, which could increase our costs and impede or delay our commercialization efforts, thereby materially and adversely affecting our business and results of operations.

Our products are currently labeled and promoted as research use only ("RUO") products, and are not currently designed, or intended to be used, for clinical diagnostic tests or as medical devices. However, in the future, certain of our products or related applications, such as those that may be developed for clinical uses, could be subject regulation by the U.S. Food and Drug Administration ("FDA"), or the FDA's regulatory jurisdiction could be expanded to include our products. Also, even if our products are labeled, promoted, and intended as RUO, the FDA or comparable agencies of other countries could disagree with our conclusion that our products are intended for research use only or deem our sales, marketing and promotional efforts as being inconsistent with the FDA's guidance on RUO products. For example, our customers may independently elect to use our RUO labeled products in their own laboratory developed tests ("LDTs") for clinical diagnostic use, which could subject our products to government regulation, and the regulatory clearance or approval and maintenance process for such products may be uncertain, expensive, and time-consuming. Regulatory requirements related to marketing, selling, and distribution of RUO products could change or be uncertain, even if clinical uses of our RUO products by our customers were done without our consent. If the FDA or other regulatory authorities assert that any of our RUO products are subject to regulatory clearance or approval, our business, financial condition, or results of operations could be adversely affected. In the event that we fail to obtain and maintain necessary regulatory clearances or approvals for products that we develop for clinical uses, or if clearances or approvals for future products and indications are delayed or not issued, our commercial operations may be materially harmed. Furthermore, even if we are granted regulatory clearances or approvals, they may include significant limitations on the indicated uses for the product, which may limit the market for the product. We do not have experience in obtaining FDA approvals and no assurance can be given that we will be able to obtain or to maintain such approvals. Furthermore, any approvals that we may obtain can be revoked if safety or efficacy problems develop.

The FDA has historically exercised enforcement discretion in not enforcing the medical device regulations against laboratories developing and 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 manufacturers of products used for LDTs, but would seek further public discussion on an appropriate oversight approach, and give Congress an opportunity to develop a legislative solution. More recently, the FDA has issued warning letters to certain genomics labs for illegally marketing genetic tests that claim to predict patients' responses to specific medications, noting that the FDA has not created a legal "carve-out" for LDTs and retains discretion to take action when appropriate, such as when certain genomic tests raise significant public health concerns.

As manufacturers develop more complex diagnostic tests and diagnostic software, the FDA may increase its regulation of LDTs. Any future legislative or administrative rule making or oversight of LDTs, 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. Changes to the current regulatory framework, including the imposition of additional or new regulations, including regulation of our products, could arise at any time during the development or marketing of our products, which may negatively affect our ability to obtain or maintain FDA or comparable regulatory approval of our products, if required. Further, sales of devices for diagnostic purposes may subject us to additional healthcare regulation and enforcement by the applicable government agencies. Such laws include, without limitation, state and federal anti-kickback or anti-referral laws, healthcare fraud and abuse laws, false claims laws, privacy and security laws, Physician Payments Sunshine Act and related transparency and manufacturer reporting laws, and other laws and regulations applicable to medical device manufacturers.

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.

As part of the Trump Administration's efforts to combat COVID-19 and consistent with Executive Orders 13771 and 13924, the Department of Health and Human Services ("HHS") announced rescission of guidance and other informal issuances of the FDA regarding premarket review of LDT absent notice-and-comment rulemaking, stating that, absent notice-and-comment rulemaking, those seeking approval or clearance of, or an emergency use authorization ("EUA"), for an LDT may nonetheless voluntarily submit a premarket approval application ("PMA"), premarket notification or an Emergency Use Authorization request, respectively, but are not required to do so. However, laboratories opting to use LDTs without FDA premarket review or authorization would not be eligible for liability protection under the Public Readiness and Emergency Preparedness Act. In November 2021, HHS under the Biden Administration issued a statement that withdrew the 2020 policy announcement issued under the Trump Administration, stating that HHS does not have a policy on LDTs that is separate from FDA's longstanding approach. The FDA also issued a revised version of its COVID-19 test policy that states the FDA expects newly offered COVID-19 tests, including LDTs, to have an EUA, or traditional marketing authorization such as a granted De Novo or cleared 510(k), prior to clinical use.

Further, in June 2021, Congress introduced an updated legislation called the Verifying Accurate, Leading-edge IVCT Development Act (VALID Act), which, if enacted, will establish a new risk-based regulatory framework for in vitro clinical tests (IVCTs), which include IVDs, LDTs, collection devices, and instruments used with such tests, and a technology certification program, among other proposals. The adoption of new restrictions on IVDs, LDTs, or RUOs, whether by the FDA or Congress, could adversely affect our ability to commercialize our products and the demand for our specialized reagents

and instruments. Further, we could be required to obtain premarket clearance or approval from the FDA before we can sell our products to certain customers.

If the FDA 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 decision-making 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, the FDA could consider our products to be misbranded or adulterated under the Federal Food, Drug, and Cosmetic Act and subject to recall and/or other enforcement action.

To the extent we elect to label and promote any of our products as medical devices, we would be required to obtain prior approval or clearance by the FDA or comparable foreign regulatory authority, which could take significant time and expense and could fail to result in a marketing authorization for the intended uses we believe are commercially attractive. Obtaining marketing authorization in one jurisdiction does not mean that we will be successful in obtaining marketing authorization in other jurisdictions where we conduct business.

If we elect 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. 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 PMA 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 for which we choose to market as a medical device or a clinical diagnostic device. Even if we were to seek and obtain regulatory approval or clearance, it may not be for the intended uses we request or that we believe are important or commercially attractive. There can be no assurance that future products for which we may seek premarket clearance or approval will be approved or cleared by FDA or a comparable foreign regulatory authority on a timely basis, if at all, nor can there be assurance that labeling claims will be consistent with our anticipated claims or adequate to support continued adoption of such products. Compliance with FDA or comparable foreign regulatory authority regulations will require substantial costs, and subject us to heightened scrutiny by regulators and substantial penalties for failure to comply with such requirements or the inability to market our products. The lengthy and unpredictable premarket clearance or approval process, as well as the unpredictability of the results of any required clinical studies, may result in our failing to obtain regulatory clearance or approval to market such products, which would significantly harm our business, results of operations, reputation, and prospects.

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 material 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.

Further, if we decide to seek regulatory clearance or approval for certain of our products in countries outside of the United States or if a foreign regulatory authority determines that our products are regulated as medical devices, we would be subject to extensive medical device laws and regulations 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. In Europe, we would need to comply with the new Medical Device Regulation 2017/745 and In Vitro Diagnostic Regulation 2017/746, which became effective May 26, 2017, with application dates of May 26, 2021 (postponed from 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. The number and scope of these requirements are increasing. Unlike many of the other companies offering nucleic acid sequencing equipment or consumables, this is an area where we do not have expertise. We, or our other third-party sales and distribution partners, may not be able to obtain regulatory approvals in such countries or may incur significant costs in obtaining or maintaining our foreign regulatory approvals. In addition, the export by us of certain of our products, which have not yet been cleared for domestic commercial distribution, may be subject to FDA or other export restrictions. 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. Any action brought against us for violations of these laws or regulations, even if successfully defended, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business.

Enhanced trade tariffs, import restrictions, export restrictions, Chinese regulations or other trade barriers may materially harm our business.

We are continuing to expand our international operations as part of our growth strategy and have experienced an increasing concentration of sales in certain regions outside the United States, especially the Asia-Pacific region. There is currently significant uncertainty about the future relationship between the United States and various other countries, most significantly China, with respect to trade policies, treaties, government regulations and tariffs. Starting in September 2018, the U.S. Trade Representative (the "USTR") enacted various tariffs of 7.5%, 10%, 15% and 25% on the import of Chinese products, including non-U.S. components and materials that may be used in our products. Additionally, China also has imposed tariffs on imports into China from the United States. These tariffs could raise our costs. Furthermore, tariffs, trade restrictions, or trade barriers that have been, and may in the future be, placed on products such as ours by foreign governments, especially China, have raised, and could further raise, amounts paid for some or all of our products, which may result in the loss of customers and our business, and our financial condition and results of operations may be harmed. Further tariffs may be imposed that could cover imports of components and materials used in our products, or our business may be adversely impacted by retaliatory trade measures taken by China or other countries, including restricted access to components or materials used in our products or increased amounts that must be paid for our products, which could materially harm our business, financial condition and results of operations. Further, the continued threats of tariffs, trade restrictions and trade barriers could have a generally disruptive impact on the global economy and, therefore, negatively impact our sales. Given the relatively fluid regulatory environment in China and the United States and uncertainty how the U.S. or foreign governments will act with respect to tariffs, international trade agreements and policies, there could be additional tax or other regulatory changes in the future. Any such changes could directly and adversely impact our financial results and results of operations.

Additionally, in November 2018, the U.S. Commerce Department's Bureau of Industry and Security ("BIS") released an advance notice of proposed rulemaking to control the export of emerging technologies. This notice included "[b]iotechnology, including nanobiology; synthetic biology; genomic and genetic engineering; or neurotech" as possible areas of increased export controls. BIS has implemented export controls on some items described in this notice, and we understand that BIS plans to continue to issue controls on additional emerging technologies. Therefore, it is possible that our ability to export our products may be restricted in the future, most notably China.

Our international business could expose us to business, regulatory, political, operational, financial, and economic risks associated with doing business outside of the United States.

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 ("GDPR") and other data privacy requirements, labor and employment regulations, anti-competition regulations, the U.K. Bribery Act of 2010 and other anti-corruption laws, regulations relating to the use of certain hazardous substances or chemicals in commercial products, 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;
- foreign currency exchange, 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, research and development, and investment both domestically as well as in the other countries and jurisdictions in which we operate and into which we may sell our products including as a result of 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, maintaining, enforcing or procuring intellectual property rights and defending against intellectual property claims under the law and judicial systems of other countries.

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

Our operations involve the use of hazardous materials, and we must comply with environmental, health and safety laws, which can be expensive and may adversely affect our business, operating results and financial condition.

Our research and development and manufacturing activities involve the use of hazardous materials, including chemicals and biological materials, and some of our products include hazardous materials. Accordingly, we are subject to federal, state, local and foreign laws, regulations and permits relating to environmental, health and safety matters, including, among others, those governing the use, storage, handling, exposure to and disposal of hazardous materials and wastes, the health and safety of our employees, and the shipment, labeling, collection, recycling, treatment and disposal of products containing hazardous materials. Liability under environmental laws and regulations can be joint and several and without regard to fault or negligence. For example, under certain circumstances and under certain environmental laws, we could be held liable for costs relating to contamination at our or our predecessors' past or present facilities and at third-party waste disposal sites. We could also be held liable for damages arising out of human exposure to hazardous materials. There can be no assurance that violations of environmental, health and safety laws will not occur as a result of human error, accident, equipment failure or other causes. The failure to comply with past, present or future laws could result in the imposition of substantial fines and penalties, remediation costs, property damage and personal injury claims, investigations, the suspension of production or product sales, loss of permits or a cessation of operations. Any of these events could harm our business, operating results and financial condition. We also expect that our operations will be affected by new environmental, health and safety laws and regulations on an ongoing basis, or more stringent enforcement of existing laws and regulations. New laws or changes to existing laws may result in additional costs and may increase penalties associated with violations or require us to change the content of our products or how we manufacture them, which could have a material adverse effect on our business, operating results and financial condition.

Ethical, legal, privacy, data protection and social concerns or governmental restrictions surrounding the use of genetic information could reduce demand for our technology.

Our products may be used to provide genetic information about humans, agricultural crops and other living organisms. The information obtained from our products could be used in a variety of applications which may have underlying ethical, legal, privacy, data protection and social concerns, including the genetic engineering or modification of agricultural products or testing for genetic predisposition for certain medical conditions. Governmental authorities could, for safety, social or other purposes, call for limits on or regulation of the use of genetic testing, and may consider or adopt such regulations or other restrictions. Such concerns or governmental restrictions could limit the use of our products or be costly and burdensome to comply with, and actual or perceived violations of any such restrictions may lead to the imposition of substantial fines and penalties, remediation costs, claims and litigation, regulatory investigations and proceedings, and other liability, and of which could have a material adverse effect on our business, financial condition and results of operations.

Regulations related to conflict minerals has caused us to incur, and will continue to cause us to incur, additional expenses and could limit the supply and increase the costs of certain materials used in the manufacture of our products.

We are subject to requirements under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 that require us to conduct diligence and report on whether or not our products contain conflict minerals. The implementation of these requirements could adversely affect the sourcing, availability and pricing of the materials used in the manufacture of components used in our products. Furthermore, the complex nature of our products requires components and materials that may be available only from a limited number of sources and, in some cases, from only a single source. We have incurred, and will continue to incur, additional costs to comply with the disclosure requirements, including costs related to conducting diligence procedures to determine the sources of conflict minerals that may be used or necessary to the production of our products and, if applicable, potential changes to components, processes or sources of supply as a consequence of such verification activities. We may face reputational harm if we determine that certain of our products contain minerals that are not determined to be conflict free or if we are unable to alter our processes or sources of supply to avoid using such materials. In such circumstances, the reputational harm could materially and adversely affect our business, financial condition or results of operations.

Risks Related to Owning Our Common Stock

The price of our common stock has been, is, and may continue to be, highly volatile, and you may be unable to sell your shares at or above the price you paid to acquire them.

The market price of our common stock is highly volatile, and we expect it to continue to be volatile for the foreseeable future in response to many risk factors listed in this section, and others beyond our control, including:

- actual or anticipated fluctuations in our financial condition and operating results;
- announcements of new products, technological innovations or strategic partnerships by us or our competitors;
- announcements by us, our customers, partners or suppliers relating directly or indirectly to our products, services or technologies;
- overall conditions in our industry and market;
- addition or loss of significant customers;
- changes in laws or regulations applicable to our products;
- actual or anticipated changes in our growth rate relative to our competitors;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, capital commitments or achievement of significant milestones;
- additions or departures of key personnel;
- competition from existing products or new products that may emerge;
- issuance of new or updated research or reports by securities analysts;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- disputes or other developments related to proprietary rights, including patents, litigation matters or our ability to obtain intellectual property protection for our technologies;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us or our stockholders;
- stock price and volume fluctuations attributable to inconsistent trading volume levels of our shares;
- reports, guidance and ratings issued by securities or industry analysts;
- operating results below the expectations of securities analysts or investors; and
- general economic and market conditions, which could be impacted by various events including COVID-19 or interest rate fluctuations.

If any of the forgoing occurs, it would cause our stock price or trading volume to decline. Stock markets in general and the market for companies in our industry in particular have experienced price and volume fluctuations, which have been exacerbated by the COVID-19 pandemic, that have affected and continue to affect the market prices of equity securities of many companies. These fluctuations often have been unrelated or disproportionate to the operating performance of those companies. These broad market and industry fluctuations, as well as general economic, political and market conditions such as recessions, interest rate changes or international currency fluctuations, may negatively impact the market price of our common stock. You may not realize any return on your investment in us and may lose some or all of your investment. In the past, companies that have experienced volatility in the market price of their stock have been subject to securities class action litigation. We have been a party to this type of litigation in the past and may be the target of this type of litigation again in the future. Securities litigation against us could result in substantial costs and divert our management's attention from other business concerns, which could seriously harm our business.

Sales of substantial amounts of our common stock in the public markets, or the perception that such sales might occur, could reduce the market price that our common stock might otherwise attain and may dilute your voting power and your ownership interest in us.

Sales of a substantial number of shares of our common stock in the public market, or the perception that such sales could occur, could adversely affect the market price of our common stock and may make it more difficult for existing stockholders to sell their common stock at a time and price that they deem appropriate and may dilute their voting power and ownership interest in us.

In addition, if our existing stockholders sell, or indicate an intent to sell, a large number of shares of our common stock in the public market, it could cause our stock price to fall. We may also issue shares of common stock or securities convertible into our common stock in connection with a financing, acquisition, our equity incentive plans, or otherwise. Any such issuances would result in dilution to our existing stockholders and the market price of our common stock may be adversely affected.

On September 20, 2021, in connection with the closing of the Omniome Merger, we completed a Private Placement for the sale of an aggregate of 11,214,953 shares of our common stock, at a price of $26.75 per share, for aggregate gross proceeds of approximately $300 million. In connection with the Private Placement, we entered into a Registration Rights Agreement with the Private Placement investors, providing them, among other things, certain registration rights, including our obligation to register the Private Placement shares for resale within 30 days following the closing of the Private Placement.

Concentration of ownership by our principal stockholders may result in control by such stockholders of the composition of our board of directors.

Our existing principal stockholders, executive officers, directors and their affiliates beneficially own a significant number of our outstanding shares of common stock. In addition, such parties may acquire additional control by purchasing stock that we issue in connection with our future fundraising efforts. Also, SB Northstar LP, a subsidiary of SoftBank Group Corp., purchased $900 million in aggregate principal amount of our 1.50% Convertible Senior Notes due 2028, convertible at the option of the holders at any time into shares of our common stock based on an initial conversion rate of 22.9885 shares of common stock per $1,000 principal amount of the Notes (which is equal to an initial conversion price of $43.50 per share). In addition, on September 20, 2021 in connection with the closing of the Omniome Merger, we completed a Private Placement for the sale of an aggregate of 11,214,953 shares of our common stock, at a price of $26.75 per share, for aggregate gross proceeds of approximately $300 million with certain qualified institutional buyers and institutional accredited investors, including approximately $60 million to SB Northstar LP. As a result, these current and future stockholders may now and in the future be able to exercise a significant level of control over all matters requiring stockholder approval, including the election of directors. This control could have the effect of delaying or preventing a change of control of our company or changes in management and will make the approval of certain transactions difficult or impossible without the support of these stockholders.

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, as amended and restated, may have the effect of delaying or preventing a change of control or changes in our management. Our amended and restated certificate of incorporation and bylaws include provisions that:

- authorize our board of directors to issue, without further action by the stockholders, up to 50,000,000 shares of undesignated preferred stock and up to approximately 1,000,000,000 shares of authorized but unissued shares of common 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 terms;
- provide that our directors may be removed only for cause; and
- 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.

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. Furthermore, our amended and restated bylaws provide that unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for: (i) any derivative action or proceeding brought on our behalf; (ii) any action asserting a breach of fiduciary duty owed by any of our current or former directors, officers or other employees to us or our stockholders; (iii) any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law; (iv) any action to interpret, apply, enforce or determine the validity of our amended and restated certificate of incorporation or our amended and restated bylaws; or (v) any action asserting a claim against us that is governed by the internal affairs doctrine, subject to the court having personal jurisdiction over the indispensable parties named as defendants therein. This provision is not intended to apply to actions arising under the Securities Act or the Exchange Act, or any claim for which the federal courts have exclusive jurisdiction. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and consented to this provision. This exclusive-forum provision may discourage lawsuits against us or our directors, officers, and employees. 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.

Our large number of authorized but unissued shares of common stock may potentially dilute existing stockholders' stockholdings.

We have a significant number of authorized but unissued shares of common stock. Our board of directors may issue shares of common stock from this authorized but unissued pool from time to time without stockholder approval, resulting in the dilution of our existing stockholders.

We do not intend to pay dividends for the foreseeable future.

We have never declared or paid any dividends on our common stock and do not intend to pay any dividends in the foreseeable future. We anticipate that we will retain all of our future earnings for use in the operation of our business and for general corporate purposes. Any determination to pay dividends in the future will be at the discretion of our board of directors. Accordingly, investors must rely on sales of their common stock after price appreciation, which may never occur, as the only way to realize any future gains on their investments.

Risks Related to Our Notes

We may not have the ability to raise the funds necessary to settle conversions of the Notes in cash or to repurchase the Notes upon a fundamental change, and our future debt may contain limitations on our ability to pay cash upon conversion or repurchase of the Notes.

In February 2021, we issued $900.0 million in aggregate principal amount of 1.50% Convertible Senior Notes due 2028, which we refer to as the Notes, The Notes will mature on February 15, 2028, subject to earlier conversion, redemption or repurchase, including upon a fundamental change. Holders of the Notes will have the right to require us to repurchase all or a portion of their Notes upon the occurrence of a fundamental change before the maturity date at a repurchase price equal to 100% of the principal amount of the Notes to be repurchased, plus unpaid interest to, but excluding, the maturity date. In addition, upon conversion of the Notes, unless we elect to deliver solely shares of our common stock to settle such conversion (other than paying cash in lieu of delivering any fractional share), we will be required to settle a portion or all of our conversion obligation in cash in respect of the Notes being converted. Moreover, we will be required to repay the Notes in cash at their maturity unless earlier converted, redeemed or repurchased. However, we may not have enough available cash or be able to obtain financing at the time we are required to make repurchases of Notes surrendered therefor or pay cash with respect to Notes being converted or at their maturity.

In addition, our ability to repurchase Notes or to pay cash upon conversions of Notes or at their maturity may be limited by law, regulatory authority or agreements governing our future indebtedness. Our failure to repurchase Notes at a time when the repurchase is required by the indenture or to pay cash upon conversions of Notes or at their maturity as 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. Moreover, the occurrence of a fundamental change under the indenture could constitute an event of default under any such agreement. If the payment 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 or to pay cash amounts due upon conversion, upon required repurchase or at maturity of the Notes.

If the Notes are converted, it may adversely affect our financial condition and operating results.

Holders of the Notes are entitled to convert their Notes at any time at their option. If one or more holders elect to convert their Notes, unless we elect to satisfy our conversion obligation by delivering solely shares of our common stock (other than paying cash in lieu of delivering any fractional share), we would be required to settle a portion or all of our conversion obligation in cash, which could adversely affect our liquidity.

General Risk Factors

Unfavorable global economic or political conditions could adversely affect our business, financial condition or results of operations.

General conditions in the global economy and in the global financial markets could adversely affect our results of operations, including the potential effects from the COVID-19 pandemic as discussed above, and the overall demand for nucleic acid sequencing products may be particularly vulnerable to unfavorable economic conditions. A global financial crisis, inflation or a global or regional political disruption could cause extreme volatility in the capital and credit markets. A severe or prolonged economic downturn or political disruption could result in a variety of risks to our business, including weakened demand for our products and our ability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy or political disruption could also strain our manufacturers or suppliers, possibly resulting in supply disruption, or cause our customers to delay making payments for our product and services. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the political or economic climate and financial market conditions could adversely impact our business.

Delivery of our products could be delayed or disrupted by factors beyond our control, and we could lose customers as a result.

We rely on third-party carriers for the timely delivery of our products. As a result, we are subject to carrier disruptions and increased costs that are beyond our control. Any failure to deliver products to our customers in a safe and timely manner may damage our reputation and brand and could cause us to lose customers. If our relationship with any of these third-party carriers is terminated or impaired or if any of these carriers are unable to deliver our products, the delivery and acceptance of our products by our customers may be delayed, which could harm our business and financial results. The failure to deliver our products in a safe and timely manner may harm our relationship with our customers, increase our costs and otherwise disrupt our operations.

Doing business internationally creates operational and financial risks for our business.

We currently conduct operations in various countries and jurisdictions, and continue to expand to new international jurisdictions as part of our growth strategy and have experienced an increasing concentration of sales in certain regions outside the U.S. We sell directly and through distribution partners throughout Europe, the Asia-Pacific region, Mexico, Brazil, and South Africa and have a significant portion of our sales and customer support personnel in Europe and the Asia-Pacific region. As a result, we or our distribution partners may be subject to additional regulations and increased diversion of management time and efforts. Conducting and launching operations on an international scale requires close coordination of activities across multiple jurisdictions and time zones and consumes significant management resources. If we fail to coordinate and manage these activities effectively, our business, financial condition or results of operations could be materially and adversely affected and failure to comply with laws and regulations applicable to business operations in foreign jurisdictions may also subject us to significant liabilities and other penalties. International operations entail a variety of other risks, including, without limitation:

- limits to travel as a result of the COVID-19 pandemic;
- challenges in staffing and managing foreign operations;
- potentially longer sales cycles and more time required to engage and educate customers on the benefits of our platform outside of the United States;
- the potential need for localized software and documentation;
- reduced protection for intellectual property rights in some countries and practical difficulties of enforcing intellectual property and contract rights abroad;
- defending against intellectual property claims in other countries;
- restriction on cross-border investment, including enhanced oversight by the Committee on Foreign Investment in the United States (“CFIUS”) and substantial restrictions on investment from China;
- U.S. and foreign government trade restrictions, including those which may impose restrictions on the importation, exportation, re-exportation, sale, shipment or other transfer of programming, technology, components, and/or services to foreign persons;

- changes in diplomatic and trade relationships, including new tariffs, trade protection measures, import or export licensing requirements, trade embargoes, sanctions and other trade barriers;
- tariffs imposed by the U.S. on goods from other countries and tariffs imposed by other countries on U.S. goods, including the tariffs by the U.S. government on various imports from China, Canada, Mexico and the EU and by the governments of these jurisdictions on certain U.S. goods, and any other possible tariffs that may be imposed on products such as ours, the scope and duration of which, if implemented, remains uncertain;
- deterioration of political relations between the U.S. and China, Canada, Russia, the United Kingdom ("U.K.") and the European Union ("EU"), which could have a material adverse effect on our sales and operations in these countries;
- changes in social, political and economic 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 into which we sell our products, including as a result of the withdrawal of the U.K. from the EU;
- difficulties in obtaining export licenses or in overcoming other trade barriers and restrictions resulting in delivery delays;
- fluctuations in currency exchange rates and the related effect on our results of operations;
- increased financial accounting and reporting burdens and complexities;
- disruptions to global trade due to disease outbreaks or conflicts;
- potential increases on tariffs or restrictions on trade generally; and
- significant taxes or other burdens of complying with a variety of foreign laws and regulations, including laws and regulations relating to privacy and data protection such as the EU General Data Protection Regulation which took effect in the EU in 2018.

In conducting our international operations, we are subject to U.S. laws relating to our international activities, such as the Foreign Corrupt Practices Act of 1977, as well as foreign laws relating to our activities in other countries, such as the United Kingdom Bribery Act of 2010. Additionally, the inclusion of one of our foreign customers on any U.S. Government sanctioned persons list, including but not limited to the U.S. Department of Commerce's List of Denied Persons and the U.S. Department of Treasury's List of Specially Designated Nationals and Blocked Persons List, could be material to our earnings. Failure to comply with these laws may subject us to claims or financial and/or other penalties in the United States and/or foreign countries that could materially and adversely impact our operations or financial condition. These risks have become increasingly prevalent as we have expanded our sales into countries that are generally recognized as having a higher risk of corruption.

We face risks related to the current global economic environment, which could delay or prevent our customers from purchasing our products, which could in turn harm our business, financial condition and results of operations. The state of the global economy continues to be uncertain. The current global economic conditions and uncertain credit markets and concerns regarding the availability of credit pose a risk that could impact customer demand for our products, as well as our ability to manage normal commercial relationships with our customers, suppliers and creditors, including financial institutions. If the current global economic environment deteriorates, our business could be negatively affected.

Moreover, changes in the value of the relevant currencies may affect the cost of certain items required in our operations. Changes in currency exchange rates may also affect the relative prices at which we are able sell products in the same market. Our revenue from international customers may be negatively impacted as increases in the U.S. dollar relative to our international customers' local currencies could make our products more expensive, impacting our ability to compete or as a result of financial or other instability in such locations which could result in decreased sales of our products. Our costs of materials from international suppliers may also increase as the value of the U.S. dollar decreases relative to their local currency. Foreign policies and actions regarding currency valuation could result in actions by the United States and other countries to offset the effects of such fluctuations. Such actions may materially and adversely impact our financial condition and results of operations.

Violations of complex foreign and U.S. laws and regulations could result in fines and penalties, criminal sanctions against us, our officers, or our employees, prohibitions on the conduct of our business and on our ability to offer our products and services in one or more countries, and could also materially affect our brand, our international growth efforts, our ability to attract and retain employees, our business, and our operating results. Even if we implement policies or procedures designed to ensure compliance with these laws and regulations, there can be no assurance that our distribution partners, our employees, contractors, or agents will not violate our policies and subject us to potential claims or penalties.

If we fail to maintain proper and effective internal controls, our ability to produce accurate financial statements on a timely basis could be impaired, which would adversely affect our business and our stock price.

Ensuring that we have adequate internal financial and accounting controls and procedures in place to produce accurate financial statements on a timely basis is a costly and time-consuming effort that needs to be evaluated frequently. We may in the future discover areas of our internal financial and accounting controls and procedures that need improvement. Operating as a public company requires sufficient resources within the accounting and finance functions in order to produce timely financial information, ensure the level of segregation of duties, and maintain adequate internal control over financial reporting customary for a U.S. public company.

Our management is responsible for establishing and maintaining adequate internal control over financial reporting to provide reasonable assurance regarding the reliability of our financial reporting and the preparation of financial statements for external purposes in accordance with U.S. GAAP. Our management does not expect that our internal control over financial reporting will prevent or detect all errors and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud, if any, within our company will have been detected.

Pursuant to Section 404 of the Sarbanes-Oxley Act, we perform periodic evaluations of our internal control over financial reporting. While we have in the past performed this evaluation and concluded that our internal control over financial reporting was operating effectively, there can be no assurance that in the future material weaknesses or significant deficiencies will not exist or otherwise be discovered. In addition, if we are unable to produce accurate financial statements on a timely basis, investors could lose confidence in the reliability of our financial statements, which could cause the market price of our common stock to decline and make it more difficult for us to finance our operations and growth.

Our business could be negatively impacted by changes in the United States political environment.

There is significant ongoing uncertainty with respect to potential legislation, regulation and government policy at the federal level, as well as the state and local levels. Any such changes could significantly impact our business as well as the markets in which we compete. Specific legislative and regulatory proposals discussed during election campaigns and more recently that might materially impact us include, but are not limited to, changes to spending priorities and potential reductions in research funding. Uncertainty about U.S. government funding has posed, and may continue to pose, a risk as customers may choose to postpone or reduce spending in response to actual or anticipated restraints on funding. To the extent changes in the political environment have a negative impact on us or on our markets, our business, results of operation and financial condition could be materially and adversely impacted in the future

Disruption of critical information technology systems or material breaches in the security of our systems could harm our business, customer relations and financial condition.

Information technology ("IT") helps us to operate efficiently, interface with customers, maintain financial accuracy and efficiently and accurately produce our financial statements. IT systems are used extensively in virtually all aspects of our business, including sales forecast, order fulfillment and billing, customer service, logistics, and management of data from running samples on our products. Our success depends, in part, on the continued and uninterrupted performance of our IT systems. IT systems may be vulnerable to damage from a variety of sources, including telecommunications or network failures, power loss, natural disasters, human acts, computer viruses, ransomware, computer denial-of-service attacks, unauthorized access to customer or employee data or company trade secrets, and other attempts to harm our systems. Certain of our systems are not redundant, and our disaster recovery planning is not sufficient for every eventuality. Despite

any precautions we may take, such problems could result in, among other consequences, disruption of our operations, which could harm our reputation and financial results.

If we do not allocate and effectively manage the resources necessary to build and sustain the proper IT infrastructure, we could be subject to transaction errors, processing inefficiencies, loss of customers, business disruptions or loss of or damage to intellectual property through security breach. If our data management systems do not effectively collect, store, process and report relevant data for the operation of our business, whether due to equipment malfunction or constraints, software deficiencies or human error, our ability to effectively plan, forecast and execute our business plan and comply with applicable laws and regulations will be impaired, perhaps materially. Any such impairment could materially and adversely affect our reputation, financial condition, results of operations, cash flows and the timeliness with which we report our internal and external operating results.

Security breaches and other disruptions could compromise our information and expose us to liability, which would cause our business and reputation to suffer.

In the ordinary course of our business, we collect and store sensitive data, including intellectual property, our proprietary business information and that of our customers, suppliers and business partners, and personally identifiable information of our customers and employees, in our data centers and on our networks. The secure processing, maintenance and transmission of this information is critical to our operations. Despite our security measures, our IT infrastructure may be vulnerable to attacks by hackers, computer viruses, malicious codes, ransomware, unauthorized access attempts, and cyber- or phishing-attacks, or breached or otherwise disrupted due to employee error, malfeasance, faulty password management or other disruptions. Third parties may attempt to fraudulently induce employees or other persons into disclosing usernames, passwords or other sensitive information, which may in turn be used to access our IT systems, commit identity theft or carry out other unauthorized or illegal activities. Any such breach could compromise our networks and the information stored there could be accessed, publicly disclosed, lost or stolen. We engage third-party vendors and service providers to store and otherwise process some of our data, including sensitive and personal information. Our vendors and service providers may also be the targets of the risks described above, including cyberattacks, malicious software, ransomware, phishing schemes, and fraud. Our ability to monitor our vendors and service providers' data security is limited, and, in any event, third parties may be able to circumvent those security measures, resulting in the unauthorized access to, misuse, disclosure, loss or destruction of our data, including sensitive and personal information, and disruption of our or third-party service providers' systems. We and our third-party service providers may face difficulties in identifying, or promptly responding to, potential security breaches and other instances of unauthorized access to, or disclosure or other loss of, information. Any hacking or other attack on our or our third-party service providers' or vendors' systems, and any unauthorized access to, or disclosure or other loss of, information suffered by us or our third-party service providers or vendors, or the perception that any of these have occurred, could result in legal claims or proceedings, loss of intellectual property, liability under laws that protect the privacy of personal information, negative publicity, 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. Moreover, we may need to increase our efforts to train our personnel to detect and defend against cyber- or phishing-attacks, which are becoming more sophisticated and frequent, and we may need to implement additional protective measures to reduce the risk of potential security breaches, which could cause us to incur significant additional expenses.

In addition, our insurance may be insufficient to cover our losses resulting from cyber-attacks, breaches, or other interruptions, and any incidents may result in loss of, or increased costs of, such insurance. The successful assertion of one or more large claims against us that exceed available insurance coverage, the occurrence of changes in our insurance policies, including premium increases or the imposition of large deductible or co-insurance requirements, or denials of coverage, could have a material adverse effect on our business, including our financial condition, results of operations and reputation.

We are currently subject to, and may in the future become subject to additional, U.S. federal and state laws and regulations imposing obligations on how we collect, store and process personal information. Our actual or perceived failure to comply with such obligations could harm our business. Ensuring compliance with such laws could also impair our efforts to maintain and expand our future customer base, and thereby decrease our revenue.

In the ordinary course of our business, we currently, and in the future will, collect, store, transfer, use or process sensitive data, including personally identifiable information of employees, and intellectual property and proprietary business information owned or controlled by ourselves and other parties. The secure processing, storage, maintenance, and transmission of this critical information are vital to our operations and business strategy. We are, and may increasingly become, subject to various laws and regulations, as well as contractual obligations, relating to data privacy and security in the jurisdictions in which we operate. The regulatory environment related to data privacy and security is increasingly rigorous, with new and constantly changing requirements applicable to our business, and enforcement practices are likely to remain uncertain for the foreseeable future. These laws and regulations may be interpreted and applied differently over time and from jurisdiction to jurisdiction, and it is possible that they will be interpreted and applied in ways that may have a material adverse effect on our business, financial condition, results of operations and prospects.

In the United States, various federal and state regulators, including governmental agencies like the Consumer Financial Protection Bureau and the Federal Trade Commission, have adopted, or are considering adopting, laws and regulations concerning personal information and data security. Certain state laws may be more stringent or broader in scope, or offer greater individual rights, with respect to personal information than federal, international or other state laws, and such laws may differ from each other, all of which may complicate compliance efforts. For example, the California Consumer Privacy Act ("CCPA"), which increases privacy rights for California residents and imposes obligations on companies that process their personal information, came into effect on January 1, 2020. Among other things, the CCPA requires covered companies to provide new disclosures to California consumers and provide such consumers new data protection and privacy rights, including the ability to opt-out of certain sales of personal information. The CCPA provides for civil penalties for violations, as well as a private right of action for certain data breaches that result in the loss of personal information. This private right of action may increase the likelihood of, and risks associated with, data breach litigation. In November 2020, California also passed the California Privacy Rights Act, or ("CPRA"), which significantly expands the CCPA, including by introducing additional obligations such as data minimization and storage limitations and granting additional rights to consumers, among others. In addition, laws in all 50 U.S. states require businesses to provide notice to consumers whose personal information has been disclosed as a result of a data breach. State laws are changing rapidly and there is discussion in the U.S. Congress of a new comprehensive federal data privacy law to which we would become subject if it is enacted. These and future laws and regulations may increase our compliance costs and potential liability.

Furthermore, regulations promulgated pursuant to the Health Insurance Portability and Accountability Act of 1996 ("HIPAA"), establish privacy and security standards that limit the use and disclosure of individually identifiable health information (known as "protected health information") and require the implementation of administrative, physical and technological safeguards to protect the privacy of protected health information and ensure the confidentiality, integrity and availability of electronic protected health information. Determining whether protected health information has been handled in compliance with applicable privacy standards and our contractual obligations can require complex factual and statistical analyses and may be subject to changing interpretation. Although we take measures to protect sensitive data from unauthorized access, use or disclosure, our information technology and infrastructure may be vulnerable to attacks by hackers or viruses or breached due to employee error, malfeasance or other malicious or inadvertent disruptions. Any such breach or interruption could compromise our networks and the information stored there could be accessed by unauthorized parties, manipulated, publicly disclosed, lost or stolen. Any such access, breach or other loss of information could result in legal claims or proceedings, and liability under federal or state laws that protect the privacy of personal information, such as the HIPAA, the Health Information Technology for Economic and Clinical Health Act ("HITECH"), and regulatory penalties. Notice of breaches must be made to affected individuals, the Secretary of the Department of Health and Human Services, and for extensive breaches, notice may need to be made to the media or State Attorneys General. Such a notice could harm our reputation and our ability to compete.

We are in the process of evaluating compliance needs, but do not currently have in place formal policies and procedures related to the storage, collection and processing of information, and have not conducted any internal or external data privacy audits, to ensure our compliance with all applicable data protection laws and regulations. Additionally, we do not currently have policies and procedures in place for assessing our third-party vendors' compliance with applicable data

protection laws and regulations. All of these evolving compliance and operational requirements impose significant costs, such as costs related to organizational changes, implementing additional protection technologies, training employees and engaging consultants, which are likely to increase over time. In addition, such requirements may require us to modify our data processing practices and policies, distract management or divert resources from other initiatives and projects, all of which could have a material adverse effect on our business, financial condition, results of operations and prospects. Any failure or perceived failure by us or our third-party vendors, collaborators, contractors and consultants to comply with any applicable federal, state or similar foreign laws and regulations relating to data privacy and security, or could result in damage to our reputation, as well as proceedings or litigation by governmental agencies or other third parties, including class action privacy litigation in certain jurisdictions, which would subject us to significant fines, sanctions, awards, penalties or judgments, all of which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Increased scrutiny of our environmental, social or governance responsibilities may result in additional costs and risks, and may adversely impact our reputation, employee retention, and willingness of customers and suppliers to do business with us.

Investor advocacy groups, institutional investors, investment funds, proxy advisory services, stockholders, and customers are increasingly focused on environmental, social and governance ("ESG") practices of companies. Additionally, public interest and legislative pressure related to public companies' ESG practices continues to grow. If our ESG practices fail to meet regulatory requirements or investor or other industry stakeholders' evolving expectations and standards for responsible corporate citizenship in areas including environmental stewardship, support for local communities, Board of Director and employee diversity, human capital management, employee health and safety practices, product quality, supply chain management, corporate governance and transparency and employing ESG strategies in our operations, our brand, reputation and employee retention may be negatively impacted and customers and suppliers may be unwilling to do business with us. In addition, as we work to align our ESG practices with industry standards, we will likely continue to expand our disclosures in these areas and doing so may result in additional costs and require additional resources to monitor, report, and comply with our various ESG practices. If we fail to adopt ESG standards or practices as quickly as stakeholders desire, report on our ESG efforts or practices accurately, or satisfy the expectations of stakeholders, our reputation, business, financial performance and growth may be adversely impacted.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our corporate headquarters, research and development facilities, manufacturing and distribution centers are located in Menlo Park, California. We lease approximately 180,000 square feet under a lease expiring on October 31, 2027. We operate additional research, development and support functions in San Diego, where we lease approximately 73,500 square feet under a lease expiring on September 30, 2027, which was acquired in connection with the acquisition of Omniome. Including these leases, we lease approximately 278,000 square feet globally.

We believe that our existing facilities, together with suitable additional or alternative space available on commercially reasonable terms, will be sufficient to meet our needs.

ITEM 3. LEGAL PROCEEDINGS

Please see *Note 8. Commitments and Contingencies*, subsection titled *Legal Proceedings*, in Part II, Item 8 of this Annual Report on Form 10-K.

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

Our common stock is traded on The Nasdaq Global Select Market under the symbol "PACB."

Holders of Record

As of January 31, 2022, there were approximately 59 stockholders of record of our common stock, although we believe that there are a significantly larger number of beneficial owners of our common stock.

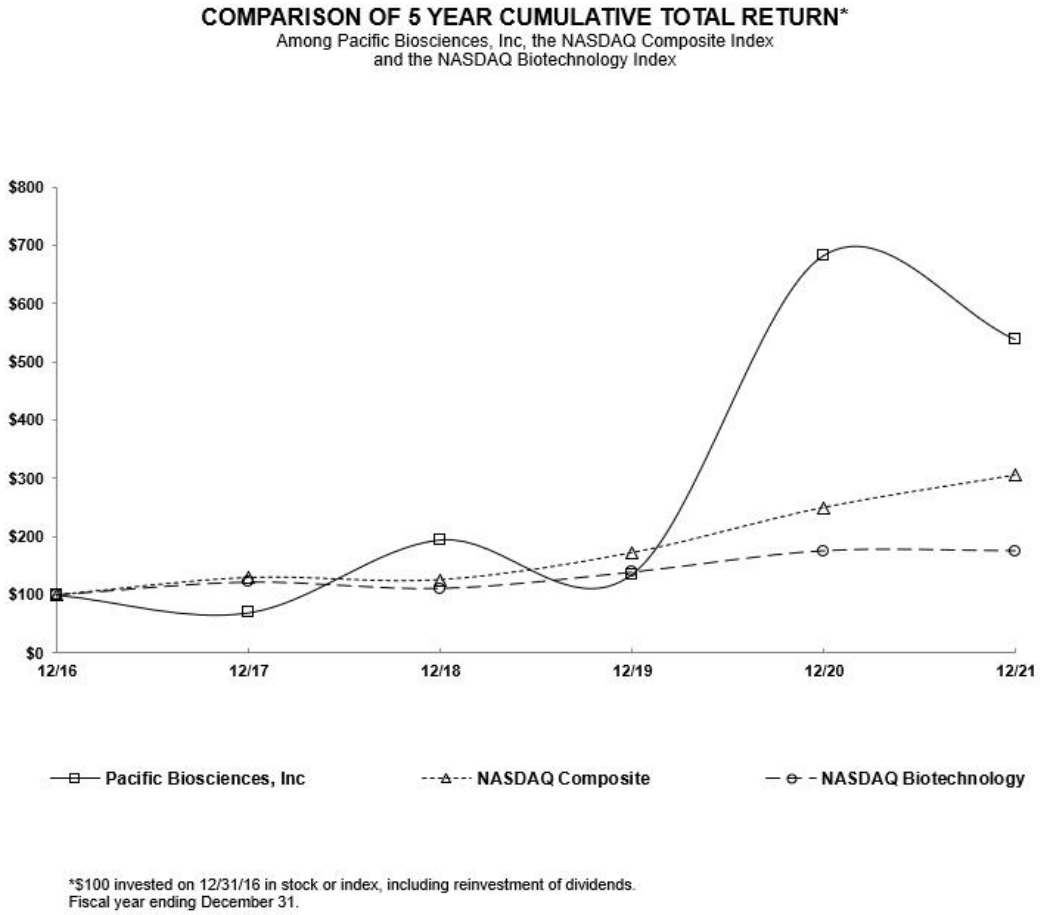
Dividend Policy

We have never declared or paid any cash dividend on our common stock and have no present plans to do so. We intend to retain earnings for use in the operation and expansion of our business.

Performance Graph

The performance graph included in this Annual Report on Form 10-K shall not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), or incorporated by reference into any filing of Pacific Biosciences under the Securities Act of 1933, as amended, or the Exchange Act, except as shall be expressly set forth by specific reference in such filing.

The following graph shows a comparison from December 31, 2016 through December 31, 2021 of the cumulative total return for our common stock, the Nasdaq Composite Index and the Nasdaq Biotechnology Index. Such returns are based on historical results and are not intended to suggest future performance. Data for The Nasdaq Composite Index and the Nasdaq Biotechnology Index assume reinvestment of dividends.



Recent Sales of Unregistered Securities

Not applicable.

ITEM 6. [Reserved]

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

You should read the following discussion and analysis of our financial condition and results of operations together with our consolidated financial statements and the related notes included in this Annual Report on Form 10-K. Some of the information contained in this discussion and analysis or set forth elsewhere in this Annual Report on Form 10-K, including information with respect to our plans and strategy for our business and related financing, includes forward-looking statements that involve risks and uncertainties. You should read the "Risk Factors" section of this Annual Report on Form 10-K for a discussion of important factors that could cause actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Our Management's Discussion and Analysis (MD&A) is organized in the following sections:

- *Overview and Outlook*
- *Results of Operations*
- *Liquidity and Capital Resources*
- *Critical Accounting Policies and Estimates*
- *Quantitative and Qualitative Disclosure of Market Risk*
- *Recent Accounting Pronouncements*
- *Contractual Obligations*
- *Off Balance Sheet Arrangements*

Overview and Outlook

About PacBio

We are a premier life science technology company that is designing, developing and manufacturing advanced sequencing solutions to help scientists and clinical researchers resolve genetically complex problems.

Our products and technology under development stem from two highly differentiated core technologies focused on accuracy, quality and completeness which include our existing HiFi long read sequencing and our emerging SBB short read sequencing technologies. Our products address solutions across a broad set of research applications including human germline sequencing, plant and animal sciences, infectious disease and microbiology, oncology, and other emerging applications.

Our focus is on providing our customers with advanced sequencing technologies with higher throughput and improved workflows that we believe will enable dramatic advancements in routine healthcare.

Our customers include academic and governmental research institutions, commercial testing and service laboratories, genome centers, public health labs, hospitals and clinical research institutes, contract research organizations (CROs), pharmaceutical companies and agricultural companies.

As of December 31, 2021, our commercial team is comprised of over 178 employees, including 48 commissionable employees, many with advanced degrees in biology and significant experience in the genomics industry.

In 2021, we grew revenues by 65% as compared to December 31, 2020, driven by increased sales of our sequencing platforms and newly developed products as well as through strategic business acquisitions. We have added to our leadership team, expanded our critical commercial and research and development capabilities, and achieved development milestones toward commercialization of new and enhanced technologies. These achievements in 2021 focused on building a foundation for growth, that we will leverage to continue to focus on strategic, future-oriented execution as an organization, with our products and for our customers.

2022 Strategic Objectives

2021 was a productive year for us as we set out to transform the company, scale the business and drive adoption for our advanced sequencing technologies.

Our 2022 strategic objectives include:

- Execution – leveraging commercial investment to drive continued HiFi and Sequel II/IIe adoption;
- Progress our product pipeline – continue developing our future higher throughput HiFi sequencing platform and differentiated short-read technology; and
- Delight our customers – deepening our customer relationships and expanding customer collaborations across existing and rapidly expanding new applications for our technology.

We will continue to leverage our commercial organization and make significant improvements in efficiency and usability of our Sequel II/IIe to seek to reach a broader customer base. We believe the commercial investments we have made in 2021 and will continue to make in 2022 will further help drive growth in our business. We employed 48 quota-carrying field sales personnel as of December 31, 2021, and we expect to continue to grow the number of quota-carrying field sales personnel throughout 2022. In 2021, we sought to increase the awareness of our products and the number of potential customers. In 2022, we expect to continue to expand our sales, general and administrative departments to invest in our growth.

To increase the adoption of HiFi sequencing, we have various development programs in progress to expand our product portfolio as well as increase the throughput and improve the usability of our existing sequencing technologies. Our focus for 2022 will be to progress these programs to accelerate new platform launches in the near to mid-term as well as increase application for our technologies. In an effort to address the oncology markets with a highly differentiated alternative, we are also progressing our short read platform development with a goal of launching our SBB short read sequencing platform in the first half of 2023. As a result, we expect our research and development expense to increase significantly in 2022 as compared to 2021.

We continue to believe that with the capabilities of our HiFi chemistry and SMRT technology, we can be a market leader in whole-genome clinical sequencing. Leading institutions have adopted our products to study rare and inherited disease. We believe the market opportunity for clinical sequencing is significant and could drive substantial revenue growth for the company. We plan to pursue an expanding pipeline of other potential customer collaborations where the technologies being developed or applications being considered extend beyond whole-genome clinical sequencing. Collaborative arrangements will likely increase through 2022, ultimately adding to the awareness of our products and service offerings and driving new applications for use of our technology.

Financial Overview

The COVID-19 pandemic and efforts to control its spread have significantly curtailed the movement of people, goods, and services worldwide, including in the regions in which we sell our products and services and conduct our business operations. Due to the uncertain scope and duration of the pandemic, we cannot reasonably estimate the future impact to our operations and financial results.

In response to local stay-at-home orders and in alignment with CDC recommendations, we have limited our manufacturing and commercial operations. We have and will continue to provide consumables, instruments, and support to scientists at government, academic, and commercial labs that remain open. To aid in containing the spread of COVID-19, we have implemented remote-work options and are limiting employee travel. We are monitoring this rapidly evolving situation.

Even after the COVID-19 pandemic has subsided, we may continue to experience an adverse impact to our business as a result of its global economic impact, including any recession that has occurred or may occur in the future. Specifically, difficult macroeconomic conditions, decreases in discretionary capital spending, increased and prolonged unemployment or a decline in consumer confidence as a result of the COVID-19 pandemic could have a continuing adverse effect on the demand for some of our products. Such economic disruption could have a material adverse effect on our business, results of operations and liquidity. The degree of impact of COVID-19 on our business will depend on several factors, such as the

duration and the extent of the pandemic, as well as actions taken by governments, businesses and consumers in response to the pandemic, all of which continue to evolve and remain uncertain at this time.

See the *Risk Factors* section for further discussion of the possible impact of the COVID-19 pandemic on our business.

Key highlights of our 2021 consolidated financial results include the following:

- Revenue increased $51.6 million, or 65%, to $130.5 million for the year ended December 31, 2021, as compared to $78.9 million for the year ended December 31, 2020, driven primarily by an increase in instrument and consumable revenue. We expect revenue to grow in 2022 compared to 2021 and 2020. However, our future revenues largely depend on the rate of sales of our sequencing instruments, which are a leading indicator of future sales of consumables. We expect instrument placements to continue to grow as we expand our sales globally through our expanded sales force, through application of technology in new markets and through offering new features and solutions. In turn, we expect that this will continue to increase our sales of consumables and related services.
- Gross profit as a percentage of revenue (gross margin) was 45.1% in 2021 compared to 41.3% for the year ended December 31, 2020. The improved gross margin percentage was primarily due to higher sales volumes and increased utilization of our products during the year ended December 31, 2021, compared to 2020. Our gross margin in future periods will depend on several factors, including: strategic product pricing; product mix; sales of higher-margin consumables; supply chain constraints increasing the cost of raw materials; manufacturing capacity and production volumes impacting the cost of inventory; freight costs; warranty costs; and excess or obsolete inventories.
- Loss from operations increased $105.8 million or 101%, to $210.2 million for the year ended December 31, 2021, as compared to $104.4 million for the year ended December 31, 2020, driven primarily by an increase of $132.1 million of operating expenses, including $31.1 million of merger-related expenses incurred in connection with the acquisitions of Omniome, Inc. and Circulomics, Inc. in 2021. We expect the loss from operations to continue to grow due to continued increases in operating expenses, as we further invest in product commercialization, product development efforts and incur a full year of operating expenses associated with the acquisition of Omniome. See *Note 2. Business Acquisitions* for further details.
- Cash, cash equivalents and short-term investments were $1.04 billion at December 31, 2021, which represents an increase of 228% compared to the balance at December 31, 2020.

A detailed discussion of our comparison between 2021 and 2020 is presented below. A discussion of the changes in our results of operations between the years ended December 31, 2020 and December 31, 2019, has been omitted from this Annual Report on Form 10-K but may be found in *Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations* of our Annual Report on Form 10-K for the year ended December 31, 2020, filed with the Securities and Exchange Commission on February 26, 2021, which is incorporated herein by reference, and which is available free of charge on the SEC's website at www.sec.gov and our corporate website (www.pacb.com).

Results of Operations

Comparison of the Years Ended December 31, 2021 and 2020

	Year Ended December 31,			
	2021	2020	$ Change	% Change
	(in thousands, except percentages)			
Revenue:				
Product revenue	$ 113,505	$ 65,424	$ 48,081	73%
Service and other revenue	17,008	13,469	3,539	26%
Total revenue	130,513	78,893	51,620	65%
Cost of Revenue:				
Cost of product revenue	56,358	35,424	20,934	59%
Cost of service and other revenue	14,989	10,903	4,086	37%
Amortization of intangible assets	306	—	306	—
Total cost of revenue	71,653	46,327	25,326	55%
Gross profit	58,860	32,566	26,294	81%
Operating Expense:				
Research and development	112,899	64,152	48,747	76%
Sales, general and administrative	124,124	72,799	51,325	71%
Merger-related expenses	31,129	—	31,129	—
Change in fair value of contingent consideration	1,143	—	1,143	
Total operating expense	269,295	136,951	132,344	97%
Operating loss	(210,435)	(104,385)	(106,050)	(102%)
Gain from reverse termination fee from Illumina	—	98,000	(98,000)	—
(Loss)/Gain from continuation advances from Illumina	(52,000)	34,000	(86,000)	(253%)
Interest expense	(12,530)	(267)	(12,263)	(4593%)
Other income, net	93	2,055	(1,962)	(95%)
Net (loss) income	$ (274,872)	$ 29,403	$ (304,275)	(1035%)

Revenue

Revenue increased $51.6 million, or 65%, to $130.5 million for the year ended December 31, 2021, as compared to $78.9 million for the year ended December 31, 2020, driven primarily by an increase in instrument and consumable revenue.

Instrument revenue increased $27.0 million, or 79%, to $61.3 million for the year ended December 31, 2021, as compared to the year ended December 31, 2020, primarily due to an increase in instruments sold. During the year ended December 31, 2021, our installed base was 374 Sequel II and Sequel IIe systems compared to the 203 systems in the year ended December 31, 2020. We expect the number of Sequel II/IIe placements to continue to grow during 2022, reflecting our increased commercial presence and customer demand.

Consumables revenue increased $21.0 million, or 68%, to $52.2 million for the year ended December 31, 2021, as compared to the year ended December 31, 2020. The increase in consumable sales was primarily attributable to higher Sequel II/IIe consumables sales from growth of the installed base.

Service and other revenue increased $3.5 million, or 26%, to $17.0 million for the year ended December 31, 2021, primarily due to product services contracts sold on the growing installed base.

Cost of revenue, gross profit and gross margin

Cost of product revenue increased by $20.9 million, or 59%, to $56.4 million for the year ended December 31, 2021, compared to $35.4 million for the year ended December 31, 2020. The increase in cost of product revenue was primarily due to higher sales.

Cost of service and other revenue increased by $4.1 million, or 37%, to $15.0 million for the year ended December 31, 2021, compared to $10.9 million for the year ended December 31, 2020, primarily due to higher service volumes from our growing installed base and increased stock-based compensation expense.

Gross profit increased $26.3 million, or 81%, to $58.9 million for the year ended December 31, 2021, compared to the year ended December 31, 2020. Gross margin was 45.1%, for the year ended December 31, 2021, compared to gross margin of 41.3% for the year ended December 31, 2020. The improved gross margin percentage was primarily due to higher sales volumes and increased factory utilization during the year ended December 31, 2021, compared to 2020, which was more adversely impacted by the impact of the COVID-19 pandemic.

The global shortage of semiconductors, which has been reported since early 2021, has caused challenges for us in our supply chain and resulted in some cost increases that have and may continue to adversely impact margins. During these periods of shortages or delays, the price of components may increase, or the components may not be available at all. We may not be able to secure enough components at reasonable prices or of acceptable quality to build new products in a timely manner in the quantities or configurations needed. Accordingly, our revenue and gross margins could suffer until other sources can be developed.

Research and Development Expense

Research and development expense increased by $48.7 million, or 76%, to $112.9 million for the year ended December 31, 2021, compared to the year ended December 31, 2020. This change was primarily driven by an increase of $29.0 million in personnel expenses, due to an increase in headcount, including the acquired workforce from the Omniome acquisition, and an increase of $14.3 million of product development costs. Research and development expense included stock-based compensation expense of $20.3 million and $7.1 million during the twelve months ended December 31, 2021 and 2020, respectively.

We will continue to focus a significant portion of our resources on developing new products and solutions, including improving the efficiency and usability of existing products, developing new solutions, software, workflows and applications leveraging our core technologies. We have and expect to continue to collaborate with strategic partners to develop sequencing solutions and expand the application of our technology. We intend to continue to significantly invest in research and development efforts into the foreseeable future. We expect research and development expenses to increase significantly in 2022, due to continued product development, research collaboration efforts, the acquisition of Omniome and our intent to continue to hire additional personnel in research and development. We also expect to continue to incur costs associated with products being developed in connection with the Invitae collaboration.

Sales, General and Administrative Expense

Sales, general and administrative expense increased by $51.3 million, or 71%, to $124.1 million for the year ended December 31, 2021, compared to the year ended December 31, 2020. This change was primarily driven by an increase of $53.6 million in salaries and related expense due to increased headcount, which included quota-carrying sales representatives and executive hires, which was partially offset by a decrease of $6.6 million in consulting and professional services fees. Sales, general and administrative expense included stock-based compensation expense of $35.4 million and $8.2 million during the twelve months ended December 31, 2021 and 2020, respectively.

Sales, general and administrative expense is planned to increase significantly in 2022 as we expect to increase quota-carrying sales representatives, increase headcount as part of our business expansion and incur incremental costs in connection with the acquisition of Omniome.

Merger-related expenses

Merger-related expenses of $31.1 million during the year ended December 31, 2021, consist of $12.2 million of transaction costs arising from the acquisitions of Omniome and Circulomics and $18.9 million of stock-based compensation expense resulting from the acceleration of certain equity awards in connection with the Omniome merger. We recognized $18.9 million of stock-based compensation expense for the acceleration that was not attributable to pre-combination services, consisting of $6.3 million that was settled in shares of our common stock, $7.4 million that was settled in cash and $5.2 million related to contingent consideration.

Change in fair value of contingent consideration

Change in fair value of contingent consideration of $1.1 million during the year ended December 31, 2021, represents the remeasurement impact of the contingent consideration of $200 million (composed of $100 million in cash and $100 million in shares of our common stock) that is due upon the achievement of a milestone, defined as the first commercial shipment to a customer of a nucleotide sequencing platform, utilizing SBB technology.

Gain from Reverse Termination Fee from Illumina

As part of the Termination Agreement, Illumina paid us a Reverse Termination Fee of $98.0 million in the first quarter of 2020. Pursuant to the Termination Agreement, in the event that, on or prior to September 30, 2020, we entered into a definitive agreement providing for, or consummated, a Change of Control Transaction, then we may have been required to repay the Reverse Termination Fee (without interest) to Illumina in connection with the consummation of such Change of Control Transaction. We deferred the gain from the Reverse Termination Fee from Illumina until the date when the associated contingency was resolved. On October 1, 2020, the contingency clauses lapsed and we recorded the $98.0 million as a part of other income.

(Loss) Gain from Continuation Advances from Illumina

As part of the Termination Agreement, Illumina paid us Continuation Advances of $18.0 million during the fourth quarter of 2019 and $34.0 million during the first quarter of 2020. We recorded the $34.0 million as part of other income in the year ended December 31, 2020.

Up to the full $52.0 million of Continuation Advances paid to us were repayable without interest to Illumina if, within two years of March 31, 2020, we entered into, or consummated a Change of Control Transaction or raised at least $100 million in a single equity or debt financing (that may have multiple closings), with the amount repayable dependent on the amount raised by us.

Resulting from the issuance and sale of $900 million of 1.50% Convertible Senior Notes due February 15, 2028, $52.0 million of Continuation Advances were paid without interest to Illumina in February 2021 and recorded as other expense in the year ended December 31, 2021.

Interest Expense

Interest expense for the year ended December 31, 2021, was $12.5 million compared to $0.3 million for the year ended December 31, 2020, primarily due to the interest incurred on the $900 million of 1.50% Convertible Senior Notes due February 15, 2028 that we issued on February 16, 2021.

Other Income, Net

The decrease in Other income, net was primarily driven by a $0.8 million foreign exchange loss for the year ended December 31, 2021, compared to a $1.0 million foreign exchange gain recognized for the year ended December 31, 2020.

Benefit from Income Taxes

A deferred income tax benefit of $93.6 million for the year ended December 31, 2021, is related to the release of the valuation allowance for deferred tax assets due to the recognition of deferred tax liabilities in connection with the Omniome and Circulomics acquisitions. We maintain a full valuation allowance on the net deferred tax assets of our U.S. entities as we have concluded that it is more likely than not that we will not realize our deferred tax assets. Accordingly, this benefit from income taxes is reflected on our *Consolidated Statements of Operations and Comprehensive (Loss) Income* for the year ended December 31, 2021.

Liquidity and Capital Resources

Our primary sources of liquidity, other than our holdings of cash, cash equivalents, and investments, has primarily been through the issuance of debt or equity securities, together with cash flow from operating activities. We have historically incurred, and expect to continue to incur, operating losses and generate negative cash flows from operations on an annual basis due to the investments we intend to make as described in *Results of Operations* above, and as a result, we may require additional capital resources to execute our strategic initiatives to grow our business.

Cash, cash equivalents and investments

As of December 31, 2021, we had $1.04 billion in cash, cash equivalents and investments, compared to $318.8 million at December 31, 2020. The increase was attributable to the net proceeds from our issuance of $900 million of 1.50% Convertible Senior Notes on February 16, 2021, and $300 million of common stock in a private placement on September 20, 2021. This increase was partially offset by the payment of $319.8 million, net of cash acquired, in the acquisitions of Omniome and Circulomics in the third quarter of 2021, repayment of $52 million of Continuation Advances to Illumina in the first quarter of 2021 and $111.2 million cash used in operating activities for the twelve months ended December 31, 2021.

Convertible Senior Notes

At December 31, 2021, we had $900 million of principal Convertible Senior Notes outstanding which mature on February 15, 2028, subject to earlier conversion, redemption or repurchase.

On February 9, 2021, we issued convertible notes due 2028 (Notes) with an aggregate principal of $900 million. The net proceeds from the issuance, after deducting offering expenses, were $895.6 million. The Notes are governed by an indenture (the “Indenture”) between the Company and U.S. Bank National Association, as trustee. The Notes bear interest at a rate of 1.50% per annum. Interest on the Notes is payable semi-annually in arrears on February 15 and August 15 commencing on August 15, 2021. The Notes will mature on February 15, 2028, subject to earlier conversion, redemption or repurchase. The proceeds from the issuance of the convertible notes will be used to fund operations, strategic investments and capital requirements.

The Notes are convertible at the option of the holder at any time until the second scheduled trading day prior to the maturity date, including in connection with a redemption by the Company. The Notes are convertible into shares of our common stock based on an initial conversion rate of 22.9885 shares of common stock per $1,000 principal amount of the Notes (which is equal to an initial conversion price of $43.50 per share), in each case subject to customary anti-dilution and other adjustments as a result of certain extraordinary transactions. Upon conversion of the Notes, we may elect to settle such conversion obligation in shares, cash or a combination of shares and cash.

With certain exceptions, upon a change of control of the Company or the failure of our common stock to be listed on certain stock exchanges, the holders of the Notes may require that we repurchase all or part of the principal amount of the Notes at a purchase price of par plus unpaid interest up to, but excluding, the maturity date.

The Indenture includes customary “events of default,” which may result in the acceleration of the maturity of the Notes under the Indenture. The Indenture also includes customary covenants for convertible notes of this type.

See *Note 7. Convertible Senior Notes* for further details.

Acquisitions

On September 20, 2021, we acquired Omniome, a San Diego-based company developing a highly differentiated, proprietary short-read DNA sequencing platform capable of delivering high accuracy results, for total consideration of $714.8 million, consisting of $315.7 million in cash, $249.4 million in shares of PacBio common stock, and contingent consideration with a fair value of $168.6 million. Out of the total payment, approximately $18.9 million, comprised of $7.4 million of cash, 226,811 shares of PacBio common stock with a fair value of $6.3 million and $5.2 million of contingent consideration, was accounted for as a one-time post acquisition stock-based compensation expense. See *Note 2. Business Acquisitions* for further details.

With regards to the contingent consideration with a fair value of $168.6 million, we are required to pay Omniome stockholders an additional payment of $200 million, composed of $100 million in cash and $100 million in shares of our common stock, upon the achievement of a milestone, defined as the first commercial shipment to a customer of a nucleotide sequencing platform, comprising both an instrument and related consumables, that utilizes SBB technology.

Private Placement of Common Stock

On July 19, 2021, we entered into a purchase agreement with certain qualified institutional buyers and institutional accredited investors, pursuant to which we agreed to sell an aggregate of 11,214,953 shares of common stock, at a price of $26.75 per share, for aggregate gross proceeds of approximately $300 million. The transaction closed on September 20, 2021. We registered the private placement shares for resale following the closing of the merger.

Invitae Collaboration Arrangement

On January 12, 2021, we entered into a multi-year Development and Commercialization Agreement with Invitae Corporation (“Invitae”). Pursuant to the Development Agreement, Invitae is providing certain funding to us to develop products relating to production-scale high-throughput sequencing (“Program Products”). If Program Products become commercially available, Invitae may purchase the Program Products. In addition to selling the Program Products to Invitae, we will have the right to broadly commercialize Program Products for sale to other customers.

Under the Development Agreement, we are conducting a program to develop and will subsequently manufacture the Program Products. Invitae is funding certain development costs we incur in connection with the Program Products (“Program Development Costs”) and will receive preferred pricing on the Program Products as further described in *Note 3. Invitae Collaboration Arrangement*.

In certain termination circumstances, (i) we will be obligated to refund all or a portion of the development costs advanced by Invitae and/or (ii) we will owe Invitae a share of the revenue that may be generated from the sale of the Program Products to third parties if and when they are commercialized, until such time as Invitae has recouped the amounts paid to us, and in certain circumstances, a mutually agreed return.

We have incurred and expect to incur significant development costs over the duration of the Development Agreement. There can be no assurances that the development program will be successful or that the Program Products will become ready for commercial sale.

All amounts received from Invitae are initially deferred and accumulated in deferred revenue, non-current. As of December 31, 2021, we have recognized payments received from Invitae of $23.5 million in deferred revenue, non-current, on the Consolidated Balance Sheet.

Additional Capital Requirements

We anticipate that our existing cash, cash equivalents and investments will be sufficient to fund our projected operating and capital requirements for at least the next 12 months from the date of filing of this Annual Report on Form 10-K for the year ended December 31, 2021. Operating needs include planned costs to operate our business, including costs to fund working capital and capital expenditures. Recent and expected working and other capital requirements, in addition to the above matters, include:

- Our purchase orders and contractual obligations of approximately $68.7 million as of December 31, 2021, which consist of open purchase orders and contractual obligations in the ordinary course of business, including commitments with contract manufacturers and suppliers for which we have not received the goods or services. A majority of these purchase obligations are due within a year. Although open purchase orders are considered enforceable and legally binding, the terms generally allow us the option to cancel, reschedule and adjust our requirements based on our business needs prior to the delivery of goods or performance of services.

- Our research and development expenditures were $112.9 million in 2021 and $64.2 million in 2020, and we expect to increase our investment in research and development in 2022, including enhancements of our existing products, continued development of a commercial product leveraging our acquired SBB technology, continued development of products in connection with our Invitae collaboration and new technology and products.

- Cash outflows for capital expenditures were $5.9 million in 2021 and $1.0 million in 2020. We expect capital expenditures to increase in fiscal 2022 to support the increase in manufacturing and expansion of our business.

- Amounts related to future lease payments for operating lease obligations at December 31, 2021, totaled $57.7 million, with $11.3 million expected to be paid within the next 12 months.

- Amounts due under the term loan acquired in connection with Omniome at December 31, 2021, totaled $3.9 million, with $1.6 million expected to be paid within the next 12 months. Please see *Note 6. Balance Sheet Components* for additional information.

- Payments made to 3rd party collaborators to help advance our technologies and the capabilities of our products. We may also choose to drive investments to help create an ecosystem of customers, partners and collaborators whose expertise and offerings complement and enhance the capabilities and utility of our technology and increase genomic data available on our platforms.

- Payments related to licensing and other arrangements are cancelable license agreements with third parties for certain patent rights and technology. Under the terms of these agreements, we may be obligated to pay royalties based on revenue from the sales of licensed products, or minimum royalties, whichever is greater, and license maintenance fees. The future license maintenance fees and minimum royalty payments under the license agreements are not deemed to be material. At this time, obligations for future royalties under our license agreements are not estimable or probable.

Our capital needs may be impacted by the pace of adoption of our products, which affects the sales of our products and services; our ability to obtain new collaboration and customer arrangements; the progress of our research and development programs; initiation or expansion of research programs and collaborations; the purchase of patent licenses; manufacturing costs; service costs; the impact of product quality; litigation costs, including the costs involved in preparing, filing, prosecuting, defending and enforcing intellectual property rights; costs of developing new and enhanced products; acquisitions of complementary businesses, technologies or assets; macroeconomic impacts of COVID-19; and other factors.

If economic, financial, business or other factors adversely affect our ability to fund our projected operating cash requirements, we may be required to obtain funding through traditional or alternative sources of financing. We cannot be certain that funds will be available on favorable terms, or at all. If we are required and unable to raise additional capital when desired, our business, operating results and financial condition may be adversely affected.

Cash Flow Summary

(in thousands)	Year Ended December 31, 2021	2020
Cash (used in) provided by operating activities	$ (111,180)	$ 19,503
Cash used in investing activities	(678,531)	(219,322)
Cash provided by financing activities	1,169,581	251,839
Net increase in cash, cash equivalents and restricted cash	$ 379,870	$ 52,020

Operating Activities

Our primary uses of cash in operating activities are for the development of future products and product enhancements, manufacturing, and support functions related to our sales, general and administrative activities.

We used $111.2 million of cash in operating activities for the year ended December 31, 2021, compared to cash provided by operating activities of $19.5 million for the year ended December 31, 2020.

Cash used in operating activities for the year ended December 31, 2021, of $111.2 million was due primarily to a $181.0 million net loss, which includes a $93.6 million deferred income tax benefit, that was partially offset by a loss of $52.0 million from Continuation Advances repaid to Illumina that is considered a financing activity, non-cash items such as stock-based compensation of $73.4 million, depreciation of $7.2 million, amortization of right-of-use assets of $4.0 million and a net cash inflow from changes in operating assets and liabilities of $20.7 million. The change in net operating assets and liabilities was primarily attributable to increases of $25.7 million in deferred revenue, an increase of $15.1 million in accrued expenses and an increase of $6.4 million in accounts payable partially offset by an increase of $12.4 million in inventory, an increase of $7.2 million in accounts receivable, an increase of $1.0 million in prepaid expenses and other assets and a decrease of $5.0 million in operating lease liabilities.

Cash provided by operating activities for the year ended December 31, 2020, was $19.5 million, reflecting net income of $29.4 million which included a gain from the Reverse Termination Fee received from Illumina of $98.0 million and a gain from the Continuation Advances from Illumina of $34.0 million. However, the Continuation Advances are considered a financing activity and therefore an associated $34.0 million adjustment has been reflected to cash provided by operating activities. The net income of $29.4 million included non-cash expense items such as stock-based compensation of $17.5 million and depreciation of $6.4 million. The change in net operating assets and liabilities was primarily attributed to an increase of $4.1 million in accrued expenses and an increase of $5.0 million in other liabilities, partially offset by a decrease of $5.1 million in accounts payable.

Investing Activities

Our investing activities consist primarily of business acquisitions, capital expenditures and investment purchases, sales and maturities. We used $678.5 million of cash for investing activities for the year ended December 31, 2021, compared to $219.3 million for the same period in 2020.

Cash used in investing activities for the year ended December 31, 2021, was due primarily to net purchases of investments of $352.8 million, cash paid, net of cash acquired, of $319.8 million for the acquisitions of Omniome and Circulomics and purchases of property and equipment of $5.9 million.

Cash used in investing activities for the year ended December 31, 2020, was due primarily to net purchases of investments of $218.3 million and purchases of property and equipment of $1.0 million.

Financing Activities

Cash provided by financing activities was $1.17 billion and $251.8 million for the year ended December 31, 2021 and 2020, respectively.

Cash provided by financing activities during the year ended December 31, 2021, resulted from net proceeds of $895.5 million from our February 2021 issuance of $900 million of 1.50% Convertible Senior Notes after deducting debt issuance costs, net proceeds of $294.8 million from our September 2021 private placement of common stock after deducting issuance

costs and proceeds of $31.8 million from the issuance of common stock through our equity compensation plans, partially offset by $52.0 million of Continuation Advances repaid to Illumina.

Cash provided by financing activities during the year ended December 31, 2020, resulted from net proceeds of $187.5 million from our August 2020 and November 2020 underwritten public equity offerings after deducting underwriter commissions and paid offering expenses, $34.0 million of Continuation Advances from Illumina and proceeds of $46.4 million from the issuance of common stock through our equity compensation plans, partially offset by $16.0 million we repaid for the remaining outstanding principal to Deerfield upon the maturity of the Facility Agreement.

Off-Balance Sheet Arrangements

As of December 31, 2021, we did not have any off-balance sheet arrangements.

In the ordinary course of business, we enter into standard indemnification arrangements. Pursuant to these arrangements, we indemnify, hold harmless, and agree to reimburse the indemnified parties for losses suffered or incurred by the indemnified party in connection with any trade secret, copyright, patent or other intellectual property infringement claim by any third party with respect to its technology, or from claims relating to our performance or non-performance under a contract, any defective products supplied by us, or any acts or omissions, or willful misconduct, committed by us or any of our employees, agents or representatives. The term of these indemnification agreements is generally perpetual after the execution of the agreement. The maximum potential amount of future payments we could be required to make under these agreements is not determinable because it involves claims that may be made against us in future periods but have not yet been made. To date, we have not incurred costs to defend lawsuits or settle claims related to these indemnification agreements.

We also enter and have entered into indemnification agreements with our directors and officers that may require us to indemnify them against liabilities that arise by reason of their status or service as directors or officers, except as prohibited by applicable law. In addition, we may have obligations to hold harmless and indemnify third parties involved with our fundraising efforts and their respective affiliates, directors, officers, employees, agents or other representatives against any and all losses, claims, damages and liabilities related to claims arising against such parties pursuant to the terms of agreements entered into between us and such third parties in connection with such fundraising efforts. To the extent that such indemnification obligations apply to the lawsuits described in *Note 8. Commitments and Contingencies* of this Form 10-K, any associated expenses incurred are included within the related accrued litigation expense amounts. No additional liability associated with such indemnification agreements has been recorded as of December 31, 2021.

Critical Accounting Policies and Estimates

Management's Discussion and Analysis of Financial Condition and Results of Operations is based upon our Consolidated Financial Statements, which we have prepared in accordance with U.S. GAAP. The preparation of these financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue, cost of revenue, and operating expenses, and related disclosure of contingent assets and liabilities. Management based its estimates on historical experience and on various other assumptions that it believes to be reasonable under the circumstances, the results of which form the basis for making judgements about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ materially from these estimates under different assumptions or conditions.

An accounting policy is deemed to be critical if it requires an accounting estimate to be made based on assumptions about matters that are highly uncertain at the time the estimate is made, if different estimates reasonably could have been used, or if changes in the estimate that are reasonably likely to occur could materially impact the financial statements.

Revenue Recognition

Our revenue is generated primarily from the sale of products and services. Product revenue primarily consists of sales of our instruments and related consumables; Service and other revenue consist primarily of revenue earned from product maintenance agreements.

We account for a contract with a customer when there is a legally enforceable contract between us and the customer, the rights of the parties are identified, the contract has commercial substance, and collectability of the contract consideration is probable. Revenues are recognized when control of the promised goods or services is transferred to our customers or services are performed, in an amount that reflects the consideration we expect to be entitled to in exchange for those goods or services.

Our instrument sales are generally sold in a bundled arrangement and commonly include the instrument, instrument accessories, installation, training, and consumables. Additionally, our instrument sale arrangements generally include a one year period of service. For such bundled arrangements, we account for individual products and services separately if they are distinct, that is, if a product or service is separately identifiable from other items in the bundled package and if a customer can benefit from it on its own or with other resources that are readily available to the customer. Our customers cannot benefit from our instrument systems without installation, and installation can only be performed by us or qualified distributors. As a result, the system and installation are considered to be a single performance obligation recognized after installation is completed except for sales to qualified distributors, in which case the system is distinct and recognized when control has transferred to the distributor which typically occurs upon shipment.

The consideration for bundled arrangements is allocated between separate performance obligations based on their individual standalone selling price. We determine the best estimate of standalone selling price using average selling prices over a 12-month period combined with an assessment of current market conditions. If the standalone selling price is not directly observable, we rely on estimates by considering multiple factors including, but not limited to, overall market conditions, including geographic or regional specific factors, internal costs, profit objectives, pricing practices and other observable inputs.

We recognize revenues as performance obligations are satisfied by transferring control of the product or service to the customer or over the term of a product maintenance agreement with a customer. Our revenue arrangements generally do not provide a right of return. Revenue is recorded net of discounts, distributor commissions, and sales taxes collected on behalf of governmental authorities.

Inventories

Inventories are stated at the lower of cost or net realizable value on a first-in, first-out (“FIFO”) basis. The cost basis of our inventory is reduced for any products that are considered excessive or obsolete based upon assumptions about future demand, market conditions and the release of new products that may supersede old ones. If actual future demand or market conditions are less favorable than those projected by management, additional inventory write-downs may be required, which could have a material adverse effect on the results of our operations.

Goodwill and Intangible Assets

We make assumptions and estimates in determining the fair value of assets acquired and liabilities assumed in a business combination. The determination of fair value of intangible assets, which represents a significant portion of the purchase price in most acquisitions, requires the use of significant judgment relating to the fair value, whether the asset should be amortized, and if so, the period and method by which the intangible asset should be amortized. The Company estimates the fair value of the acquisition-related intangible assets primarily using the income approach, which discounts expected future cash flows to present value at the dates of the acquisition. Expected future cash flows utilize significant assumptions such as assumed revenue growth, discount rate and obsolescence factors

Finite-lived intangible assets, our developed technology and customer relationships, are capitalized and amortized over the lesser of the terms of the agreement or estimated useful life. We regularly review the carrying amount of our finite-lived intangible assets to determine whether indicators of impairment may exist which warrant adjustments to carrying values or estimated useful lives. We make judgements about the recoverability of finite-lived assets when events or changes in circumstances indicate that an impairment may exist. An impairment loss would be recognized when the sum of the expected future undiscounted net cash flows is less than the carrying amount of the asset. Should impairment exist, the impairment loss would be measured based on the excess of the carrying amount of the asset over the asset’s fair value.

Goodwill is evaluated for impairment annually in the second quarter of each year, and when events occur, or circumstances change that would more likely than not reduce the fair value of the asset below its carrying value. Qualitative factors that might require an interim evaluation include unexpected adverse business conditions, economic factors, unanticipated technological changes or competitive activities, loss of key personnel and acts by governments or courts. When impairment seems more likely than not during our qualitative assessment, we perform the quantitative assessment where we compare the fair value of the reporting unit with the carrying values, including goodwill. If the carrying amounts of the reporting units exceed the fair values, we will record an impairment loss based on the difference.

Indefinite-lived intangible assets, our In-Process Research and Development (IPR&D), is not subject to amortization and is assessed for impairment on, at least, an annual basis in the second quarter of each year. We review indefinite-lived intangible assets for impairment using a qualitative assessment. When impairment seems more likely than not during our qualitative assessment, we will proceed with a quantitative assessment where we estimate the fair value. Recoverability of indefinite-lived intangible assets is measured by comparing the carrying amount of the asset to its fair value. We make judgements about the recoverability of indefinite-lived assets when events or changes in circumstances indicate that an impairment may exist. Upon the commercialization of an IPR&D asset, it is reclassified to developed technology, which is a finite-lived intangible asset, and amortized over its estimated useful life.

Estimates of discounted future cash flows require assumptions related to revenue and operating income growth rates, discount rates and other factors. We consider peer revenues and earnings trading multiples from companies that have operational and financial characteristics that are similar to the asset under measurement and estimated weighted average costs of capital. Different assumptions from those made in our analysis could materially affect projected cash flows and the evaluation of assets for impairment.

We acquired $11.4 million of finite-lived intangible assets, $400.0 million of IPR&D and $410.0 million of goodwill in connection with the acquisitions of Omniome and Circulomics in the third quarter of 2021. We will perform the first annual quantitative goodwill and IPR&D impairment test in the second quarter of 2022. Through the review of qualitative factors in the fourth quarter of 2021, we noted no indications of impairment.

Contingent Consideration

In connection with the acquisition of Omniome in the third quarter of 2021, we entered into an arrangement where we are obligated to pay $200 million in cash and equity dependent upon the achievement of a milestone event upon the first commercial shipment of products developed from our acquired sequencing technology. See *Note 2. Business Acquisitions* for further information.

The contingent consideration liability was measured at fair value as of the acquisition date and is remeasured periodically at each reporting date, with changes in fair value recorded as change in fair value of contingent consideration in the statement of operations. The initial measurement and post-acquisition remeasurement require estimates and assumptions using a scenario-based method that considers a range of potential outcomes and assigned probabilities of occurrence for each outcome. Outcomes are discounted to present value, which is then weighted by the probability of each scenario to determine the total fair value of the contingent consideration payment as of each reporting period. Refer to *Note 5. Financial Instruments* for further discussion on valuation assumptions.

Recent Accounting Pronouncements

Please see *Note 1. Organization and Significant Accounting Policies*, subsection titled “Recent Accounting Pronouncements”, in Part II, Item 8 of this Annual Report on Form 10-K for information regarding applicable recent accounting pronouncements.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Interest Rate and Market Risk

Our investment portfolio is exposed to market risk from changes in interest rates. The goals of our investment policy are preservation of capital, fulfillment of liquidity needs and fiduciary control of cash and cash equivalents and investments.

We also seek to maximize income from our investments without assuming significant risk. To achieve our goals, we maintain a portfolio of cash equivalents and investments in a variety of securities of high credit quality. The securities in our investment portfolio are not leveraged, are classified as available for sale and are, due to their short-term nature, subject to minimal interest rate risk. We currently do not hedge interest rate exposure. Due to the short-term maturities of our investments, we do not believe that a hypothetical 10% adverse move in interest rates would have any material negative impact on the value of our investment portfolio.

We carry our convertible senior notes at the principal amount, less unamortized debt issuance costs, on our Consolidated Balance Sheets. Because the notes have a fixed annual interest rate of 1.50%, we do not have any economic interest rate exposure or financial statement risk associated with changes in interest rates. The fair value of the notes, however, may fluctuate when interest rates and the market price of our stock changes. See *Note 7. Convertible Senior Notes* in Part II, Item 8 of this Annual Form 10-K for additional information.

Foreign Exchange Risk

Our revenue, expense, and capital purchasing activities are primarily transacted in U.S. dollars; however, a portion of our operations is conducted in foreign currencies. As a result, we have foreign exchange exposures relating to non-U.S. dollar denominated cash flows and monetary assets and liabilities that are denominated in currencies other than U.S. dollars. The value of the amounts is exposed to changes in currency exchange rates from the time the transactions are originated, until the time the cash settlement is converted into U.S. dollars. Our foreign currency exposure is primarily concentrated in the Euro. A 10% strengthening of the U.S. dollar exchange rate against all currencies with which we have exposure, after taking into account offsetting positions at December 31, 2021 would have resulted in a $2.7 million decrease in the carrying amounts of those net assets. Actual gains and losses in the future may differ materially from these hypothetical gains and losses based on changes in the timing and amount of foreign currency exchange rate movements and our actual exposure. Our international operations are subject to risks typical of international operations, including, but not limited to, differing economic conditions, changes in political climate, differing tax structures, other regulations and restrictions and foreign exchange rate volatility.

ITEM 8.
FINANCIAL STATEMENTS AND SUPPLEMENTAL DATA

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.
Index to Consolidated Financial Statements

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Pacific Biosciences of California, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Pacific Biosciences of California, Inc. (the Company) as of December 31, 2021 and 2020, the related consolidated statements of operations and comprehensive (loss) income**,** stockholders' equity and cash flows for each of the three years in the period ended December 31, 2021, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control–Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 28, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the 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 audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the 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 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 financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Business combinations - Valuation of intangible assets

Description of the Matter	As described in Note 2 to the consolidated financial statements, the Company completed its acquisitions of Omniome, Inc. and Circulomics, Inc. during 2021. The transactions were accounted for as business combinations. As a result of the acquisitions, the Company recorded goodwill of $410.0 million and intangible assets of $411.4 million. Auditing the Company's accounting for the acquisitions was challenging because the determination of the fair value of the identified intangible assets, which principally consisted of in-process research and development (IPR&D), required management to make subjective estimates and assumptions. The Company used an income approach to measure the intangible assets. The valuation of the intangible assets is subject to higher estimation uncertainty due to management's judgments in determining significant assumptions that included assumed revenue growth and obsolescence factors. Changes in these significant assumptions could have a significant effect on the fair value of the intangible assets.
How We Addressed the Matter in Our Audit	We obtained an understanding, evaluated the design and tested the operating effectiveness of controls addressing the identified audit risks. For example, we tested controls over management's review of the significant assumptions used to develop the fair value estimates of the intangible assets. We also tested management's controls to validate that data used in the fair value estimates were complete and accurate. To test the estimated fair value of the intangible assets, we performed audit procedures that included, among others, evaluating the Company's valuation models with the assistance of valuation specialists, performing sensitivity analyses to determine which assumptions had the greatest impact on the overall determination of value, and testing the completeness and accuracy of the underlying data used to develop the assumptions. We also evaluated the assumptions by comparing them to market and economic trends, historical results of the Company's business and other guideline companies within the same industry.

Revenue recognition - Estimation of standalone selling price

Description of the Matter	As described in Note 1 to the consolidated financial statements, the Company's instrument is generally sold in a bundled arrangement and commonly includes the instrument, instrument accessories, installation, one-year period of service, training, and consumables. The consideration for bundled arrangements is allocated between separate performance obligations based on their individual standalone selling price. The Company estimates the standalone selling price of each performance obligation using average selling prices over a 12-month period combined with an assessment of current market conditions. If the standalone selling price is not directly observable, then the Company estimates the standalone selling price by considering multiple factors including, but not limited to, overall market conditions, including geographic or regional specific factors, internal costs, profit objectives, pricing practices and other observable inputs. Auditing the Company's estimated standalone selling price is complex and required a higher level of judgment due to the level of estimation and subjectivity in establishing the standard selling price for products that are not sold separately.
How We Addressed the Matter in Our Audit	We obtained an understanding, evaluated the design and tested the operating effectiveness of controls addressing the identified audit risks. For example, we tested controls over the process to determine the standalone selling price of each performance obligation. We also tested management’s controls to validate that data used were complete and accurate. We tested management’s calculation of the standalone selling price by evaluating the completeness and accuracy of the underlying data used in management's calculation by agreeing the data to historical transactions and contract pricing for backlog orders. We also performed sensitivity analyses of significant assumptions to evaluate the changes in revenue recognized for the period under audit that would result from changes in the Company's estimated standalone selling price for the performance obligations.

/s/ Ernst & Young LLP

We have served as the Company’s auditor since 2011.

Redwood City, California

February 28, 2022

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Balance Sheets

(in thousands, except per share amounts)	December 31, 2021	December 31, 2020
Assets		
Current assets		
Cash and cash equivalents	$ 460,725	$ 81,611
Investments	583,675	237,203
Accounts receivable, net	24,241	16,837
Inventory	24,599	14,230
Prepaid expenses and other current assets	7,394	4,870
Short-term restricted cash	500	836
Total current assets	1,101,134	355,587
Property and equipment, net	32,504	24,899
Operating lease right-of-use assets, net	46,617	29,951
Long-term restricted cash	4,592	3,500
Intangible assets, net	410,979	—
Goodwill	409,974	—
Other long-term assets	1,170	43
Total assets	$ 2,006,970	$ 413,980
Liabilities and Stockholders' Equity		
Current liabilities		
Accounts payable	$ 11,002	$ 3,579
Accrued expenses	36,261	17,350
Deferred revenue, current	10,977	8,722
Operating lease liabilities, current	7,710	4,332
Other liabilities, current	5,759	4,519
Total current liabilities	71,709	38,502
Deferred revenue, non-current	25,049	1,568
Contingent consideration liability, non-current	169,717	—
Operating lease liabilities, non-current	49,970	37,667
Convertible senior notes, net, non-current	896,067	—
Other liabilities, non-current	3,471	752
Total liabilities	1,215,983	78,489
Commitments and contingencies		
Stockholders' equity		
Preferred stock, $0.001 par value:		
Authorized 50,000 shares; No shares issued or outstanding	—	—
Common stock, $0.001 par value:		
Authorized 1,000,000 shares; issued and outstanding 220,978 and 192,294 shares at December 31, 2021 and December 31, 2020, respectively	221	192
Additional paid-in capital	2,009,945	1,372,083
Accumulated other comprehensive (loss) income	(1,087)	85
Accumulated deficit	(1,218,092)	(1,036,869)
Total stockholders' equity	790,987	335,491
Total liabilities and stockholders' equity	$ 2,006,970	$ 413,980

See accompanying notes to the consolidated financial statements.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Statements of Operations and Comprehensive (Loss) Income

(in thousands, except per share amounts)	Years Ended December 31, 2021	2020	2019
Revenue:			
Product revenue	$ 113,505	$ 65,424	$ 77,742
Service and other revenue	17,008	13,469	13,149
Total revenue	130,513	78,893	90,891
Cost of Revenue:			
Cost of product revenue	56,358	35,424	44,771
Cost of service and other revenue	14,989	10,903	11,544
Amortization of intangible assets	306	—	—
Total cost of revenue	71,653	46,327	56,315
Gross profit	58,860	32,566	34,576
Operating Expense:			
Research and development	112,899	64,152	59,630
Sales, general and administrative	124,124	72,799	75,491
Merger-related expenses	31,129	—	—
Change in fair value of contingent consideration	1,143	—	—
Total operating expense	269,295	136,951	135,121
Operating loss	(210,435)	(104,385)	(100,545)
Gain from Reverse Termination Fee from Illumina	—	98,000	—
(Loss)/Gain from Continuation Advances from Illumina	(52,000)	34,000	18,000
Interest expense	(12,530)	(267)	(2,611)
Other income, net	93	2,055	1,022
(Loss) income before benefit from income taxes	(274,872)	29,403	(84,134)
Benefit from income taxes	(93,649)	—	—
Net (loss) income	(181,223)	29,403	(84,134)
Other comprehensive (loss) income:			
Unrealized (loss) gain on investments	(1,172)	80	41
Comprehensive (loss) income	$ (182,395)	$ 29,483	$ (84,093)
Net (loss) income per share:			
Basic	$ (0.89)	$ 0.18	$ (0.55)
Diluted	$ (0.89)	$ 0.17	$ (0.55)
Weighted average shares outstanding used in calculating net (loss) income per share			
Basic	204,136	165,187	152,527
Diluted	204,136	174,970	152,527

See accompanying notes to the consolidated financial statements.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Statements of Stockholders' Equity

(in thousands)	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Accumulated Other Comprehensive (Loss) Income	Accumulated Deficit	Total Stockholders' Equity
Balance at December 31, 2018	150,244	150	1,096,053	(36)	(982,106)	114,061
Net loss	—	—	—	—	(84,134)	(84,134)
Other comprehensive gain	—	—	—	41	—	41
Issuance of common stock in conjunction with equity plans	2,875	3	8,545	—	—	8,548
Stock-based compensation expense	—	—	16,401	—	—	16,401
Balance at December 31, 2019	153,119	$ 153	$ 1,120,999	$ 5	$ (1,066,240)	$ 54,917
Net income	—	—	—	—	29,403	29,403
Other comprehensive gain	—	—	—	80	—	80
ASC326 adoption effect					(32)	(32)
Issuance of common stock in conjunction with equity plans	9,819	10	46,350	—	—	46,360
Issuance of common stock from Underwritten Public Equity Offerings, net of issuance costs	29,356	29	187,201	—	—	187,230
Stock-based compensation expense	—	—	17,533	—	—	17,533
Balance at December 31, 2020	192,294	$ 192	$ 1,372,083	$ 85	(1,036,869)	$ 335,491
Net loss	—	—	—	—	(181,223)	(181,223)
Other comprehensive loss	—	—	—	(1,172)	—	(1,172)
Issuance of common stock in conjunction with equity plans	8,557	9	31,797	—	—	31,806
Issuance of common stock in Private Placement, net of issuance costs	11,215	11	294,834	—	—	294,845
Issuance of common stock in acquisition of Omniome	8,912	9	237,876	—	—	237,885
Stock-based compensation expense	—	—	73,355	—	—	73,355
Balance at December 31, 2021	220,978	$ 221	$ 2,009,945	$ (1,087)	(1,218,092)	$ 790,987

See accompanying notes to the consolidated financial statements.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.
Consolidated Statements of Cash Flows

(in thousands)	Years Ended December 31, 2021	2020	2019
Cash flows from operating activities			
Net (loss) income	$ (181,223)	$ 29,403	$ (84,134)
Adjustments to reconcile net loss to net cash used in operating activities			
Loss (gain) from Continuation Advances	52,000	(34,000)	(18,000)
Depreciation	7,199	6,428	7,265
Amortization of intangibles	381	—	—
Amortization of right-of-use assets	4,005	2,876	2,683
Amortization of debt discount and financing costs	539	129	1,212
Stock-based compensation	73,355	17,533	16,401
Loss from derivative	—	—	(16)
Amortization (accretion) from investment premium (discount)	4,011	(107)	(913)
Change in the estimated fair value of contingent consideration	1,143	—	—
Loss on disposition of equipment	54	—	194
Deferred income taxes	(93,649)	—	—
Changes in assets and liabilities			
Accounts receivable	(7,166)	(1,603)	(6,671)
Inventory	(12,431)	(1,096)	3,915
Prepaid expenses and other assets	(1,024)	(1,063)	(523)
Accounts payable	6,363	(5,072)	1,713
Accrued expenses	15,320	4,102	2,333
Deferred revenue	25,736	729	2,134
Operating lease liabilities	(4,990)	(3,802)	(3,428)
Other liabilities	(803)	5,046	(2,477)
Net cash (used in) provided by operating activities	(111,180)	19,503	(78,312)
Cash flows from investing activities			
Purchase of property and equipment	(5,931)	(1,039)	(2,836)
Cash paid for purchase of Circulomics, net of cash acquired	(28,560)	—	—
Cash paid for purchase of Omniome, net of cash acquired	(291,233)	—	—
Purchase of investments	(988,046)	(373,283)	(57,727)
Sales of investments	212,734	1,400	1,500
Maturities of investments	422,505	153,600	121,110
Net cash (used in) provided by in investing activities	(678,531)	(219,322)	62,047
Cash flows from financing activities			
Continuation Advances	(52,000)	34,000	18,000
Proceeds from issuance of Convertible Senior Notes, net of issuance costs	895,536	—	—
Proceeds from issuance of common stock under equity offerings, net of issuance costs	294,845	187,479	—
Proceeds from issuance of common stock from equity plans	31,806	46,360	8,548
Notes payable principal payoff	(361)	(16,000)	—
Other	(245)	—	—
Net cash provided by financing activities	1,169,581	251,839	26,548
Net increase in cash and cash equivalents and restricted cash	379,870	52,020	10,283
Cash and cash equivalents and restricted cash at beginning of period	85,947	33,927	23,644
Cash and cash equivalents and restricted cash at end of period	$ 465,817	$ 85,947	$ 33,927
Cash and cash equivalents at end of period	460,725	81,611	29,627
Restricted cash at end of period	5,092	4,336	4,300
Cash and cash equivalents and restricted cash at end of period	$ 465,817	$ 85,947	$ 33,927
Supplemental disclosure of cash flow information			
Interest paid	$ 6,928	$ 491	$ 1,400
Supplemental disclosure of non-cash investing and financing activities			
Inventory transferred to property and equipment	2,586	1,097	2,062
Property and equipment transferred to inventory	(383)	(919)	(1,536)
Right-of-use asset and liability additions and modifications	2,576	-	-
Issuance of common stock in acquisition of Omniome	237,885	-	-

See accompanying notes to the consolidated financial statements.

NOTE 1. ORGANIZATION AND SIGNIFICANT ACCOUNTING POLICIES

Business Overview

We are a premier life science technology company that is designing, developing and manufacturing advanced sequencing solutions to help scientists and clinical researchers resolve genetically complex problems. Our products and technology under development stem from two highly differentiated core technologies focused on accuracy, quality and completeness which include our existing HiFi long read sequencing technology and our emerging short read Sequencing by Binding (SBB®) technology. Our products address solutions across a broad set of applications including human germline sequencing, plant and animal sciences, infectious disease and microbiology, oncology, and other emerging applications. Our focus is on providing our customers with advanced sequencing technologies with higher throughput and improved workflows that we believe will enable dramatic advancements in routine healthcare. Our customers include academic and governmental research institutions, commercial testing and service laboratories, genome centers, public health labs, hospitals and clinical research institutes, contract research organizations (CROs), pharmaceutical companies and agricultural companies.

References in this report to “PacBio,” “we,” “us,” the “Company,” and “our” refer to Pacific Biosciences of California, Inc. and its consolidated subsidiaries.

Basis of Presentation

Our consolidated financial statements have been prepared in conformity with accounting principles generally accepted in the United States, or U.S. GAAP, as set forth in the Financial Accounting Standards Board, or FASB, Accounting Standards Codification, or ASC. The consolidated financial statements include the accounts of Pacific Biosciences and our wholly owned subsidiaries. All intercompany transactions and balances have been eliminated.

Use of Estimates

The preparation of financial statements in conformity with GAAP requires us to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes to the financial statements. On an ongoing basis, we evaluate our significant estimates including, but not limited to, the valuation of inventory, the determination of stand-alone selling prices for revenue recognition, the fair value of contingent consideration, the valuation of acquired intangible assets, the fair value of certain equity awards, the useful lives assigned to long-lived assets, the computation of provisions for income taxes, the borrowing rate used in calculating the operating lease right-of-use assets and operating lease liabilities, the probability associated with variable payments under partnership development agreements, and the valuations related to our convertible senior notes. While the extent of the impact of the COVID-19 pandemic on our business is highly uncertain, we considered the impact on our assumptions and estimates used to determine the results reported and asset valuations as of December 31, 2021. Actual results could differ materially from these estimates.

Functional Currency

The U.S. dollar is the functional currency of our international operations. We remeasure foreign subsidiaries monetary assets and liabilities to the U.S. dollar and record net gains or losses from remeasurement in other income, net, in the consolidated statement of operations and comprehensive (loss) income.

Cash, Cash Equivalents, and Investments

We consider all highly liquid investments purchased with an original maturity of 90 days or less to be cash equivalents.

We classify our investments in debt securities as available-for sale and report the investments at fair value in current assets. We evaluate our available-for-sale investments in unrealized loss positions and assess whether the unrealized loss is credit-

related. Unrealized gains and losses that are not credit-related are recognized in accumulated other comprehensive (loss) income in stockholders' equity. Realized gains and losses, expected credit losses, as well as interest income, on available-for-sale securities are also reported in other income, net. The cost used in the determination of gains and losses of securities sold is based on the specific identification method. The cost of marketable securities is adjusted for the amortization of premiums and discounts to expected maturity. Premium and discount amortization is recorded in other income, net.

Our investment portfolio at any point in time contains investments in cash deposits, money market funds, commercial paper, corporate debt securities and US government and agency securities with high credit ratings. We have established guidelines regarding diversification and maturities of investments with the objectives of maintaining safety and liquidity, while maximizing yield.

Concentration and Credit Risks

Financial instruments that potentially subject us to credit risk consist principally of interest-bearing investments and trade receivables. We maintain cash, cash equivalents and investments with various major financial institutions. The counterparties to the agreements relating to our investment securities consist of various major corporations, financial institutions, municipalities and government agencies of high credit standing. At December 31, 2021, most of our cash was deposited with U.S. financial institutions. Our investment policy generally restricts the amount of credit exposure to any one issuer. There is no limit to the percentage of the portfolio that may be maintained in securities issued by the U.S. Treasury and U.S. Government Agencies, or other securities fully backed by US Treasury or Government agencies. We have not experienced significant credit losses from financial institutions.

Our trade receivables are derived from net revenue to customers and distributors located in the United States and other countries. We perform credit evaluations of our customers' financial condition and, generally, require no collateral from our customers. The allowance for doubtful accounts is based on our assessment of the collectability of customer accounts. We regularly review our trade receivable including consideration of factors such as historical experience, the age of the accounts receivable balances, customer creditworthiness, customer industry, and current and forecasted economic conditions that may affect a customer's ability to pay. We have not experienced any significant credit losses to date.

Although we have historically not experienced significant credit losses, our exposure to credit losses may increase if our customers are adversely affected by changes in economic pressures or uncertainty associated with local or global economic recessions, disruption associated with the current COVID-19 pandemic, or other customer-specific factors.

For the years ended December 31, 2021, 2020 and 2019, one customer, Gene Company Limited, accounted for approximately 13%, 14% and 17% our total revenue, respectively.

As of December 31, 2021 and 2020, 53% and 43% of our accounts receivable were from domestic customers, respectively. As of December 31, 2021, no customer represented 10% of greater of our net accounts receivable. As of December 31, 2020, two customers, Berry Genomics Co., Ltd and Gene Company Limited, represented approximately 15% and 12% of our net accounts receivable, respectively.

We currently purchase several key parts and components used in the manufacture of our products from a limited number of suppliers. Generally, we have been able to obtain an adequate supply of such parts and components but in certain instances have incurred additional costs to secure supply constrained materials. An extended interruption in the supply of parts and components currently obtained from our suppliers could adversely affect our business and consolidated financial statements.

Inventory

Inventories are stated at the lower of average cost or net realizable value. Cost is determined using the first-in, first-out ("FIFO") method. Adjustments to reduce the cost of inventory to its net realizable value, if required, are made for estimated excess or obsolete balances. Cost includes depreciation, labor, material, and overhead costs, including product and process technology costs while determining net realizable value of inventories involves numerous judgements, including projecting future average selling prices, sales volumes, and costs to complete products in work in process inventories.

We make inventory purchases and commitments to meet future shipment schedules based on forecasted demand for our products. The business environment in which we operate is subject to rapid changes in technology and customer demand. We perform a detailed assessment of inventory each period, which includes a review of, among other factors, demand requirements, product life cycle and development plans, component cost trends, product pricing, product expiration, and quality issues. Based on our analysis, we record adjustments to inventory for potentially excess, obsolete, or impaired goods, when appropriate, to report inventory at net realizable value. Inventory adjustments may be required if actual demand, component costs, supplier arrangements, or product life cycles differ from our estimates. Any such adjustments would result in a charge to our results of operations.

Property and Equipment, Net

Property and equipment are stated at cost, reviewed regularly for impairment charges, and depreciated over the estimated useful lives of the assets, using the straight-line method. Leasehold improvements are depreciated over the shorter of the lease term or the estimated useful life of the related asset. Major improvements are capitalized, while maintenance and repairs are expensed as incurred.

Estimated useful lives of the major classes of property and equipment are as follows:

	Estimated Useful Lives
Leasehold improvements	3 to 10 years
Lab equipment	3 to 5 years
Computer equipment	3 to 5 years
Computer software	3 years
Furniture and fixtures	3 to 5 years

Impairment of Tangible Long-Lived Assets

We periodically review property and equipment for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset is impaired or the estimated useful lives are no longer appropriate. Fair value is estimated based on discounted future cash flows. If indicators of impairment exist and the undiscounted projected cash flows associated with such assets are less than the carrying amount of the asset, an impairment loss is recorded to write the asset down to its estimated fair value. To date, we have not recorded any impairment charges.

Operating Leases

We record operating lease right-of-use assets and liabilities on our Consolidated Balance Sheets for all leases with a term of more than 12 months. The operating lease right-of-use assets and liabilities are calculated as the present value of remaining minimum lease payments over the remaining lease term using our estimated secured incremental borrowing rates at the commencement date. Lease payments included in the measurement of the lease liability comprise the fixed rent per the term of the Lease. Operating lease expense is recognized on a straight-line basis over the lease term, with variable lease payments, such as common area maintenance fees, recognized in the period incurred.

Goodwill and Intangible Assets

We perform annual impairment testing of goodwill and in-process research and development project (“IPR&D”) in the second quarter of each year, or more frequently if indicators of potential impairment exist.

We capitalize IPR&D assets and will begin to amortize the asset over the life of the product upon commercialization or record an impairment charge if the project is abandoned. We also capitalize finite-lived intangibles assets and amortize them on a straight-line basis over the estimated useful lives.

Finite-lived intangibles assets include our acquired developed technology and customer relationships. We regularly review the carrying amount and useful lives of our finite-lived assets to determine whether indicators of impairment may exist which warrant adjustments to carrying values or estimated useful lives.

Short-term Restricted Cash

At December 31, 2021, the short-term restricted cash balance of $0.5 million consisted of security deposits for employee credit cards.

Long-term Restricted Cash

Under the lease agreement for our corporate offices, we were required to establish a letter of credit for the benefits of the landlord and to submit $4.5 million as a deposit for the letter of credit in October 2015. Subsequently pursuant to the terms of the O'Brien Lease, beginning on May 1, 2019, the amount of the letter of credit was reduced by $0.5 million each year thereafter on May 1. As such, $3.0 million and $3.5 million was recorded in long-term restricted cash related to the O'Brien Lease in the Consolidated Balance Sheets as of December 31, 2021 and December 31, 2020, respectively.

In connection with the acquisition of Omniome in September 2021, we acquired $1.6 million of long-term restricted cash related to a letter of credit established for a facility lease.

Revenue Recognition

Our revenue is generated primarily from the sale of products and services. Product revenue primarily consists of sales of our instruments and related consumables. Service and other revenue consists primarily of revenue earned from product maintenance agreements.

We account for a contract with a customer when there is a legally enforceable contract between us and the customer, the rights of the parties are identified, the contract has commercial substance, and collectability of the contract consideration is probable. Revenues are recognized when control of the promised goods or services is transferred to our customers or services are performed, in an amount that reflects the consideration we expect to be entitled to in exchange for those goods or services.

Our instrument sales are generally sold in a bundled arrangement and commonly include the instrument, instrument accessories, installation, training, and consumables. Additionally, our instrument sale arrangements generally include a one-year period of service. For such bundled arrangements, we account for individual products and services separately if they are distinct, that is, if a product or service is separately identifiable from other items in the bundled package and if a customer can benefit from it on its own or with other resources that are readily available to the customer. Our customers cannot benefit from our instrument systems without installation, and installation can only be performed by us or qualified distributors. As a result, the system and installation are considered to be a single performance obligation recognized after installation is completed except for sales to qualified distributors, in which case the system is distinct and recognized when control has transferred to the distributor which typically occurs upon shipment.

The consideration for bundled arrangements is allocated between separate performance obligations based on their individual standalone selling price. We determine the best estimate of standalone selling price using average selling prices over a 12-month period combined with an assessment of current market conditions. If the standalone selling price is not directly observable, then we will estimate the SSP by considering multiple factors including, but not limited to, overall market conditions, including geographic or regional specific factors, internal costs, profit objectives, pricing practices and other observable inputs.

We recognize revenues as performance obligations are satisfied by transferring control of the product or service to the customer or over the term of a product maintenance agreement with a customer. Our revenue arrangements generally do not provide a right of return. Revenue is recorded net of discounts, distributor commissions, and sales taxes collected on behalf of governmental authorities.

We record deferred revenues when cash payments are received or due in advance of our performance. Deferred revenue for instrument service contracts is recognized over the related performance period, generally one year to five years, on a straight-line basis as we are standing ready to provide services and a time-based measure of progress best reflects the satisfaction of the performance obligation.

Cost of Revenue

Cost of revenue reflects the direct cost of product components, third-party manufacturing services and our internal manufacturing overhead and customer service infrastructure costs incurred to produce, deliver, maintain and support our instruments, consumables, and services. There are no incremental costs associated with our contractual revenue; all product development costs are reflected in research and development expense.

Manufacturing overhead is predominantly comprised of labor and facility costs. We determine and capitalize manufacturing overhead into inventory based on a standard cost model that approximates actual costs.

Service costs include the direct costs of components used in support, repair and maintenance of customer instruments as well as the cost of personnel, materials, shipping and support infrastructure necessary to support our installed customer base.

Research and Development

Research and development expense consists primarily of expenses for personnel engaged in the development of our core technology, the design and development of our future products and current product enhancements. These expenses also include prototype-related expenditures, development equipment and supplies, partner development costs, facilities costs and other related overhead. We expense research and development costs during the period in which the costs are incurred. However, we defer and capitalize non-refundable advance payments made for research and development activities until the related goods are received or the related services are rendered.

Credit Losses

We adopted Topic 326 on January 1, 2020. The adoption of Topic 326 did not have a material impact on our financial statements and our bad debt expense was immaterial as of the years ended December 31, 2020 and 2021.

Trade accounts receivable - The allowance for doubtful accounts is based on our assessment of the collectability of customer accounts. We regularly review the allowance by considering factors such as the age of the accounts receivable balances, customer creditworthiness, customer industry, and current and forecasted economic conditions that may affect a customer’s ability to pay.

Available-for-sale debt securities - Our investment portfolio at any point in time contains investments in cash deposits, money market funds, commercial paper, corporate debt securities and US government and agency securities. We regularly review the securities in an unrealized loss position and evaluate the current expected credit loss by considering factors such as significance of loss, historical experience, market data, issuer-specific factors, and current economic conditions and concluded that an allowance for credit losses was immaterial as of December 31, 2021. The unrealized losses on our investments are mainly attributable to government securities, including U.S. government and U.S. agency bond securities, impacted by movements in market rates and not due to issuer credit ratings. We have the ability to hold and do not intend to sell the investments in unrealized loss positions before the recovery of their amortized cost bases.

Although we have historically not experienced significant credit losses, our exposure to credit losses may increase if our customers are adversely affected by changes in economic pressures or uncertainty associated with local or global economic recessions, disruptions associated with the evolution of the COVID-19 pandemic, or other customer-specific factors.

Income Taxes

We account for income taxes under the asset and liability method, which requires, among other things, that deferred income taxes be provided for temporary differences between the tax bases of our assets and liabilities and the amounts reported in the financial statements. In addition, deferred tax assets are recorded for the future benefit of utilizing net operating losses and research and development credit carryforwards. The effect of a change in tax rates on the deferred tax assets and liabilities is recognized in the provision for income taxes in the period that includes the enactment date. A full valuation allowance is provided against our net deferred tax assets as it is more likely than not that the deferred tax assets will not be fully realized.

We regularly review our positions taken relative to income taxes. To the extent our tax positions are more likely than not going to result in additional taxes, we accrue the estimated amount of tax related to such uncertain positions.

Stock-based Compensation

We account for share-based payments using a fair-value based method for costs related to all share-based payments, including stock options, restricted stock units, and stock issued under our employee stock purchase plan ("ESPP"). We estimate the fair value of share-based payment awards that are stock options and issued under our ESPP on the date of grant using an option-pricing model. See *Note 10. Stockholders' Equity* for further information regarding stock-based compensation.

Other Comprehensive (Loss) Income

Other comprehensive (loss) income is comprised of unrealized gains (losses) on our investment securities.

Shipping and Handling

Costs related to shipping and handling are included in cost of revenues for all periods presented.

Recent Accounting Pronouncements

Recently Adopted Accounting Standards

In August 2020, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2020-06, *Debt—Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging—Contracts in Entity's Own Equity (Subtopic 815-40): Accounting for Convertible Instruments and Contracts in an Entity's Own Equity.* This guidance simplifies the accounting for convertible instruments primarily by eliminating the existing cash conversion and beneficial conversion models within Subtopic 470-20, which will result in fewer embedded conversion options being accounted for separately from the debt host. The guidance also amends and simplifies the calculation of earnings per share relating to convertible instruments. This guidance is effective for annual periods beginning after December 15, 2021, including interim periods within that reporting period, excluding smaller reporting companies. Early adoption is permitted, but no earlier than fiscal years beginning after December 15, 2020, including interim periods within that reporting period, using either a full or modified retrospective approach. We adopted ASU 2020-06 on January 1, 2021. Because we had no convertible instruments within the scope of ASU 2020-06 at the time of adoption, there was no impact of adoption on our consolidated financial statements. In February 2021, we issued $900 million of 1.50% Convertible Senior Notes due February 15, 2028, as described in *Note 7. Convertible Senior Notes*, which are accounted for under ASU 2020-06.

In December 2019, the FASB issued ASU No. 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes*. This ASU simplifies the accounting for income taxes by clarifying and amending existing guidance related to the recognition of franchise tax, the evaluation of a step up in the tax basis of goodwill, and the effects of enacted changes in tax laws or rates in the effective tax rate computation, among other clarifications. The standard is effective for our annual reporting periods beginning after December 15, 2020, including interim reporting periods within those fiscal years. We adopted ASU 2019-12 on January 1, 2021, and the adoption did not have a material impact on our consolidated financial statements.

Accounting Pronouncements Pending Adoption

In October 2021, the FASB issued ASU No. 2021-08, *Business Combinations (Topic 805): Accounting for Contract Assets and Contract Liabilities from Contracts with Customers.* This ASU provides specific guidance on how to recognize contract assets and contract liabilities related to revenue contracts with customers acquired in a business combination. This amendment improves comparability for both the recognition and measurement of acquired revenue contracts with customers at the date of and after a business combination. This authoritative guidance will be effective for us in the first quarter of 2023, with early adoption permitted. We are currently evaluating the effect of this new guidance on our consolidated financial statements.

NOTE 2. BUSINESS ACQUISITIONS

Omniome, Inc.

On September 20, 2021, we completed our acquisition of Omniome, Inc. ("Omniome"), a San Diego-based company developing a highly differentiated, proprietary short-read DNA sequencing platform capable of delivering high accuracy.

In connection with the acquisition, all outstanding equity securities of Omniome were cancelled in exchange for approximately $315.7 million in cash, 8,911,580 shares of our common stock with a fair value of $249.4 million and contingent consideration with a fair value of $168.6 million. The fair value of the 8,911,580 common shares issued was determined based on the closing market price of PacBio's common shares on the acquisition date.

In addition, approximately $18.9 million, comprised of $7.4 million of cash, 226,811 shares of our common stock with a fair value of $6.3 million, and $5.2 million related to contingent consideration, was accounted for as a one-time post acquisition stock-based compensation expense. This stock-based compensation expense was due to accelerated vesting of Omniome stock awards in connection with the acquisition.

Total consideration transferred for the acquisition is as follows (in thousands):

Total cash paid	$	315,703
Fair value of share consideration		249,435
Fair value of contingent consideration		168,574
Less: Stock-based compensation expense excluded from consideration transferred		(18,923)
Total consideration transferred	$	714,789

The contingent consideration of $200 million (composed of $100 million in cash and $100 million in shares of our common stock) is due upon the achievement of a milestone, defined as the first commercial shipment to a customer of a nucleotide sequencing platform, comprising both an instrument and related consumables, that utilizes SBB technology. The number of shares of stock to be issued will be determined using the volume-weighted average of the trading prices of our common stock for the twenty trading days ending with and including the trading day that is two days immediately prior to the achievement of the milestone. Of the $100 million in shares of our common stock to be issued as part of the milestone, $4.1 million is attributable to stock options issued by PacBio in replacement of Omniome's unvested options as part of the transaction.

The contingent consideration is accounted for as a liability at fair value, with changes during each reporting period recognized in our Consolidated Statements of Operations and Comprehensive (Loss) Income. The fair value of the contingent consideration liability, with the assistance from a third-party valuation firm, is based on a scenario-based method which considers a range of possible outcomes and their assigned probabilities of occurrence. The potential outcomes are discounted to present value at a discount rate equal to the sum of the term-matched risk-free-interest rate plus PacBio's credit spread.

The acquisition was accounted for as a business combination and, accordingly, the total fair value of the consideration transferred was allocated to the tangible and intangible assets acquired and liabilities assumed based on their fair values on the acquisition date. The major classes of assets and liabilities to which we have allocated the total fair value of the consideration transferred were as follows (in thousands):

Cash and cash equivalents	$	15,338
Property and equipment, net		6,123
Operating lease right-of-use assets, net		18,095
In-process research and development ("IPR&D")		400,000
Goodwill		390,665
Other assets		3,203
Deferred income tax liability		(91,814)
Liabilities assumed		(26,821)
Total consideration transferred	$	714,789

The purchase price allocation is preliminary. We continue to collect information regarding certain estimates and assumptions, including potential liabilities and contingencies. We will recognize adjustments to the preliminary amounts with a corresponding adjustment to goodwill in the reporting period in which the adjustments to the preliminary amounts are determined over a period not to exceed twelve months.

During the year ended December 31, 2021, we recorded a measurement period adjustment of $1.6 million to decrease goodwill and a corresponding $0.4 million to decrease the deferred tax liability on the Consolidated Balance Sheet, and a $1.2 million decrease to our benefit from income taxes on the Consolidated Statements of Operations and Comprehensive (Loss) Income. The measurement period adjustment was due to new information that became available to us upon the completion of the IRC Section 382 Tax Study, where we identified additional net operating losses that are available to us from acquired assets. Refer to *Note 9. Income Taxes* for more information.

The goodwill recognized was primarily attributable to the assembled workforce and synergies that are expected to occur from the integration of Omniome and is not deductible for income tax purposes.

We allocated $400 million of the purchase price to acquired in-process research and development. The fair value of the IPR&D was determined, with the assistance of a third-party valuation firm, using an income approach based on a forecast of expected future cash flows. Expected future cash flows utilize significant assumptions such as assumed revenue growth, discount rate and obsolescence factors. The IPR&D will remain on our consolidated balance sheet as an indefinite-lived intangible asset until the completion or abandonment of the associated research and development activities. During the development period following the acquisition, IPR&D will not be amortized, but instead will be tested for impairment annually and more frequently if events or changes in circumstances indicate that it is more likely than not that the asset is impaired.

We incurred costs related to the Omniome acquisition of approximately $12.0 million during the twelve months ended December 31, 2021, which are included in merger-related costs on the Consolidated Statement of Operations and Comprehensive (Loss) Income.

Separately, in connection with the Omniome acquisition, on September 20, 2021, we issued and sold 11,214,953 shares of common stock in a private placement transaction at a price of $26.75 per share, for aggregate proceeds of approximately $294.8 million, net of issuance costs of approximately $5.2 million. We were also required to register the private placement shares for resale following the closing of the merger.

The following unaudited pro forma financial information presents combined results of operations for each of the periods presented as if Omniome had been acquired as of the beginning of the comparable fiscal year prior to the year of acquisition, giving effect on a pro forma basis to the purchase accounting adjustments such as $12.0 million of PacBio acquisition-related costs, $18.9 million of stock-based compensation expense related to acceleration of certain Omniome stock options not attributable to pre-combination service, and a $91.0 million one-time income tax benefit from the reduction of our deferred tax asset valuation allowance resulting from the Omniome acquisition, as well as a pro forma adjustment to reflect $16.7 million of Omniome's acquisition-related costs. The unaudited pro forma information presented below is for

informational purposes only and is not necessarily indicative of the consolidated results of the combined business had the acquisition actually occurred at the beginning of the fiscal year 2020 or the results of future operations of the combined business.

The following table summarizes the unaudited pro forma financial information:

(in thousands, except per share amounts)	Years Ended December 31, 2021	2020
Pro forma total revenue	$ 130,513	$ 78,893
Pro forma net (loss) income	$ (278,451)	$ 17,510
Pro forma net (loss) income per share - basic and diluted	$ (1.27)	$ 0.09

Our consolidated financial statements include the results of operations for Omniome beginning September 20, 2021. Since the date of acquisition, revenues of $0 and a net loss of $15.6 million from the acquired Omniome business have been included in our Consolidated Statement of Operations and Comprehensive (Loss) Income for the twelve months ended December 31, 2021.

Circulomics, Inc.

On July 20, 2021, we acquired Circulomics Inc. (“Circulomics”), a Maryland-based biotechnology company focused on delivering highly differentiated sample preparation products that enable genomic workflows.

We paid $29.5 million in cash in exchange for all outstanding shares of common stock of Circulomics. We allocated the consideration transferred to the identifiable assets acquired and liabilities assumed based on their respective fair values at the date of the completion of the acquisition. The major classes of assets and liabilities to which we have allocated the total fair value of the consideration transferred were as follows (in thousands):

Cash and cash equivalents	$ 987
Property and equipment, net	214
Intangible assets	11,360
Goodwill	19,309
Other assets	467
Deferred income tax liability	(2,672)
Liabilities assumed	(118)
Total consideration transferred	$ 29,547

The excess of the value of consideration paid over the aggregate fair value of those net assets has been recorded as goodwill. We recognized goodwill of $19.3 million, which is primarily attributable to the synergies expected from capabilities in extraction and sample preparation and is not deductible for income tax purposes.

We recorded $11.4 million for the fair value of acquired intangible assets, of which $11.0 million consists of developed technology. The fair value of the developed technology was determined, with the assistance from a third-party valuation firm, using an income approach based on a forecast of expected future cash flows. The purchase price allocation is preliminary as we continue to collect information with regard to certain estimates and assumptions. We will record adjustments to the fair value of the assets acquired, liabilities assumed and goodwill within the twelve-month measurement period, if necessary.

NOTE 3. INVITAE COLLABORATION ARRANGEMENT

On January 12, 2021 we entered into a multi-year Development and Commercialization Agreement (the “Development Agreement”) with Invitae Corporation (“Invitae”). Pursuant to the Development Agreement, Invitae is providing certain funding to us to develop products relating to production-scale high-throughput sequencing (“Program Products”). If Program Products become commercially available, Invitae may purchase the Program Products. In addition to selling the Program Products to Invitae, we will have the right to broadly commercialize Program Products for sale to other customers.

Under the Development Agreement, Invitae is funding certain development costs we incur in connection with the Program Products ("Program Development Costs"). Under the Development Agreement, we will be responsible for conducting a program to develop Program Products, and subsequently for manufacturing the Program Product. We jointly make general decisions regarding the development program with Invitae but we are responsible for research and development activities. The development program is expected to last approximately sixty months but may be shorter or longer.

The primary benefit of the arrangement to Invitae is preferred pricing on the Program Products. Each Program Product will have a preferential pricing period, which will not exceed four years from the date of the first delivery of that Program Product ("Preferential Pricing Period"). During the Preferential Pricing Period for each Program Product, we are obligated to sell the Program Product at a substantial discount to Invitae until a multiple of the contribution received from Invitae is repaid. For a specified period after the end of the Preferential Pricing Period, we have arranged to sell the Program Product to Invitae at a higher price, as determined by a formula, than the price during the Preferential Pricing Period ("Extended Pricing Period"). The Extended Pricing Periods will terminate early if Invitae does not meet certain volume minimums.

We and Invitae may terminate the Development Agreement if the other party remains in material breach of the Development Agreement following a cure period to remedy the material breach and certain other circumstances by each party, including circumstances where Invitae may terminate for delays, intellectual property concerns, our change in control, or without cause.

In certain termination circumstances, (i) we will be obligated to refund all or a portion of the development costs advanced by Invitae and/or (ii) we will owe Invitae a share of the revenue that may be generated from the sale of the Program Products to third parties if and when they are commercialized, until such time as Invitae has recouped the amounts paid to us, and in certain circumstances, a mutually agreed return.

We have incurred and expect to incur significant development costs over the duration of the Development Agreement. There can be no assurances that the development program will be successful or that the Program Products will become ready for commercial sale.

The contract is accounted for in accordance with Accounting Standards Codification ("ASC") Topic 606, *Revenue from Contracts with Customers* as the primary benefit from the arrangement to Invitae is the ability to procure the Program Products during the Preferential Pricing Period at substantial discounts. Invitae is not expected to substantially benefit from the intellectual property developed under the arrangement, or benefit from other goods or services during the development period.

We will recognize proportionate amounts of the material right in revenue as the performance obligations are satisfied, which is when Invitae places purchase orders for Program Products and the associated goods or services are delivered. Discounts that are not expected to be used will be recognized consistent with the guidance in Topic 606 relating to breakage, in proportion to the expected purchases by Invitae. Any remaining unused discounts will be recognized when they expire.

All amounts received from Invitae are initially deferred and accumulated in deferred revenue, non-current. As of December 31, 2021, we have recognized payments received from Invitae of $23.5 million in deferred revenue, non-current, on the Consolidated Balance Sheet.

Costs incurred to develop the Program Products are research and development costs and are expensed as incurred. There were no capitalized origination or fulfilment costs related to the arrangement with Invitae that are eligible to be capitalized.

NOTE 4. TERMINATION OF MERGER WITH ILLUMINA

On November 1, 2018, we entered into an Agreement and Plan of Merger (as amended, the "Illumina Merger Agreement") with Illumina, Inc. ("Illumina") and FC Ops Corp., a wholly owned subsidiary of Illumina ("Illumina Merger Sub"). On January 2, 2020, we, Illumina and Illumina Merger Sub, entered into an agreement to terminate the Merger Agreement (the "Termination Agreement").

Continuation Advances from Illumina

As part of the Termination Agreement, Illumina paid us cash payments ("Continuation Advances") of $18.0 million during the fourth quarter of 2019 and $34.0 million during the first quarter of 2020. We recorded the $34.0 million and $18.0 million as non-operating income in the Consolidated Statements of Operations and Comprehensive (Loss) Income for the years ended December 31, 2020 and 2019, respectively.

Up to the full $52.0 million of Continuation Advances paid to us were repayable without interest to Illumina if, within two years of March 31, 2020, we entered into, or consummated a Change of Control Transaction or raised at least $100 million in a single equity or debt financing (that may have multiple closings), with the amount repayable dependent on the amount raised by us.

Resulting from the issuance and sale of $900 million of 1.50% Convertible Senior Notes due February 15, 2028, $52.0 million of Continuation Advances were paid without interest to Illumina in February 2021 and recorded a non-operating expense in the Consolidated Statements of Operations and Comprehensive (Loss) Income for the year ended December 31, 2021. Please refer to *Note 1. Organization and Significant Accounting Policies* for the accounting treatment of the Continuation Advances.

Reverse Termination Fee from Illumina

As part of the Termination Agreement, Illumina paid us a $98.0 million termination fee (the "Reverse Termination Fee"), from which we paid our financial advisor associated fees of $6.0 million in April 2020. Pursuant to the Termination Agreement, in the event that, on or prior to September 30, 2020, we entered into a definitive agreement providing for, or consummated, a Change of Control Transaction, then we may have been required to repay the Reverse Termination Fee (without interest) to Illumina in connection with the consummation of such Change of Control Transaction. As indicated in ASC 450, *Contingencies*, a gain contingency usually is not recognized in the financial statements until the period in which all contingencies are resolved and the gain is realizable. As such, we deferred the gain from the Reverse Termination Fee from Illumina until the date when the associated contingency lapsed. On October 1, 2020, the contingency clauses lapsed and we recorded the $98.0 million as a part of non-operating income in the fourth quarter of 2020.

NOTE 5. FINANCIAL INSTRUMENTS

Fair Value of Financial Instruments

Fair value is the exchange price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

The fair value hierarchy established under GAAP requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. The three levels of inputs that may be used to measure fair value are as follows:

- Level 1: quoted prices in active markets for identical assets or liabilities;
- Level 2: inputs other than Level 1 that are observable, either directly or indirectly, such as quoted prices in active markets for similar assets or liabilities, quoted prices for identical or similar assets or liabilities in markets that are not active, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities; and
- Level 3: unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

We consider an active market as one in which transactions for the asset or liability occurs with sufficient frequency and volume to provide pricing information on an ongoing basis. Conversely, we view an inactive market as one in which there are few transactions for the asset or liability, the prices are not current, or price quotations vary substantially either over

time or among market makers. Where appropriate, our non-performance risk, or that of our counterparty, is considered in determining the fair values of liabilities and assets, respectively.

We classify our cash deposits and money market funds within Level 1 of the fair value hierarchy because they are valued using bank balances or quoted market prices. We classify our investments as Level 2 instruments based on market pricing and other observable inputs. We did not classify any of our investments within Level 3 of the fair value hierarchy.

Assets and liabilities measured at fair value are classified in their entirety based on the lowest level input that is significant to the fair value measurement. Our assessment of the significance of a particular input to the entire fair value measurement requires management to make judgments and consider factors specific to the asset or liability.

The carrying amount of our accounts receivable, prepaid expenses, other current assets, accounts payable, accrued expenses and other liabilities, current, approximate fair value due to their short maturities.

Assets and Liabilities Measured at Fair Value on a Recurring Basis

The following table sets forth the fair value of our financial assets and liabilities that were measured on a recurring basis as of December 31, 2021 and December 31, 2020 respectively:

	December 31, 2021				December 31, 2020			
(in thousands)	**Level 1**	**Level 2**	**Level 3**	**Total**	**Level 1**	**Level 2**	**Level 3**	**Total**
Assets								
Cash and cash equivalents:								
Cash and money market funds	$ 327,315	$ —	$ —	$ 327,315	$ 43,040	$ —	$ —	$ 43,040
Commercial paper	—	133,185	—	133,185	—	32,537	—	32,537
U.S. government & agency securities	—	225	—	225	—	170	—	170
U.S. Treasury security	—	—	—	—	—	5,864	—	5,864
Total cash and cash equivalents	327,315	133,410	—	460,725	43,040	38,571	—	81,611
Investments:								
Commercial paper	—	187,632	—	187,632	—	112,644	—	112,644
Corporate debt securities	—	8,968	—	8,968	—	17,456	—	17,456
U.S. government & agency securities	—	387,075	—	387,075	—	107,103	—	107,103
Total investments	—	583,675	—	583,675	—	237,203	—	237,203
Short-term restricted cash:								
Cash	500	—	—	500	836	—	—	836
Long-term restricted cash:								
Cash	4,592	—	—	4,592	3,500	—	—	3,500
Total assets measured at fair value	$ 332,407	$ 717,085	$ —	$ 1,049,492	$ 47,376	$ 275,774	$ —	$ 323,150
Liabilities								
Continuation advances	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
Contingent consideration	—	—	169,717	169,717	—	—	—	—
Total liabilities measured at fair value	$ —	$ —	$ 169,717	$ 169,717	$ —	$ —	$ —	$ —

We classify contingent consideration, which was incurred in connection with the acquisition of Omniome, within Level 3 as factors used to develop the estimate of fair value include unobservable inputs that are not supported by market activity and are significant to the fair value.

On a quarterly basis, we estimate the fair value of the contingent consideration liability by discounting the probability-weighted outcomes to present value using an estimate of our borrowing rate and the risk-free rate. The potential outcomes of milestone achievement dates are within the period from December 31, 2022 to June 30, 2025. A decrease in the probability of an earlier scenario within this range would result in a decrease in the fair value of the liability. The discount rates used are the sum of the U.S. risk-free rate and the estimated subordinated credit spread for B- and B credit rating, which ranges from 4.8% to 5.5%. Changes in our estimated subordinated credit spread can result in changes in the fair value of the contingent consideration liability, where a lower credit spread may result in an increased liability valuation.

Changes in the estimated fair value of the contingent consideration liability for the year ended December 31, 2021 were as follows:

(in thousands)	Level 3
Beginning balance as of January 1, 2021	-
Acquisition of Omniome	168,574
Change in estimated fair value	1,143
Ending balance as of December 31, 2021	169,717

Changes to the fair value are recorded as the Change in fair value of contingent consideration in the Consolidated Statement of Operations and Comprehensive (Loss) Income.

As of December 31, 2020, we classified the Continuation Advances, which were incurred in connection with the Illumina Merger Agreement and were subject to repayment under certain circumstances, as a financial liability and were reported at fair value. The estimated fair value of the liability related to the Continuation Advances was determined using Level 3 inputs, or significant unobservable inputs. Management assessed the fair value of this financial instrument to be zero at December 31, 2020.

We were first approached by SB Northstar LP during the quarter ended March 31, 2021 regarding a potential convertible debt transaction. As discussed further below in *Note 7. Convertible Senior Notes*, in February 2021, we entered into an investment agreement with SB Northstar LP for the issuance and sale of $900 million of 1.50% Convertible Senior Notes due February 15, 2028. As a result, $52.0 million of Continuation Advances were repaid without interest to Illumina in February 2021 and recorded as a non-operating expense in the Consolidated Statements of Operations and Comprehensive (Loss) Income for the year ended December 31, 2021. There was no further liability exposure for Continuation Advances as of December 31, 2021.

For the year ended December 31, 2021, there were no transfers between Level 1, Level 2, or Level 3 assets or liabilities reported at fair value on a recurring basis and our valuation techniques did not change compared to the prior year. As discussed above, we recorded a contingent consideration liability in connection with our acquisition of Omniome during the year ended December 31, 2021.

Cash, Cash Equivalents and Investments

The following table summarizes our cash, cash equivalents and investments as of December 31, 2021 and 2020:

	As of December 31, 2021			
(in thousands)	**Amortized Cost**	**Gross unrealized gains**	**Gross unrealized losses**	**Fair Value**
Cash and cash equivalents:				
Cash and money market funds	$ 327,316	$ —	$ —	$ 327,316
Commercial paper	133,190	—	(5)	133,185
U.S. government & agency securities	225	—	—	224
Total cash and cash equivalents	460,731	—	(5)	460,725
Investments:				
Commercial paper	187,705	—	(73)	187,632
Corporate debt securities	8,964	9	(5)	8,968
U.S. government & agency securities	388,088	1	(1,014)	387,075
Total investments	584,757	10	(1,092)	583,675
Total cash, cash equivalents and investments	$ 1,045,488	$ 10	$ (1,097)	$ 1,044,400
Short-term restricted cash:				
Cash	$ 500	$ —	$ —	$ 500
Long-term restricted cash:				
Cash	$ 4,592	$ —	$ —	$ 4,592

	As of December 31, 2020			
(in thousands)	**Amortized Cost**	**Gross unrealized gains**	**Gross unrealized losses**	**Fair Value**
Cash and cash equivalents:				
Cash and money market funds	$ 43,040	$ —	$ —	$ 43,040
Commercial paper	32,538	—	(1)	32,537
U.S. government & agency securities	170	—	—	170
U.S. Treasury security	5,864	—	—	5,864
Total cash and cash equivalents	81,612	—	(1)	81,611
Investments:				
Commercial paper	112,648	4	(8)	112,644
Corporate debt securities	17,360	96	—	17,456
U.S. government & agency securities	107,109	6	(12)	107,103
Total investments	237,117	106	(20)	237,203
Total cash, cash equivalents and investments	$ 318,729	$ 106	$ (21)	$ 318,814
Short-term restricted cash:				
Cash	$ 836	$ —	$ —	$ 836
Long-term restricted cash:				
Cash	$ 3,500	$ —	$ —	$ 3,500

The following table summarizes the contractual maturities of our cash equivalents and available-for-sale investments, excluding money market funds, as of December 31, 2021:

(in thousands)	**Fair Value**
Due in one year or less	$ 595,063
Due after one year through 5 years	122,022
Total investments	$ 717,085

Actual maturities may differ from contractual maturities because issuers may have the right to call or prepay obligations without call or prepayment penalties.

NOTE 6. BALANCE SHEET COMPONENTS

Short-term restricted cash

As of December 31, 2021, the short-term restricted cash balance of $0.5 million was comprised of security deposits for the credit cards of employees. As of December 31, 2020, the short-term restricted cash balance of $0.8 million was comprised of $0.5 million for a customer deposit and $0.3 million for a security deposit for the credit cards of employees.

In connection with the acquisition of Omniome in September 2021, we acquired $0.2 million of short-term restricted cash consisting of a security deposit for credit cards of Omniome employees.

Inventory

As of December 31, 2021 and 2020, our inventory consisted of the following components:

	December 31,	
(in thousands)	**2021**	**2020**
Purchased materials	$ 7,993	$ 3,531
Work in process	8,611	6,651
Finished goods	7,995	4,048
Inventory	$ 24,599	$ 14,230

Property and Equipment, Net

As of December 31, 2021 and 2020, our property and equipment, net, consisted of the following components:

	December 31,	
(in thousands)	**2021**	**2020**
Laboratory equipment and machinery	$ 31,534	$ 24,948
Leasehold improvements	31,114	29,931
Computer equipment	15,059	12,400
Software	5,578	4,940
Furniture and fixtures	3,202	2,434
Construction in progress	2,303	137
	88,790	74,790
Less: Accumulated depreciation	(56,286)	(49,891)
Property and equipment, net	$ 32,504	$ 24,899

Depreciation expense during the years ended December 31, 2021, 2020 and 2019 was $7.2 million, $6.4 million and $7.3 million, respectively.

Long-term restricted cash

For our facility located at 1305 O’Brien Drive, Menlo Park, California (the “O’Brien Lease”), we were required to establish a letter of credit for the benefit of the landlord and to submit $4.5 million as a deposit for the letter of credit in October 2015. Subsequently, pursuant to the terms of the O’Brien Lease, beginning on May 1, 2019, the amount of the letter of credit was reduced by $0.5 million each year thereafter on May 1. As such, $3.0 million and $3.5 million was recorded in long-term restricted cash related to the O’Brien Lease in the Consolidated Balance Sheets as of December 31, 2021 and December 31, 2020, respectively.

In connection with the acquisition of Omniome in September 2021, we acquired $1.6 million of long-term restricted cash related to a letter of credit established for a facility lease.

Goodwill and intangible assets

Goodwill

Goodwill arises from business combinations and represents the excess of the purchase price over the fair value of the net assets and other identifiable intangible assets acquired. The fair values of net tangible assets and intangible assets acquired are based upon preliminary valuations and our estimates and assumptions are subject to change within the measurement period (potentially up to one year from the acquisition date).

The following table presents the changes in the carrying amount of goodwill for the periods indicated (in thousands):

Balance as of December 31, 2020	$ -
Acquisition of Omniome	390,665
Acquisition of Circulomics	19,309
Balance as of December 31, 2021	$ 409,974

Acquired Intangible Assets

Intangible assets include acquired in-process research and development (IPR&D) of $400 million as a result of the Omniome acquisition in September 2021.

In addition to IPR&D, we had the following acquired definite-lived intangible assets as of December 31, 2021 (in thousands, except years):

	Estimated Useful Life (in years)	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Developed technology	15	$ 11,000	$ (306)	$ 10,694
Customer relationships	2	360	(75)	285
Total		$ 11,360	$ (381)	$ 10,979

Amortization expense of intangibles was $0.4 million for the year ended December 31, 2021. We had no amortization expense of intangibles for the years ended December 31, 2020 and 2019.

The estimated future amortization expense of acquisition-related intangible assets with definite lives is estimated as follows (in thousands):

2022	$ 913
2023	838
2024	733
2025	733
2026	733
2027 and thereafter	7,029
Total	$ 10,979

Accrued Expenses

As of December 31, 2021 and 2020, our accrued expenses consisted of the following components:

	December 31,	
(in thousands)	**2021**	**2020**
Salaries and benefits	$ 25,282	$ 15,261
Accrued product development costs	1,936	415
Accrued interest payable	5,100	—
Inventory accrual	108	218
Warranty	594	161
Accrued professional services and legal fees	1,640	726
Other	1,601	569
Accrued expenses	$ 36,261	$ 17,350

Deferred Revenue

As of December 31, 2021, we had a total of $ 36.0 million of deferred revenue, $11.0 million of which was recorded as deferred revenue, current and primarily relates to deferred service contract revenues to be recognized over the next year and the remaining $25.0 million was recorded as deferred revenue, non-current. Of the deferred revenue, non-current balance, $23.5 million relates to payments received under the Invitae collaboration and $1.5 million primarily relates to deferred service contract revenues and is scheduled to be recognized in the next 5 years. Revenue recorded in the year ended December 31, 2021 includes $8.6 million of previously deferred revenue that was included in “Deferred revenue, current” as of December 31, 2020. Contract assets as of December 31, 2021 and December 31, 2020 were not material.

As of December 31, 2021, we had a total of $0.7 million of deferred commissions included in “Prepaid expenses and other current assets” which is recognized as the related revenue is recognized. Additionally, as a practical expedient, we expense costs to obtain a contract as incurred if the amortization period would have been a year or less.

Term Loans

In connection with the acquisition of Omniome, we acquired $1.3 million in short-term debt and $3.0 million in long-term debt relating to a term loan facility that Omniome obtained in April 2020. Borrowings on the term loan facility were used to fund Omniome’s purchases of equipment, which serves as collateral. Each term loan has a term of 43 months and bears a fixed interest rate of approximately 17% annually. The fee for the elective option to prepay all, but not less than all, of the borrowed amounts at any time after the 24th month and before the 43rd month after the commencement date, is 4% of the outstanding loan balance. Payments are made in equal monthly installments including principal and interest.

As of December 31, 2021, the carrying value of term loans outstanding was $3.9 million. The related long-term portion of $2.3 million was recorded as part of “Other liabilities, non-current” and the short-term portion of $1.6 million was recorded as part of “Other liabilities, current” on the Consolidated Balance Sheet. The interest expense was $0.2 million for the year ended December 31, 2021, which was included as part of interest expense in the Consolidated Statement of Operations and Comprehensive (Loss) Income.

As of December 31, 2021, the future principal payments remaining on term loans was the following:

(in thousands)	
2022	$ 1,608
2023	1,842
2024	490
Total	$ 3,940

Other liabilities, current

As of December 31, 2021 and 2020, our Other liabilities, current consisted of the following components:

	December 31,	
(in thousands)	**2021**	**2020**
Accrued ESPP	$ 3,598	$ 2,037
Other	2,161	2,482
Other liabilities, current	$ 5,759	$ 4,519

NOTE 7. CONVERTIBLE SENIOR NOTES

On February 9, 2021, we entered into an investment agreement (the "Investment Agreement") with SB Northstar LP (the "Purchaser"), a subsidiary of SoftBank Group Corp., relating to the issuance and sale to the Purchaser of $900 million in aggregate principal amount of our 1.50% Convertible Senior Notes (the "Notes"). The Notes were issued on February 16, 2021.

The Notes are governed by an indenture (the "Indenture") between the Company and U.S. Bank National Association, as trustee. The Notes bear interest at a rate of 1.50% per annum. Interest on the Notes is payable semi-annually in arrears on February 15 and August 15 and commenced on August 15, 2021. The Notes will mature on February 15, 2028, subject to earlier conversion, redemption or repurchase.

The Notes are convertible at the option of the holder at any time until the second scheduled trading day prior to the maturity date, including in connection with a redemption by the Company. The Notes are convertible into shares of our common stock based on an initial conversion rate of 22.9885 shares of common stock per $1,000 principal amount of the Notes (which is equal to an initial conversion price of $43.50 per share), in each case subject to customary anti-dilution and other adjustments as a result of certain extraordinary transactions. Upon conversion of the Notes, we may elect to settle such conversion obligation in shares, cash or a combination of shares and cash.

On or after February 20, 2026, the Notes will be redeemable by the Company in the event that the closing sale price of our common stock has been at least 150% of the conversion price then in effect for at least 20 trading days (whether or not consecutive) during any 30 consecutive trading day period (including the last trading day of such period) ending on, and including, the trading day immediately preceding the date on which we provide the redemption notice at a redemption price of 100% of the principal amount of such Notes, plus accrued and unpaid interest up to, but excluding, the redemption date.

With certain exceptions, upon a change of control of the Company or the failure of our common stock to be listed on certain stock exchanges (a "Fundamental Change"), the holders of the Notes may require that we repurchase all or part of the principal amount of the Notes at a purchase price of par plus unpaid interest up to, but excluding, the maturity date.

The Indenture includes customary "events of default," which may result in the acceleration of the maturity of the Notes under the Indenture. The Indenture also includes customary covenants for convertible notes of this type.

To the extent we elect, the sole remedy for an event of default relating to our failure to comply with certain of our reporting obligations shall, for the first 360 calendar days after the occurrence of such an event of default, consist exclusively of the right to receive additional interest on the Notes at a rate equal to (i) 0.25% per annum of the principal amount of the Notes outstanding for each day during the first 180 calendar days of the 360-day period after the occurrence of such an event of default during which such event of default is continuing (or, if earlier, the date on which such event of default is cured or waived) and (ii) 0.50% per annum of the principal amount of the Notes outstanding for each day from, and including, the 181st calendar day to, and including, the 360th calendar day after the occurrence of such an event of default during which such event of default is continuing (or, if earlier, the date on which such event of default is cured or waived as provided for in the Indenture). On the 361st day after such event of default (if the event of default relating to our failure to comply with its obligations is not cured or waived prior to such 361st day), the Notes shall be subject to acceleration as provided for in the Indenture.

The notes are accounted for in accordance with the authoritative guidance for convertible debt instruments that may be settled in cash upon conversion. Under ASU 2020-06, the guidance requires that debt with an embedded conversion feature is accounted for in its entirety as a liability and no portion of the proceeds from the issuance of the convertible debt instrument is accounted for as attributable to the conversion feature unless the conversion feature is required to be accounted for separately as an embedded derivative or the conversion feature results in a substantial premium. The conversion feature of the Notes is not accounted for as an embedded derivative because it is considered to be indexed to our common stock, and the Notes were not issued at a premium; therefore, the Notes are accounted for in their entirety as a liability. Because we may elect to settle any conversions entirely in shares, and because settlement in shares is the default settlement method, the liability is classified as non-current.

The requirement to repurchase the Notes including unpaid interest to the maturity date in the event of a Fundamental Change is considered a put option for certain periods requiring bifurcation under ASC 815 – *Derivatives and Hedging.* However, given the low probability of a Fundamental Change occurring during the applicable periods, the value of the embedded derivative is immaterial.

The additional interest feature in the event of our failure to comply with certain reporting obligations is also considered an embedded derivative requiring bifurcation under ASC 815. However, due to the nature and terms of the reporting obligations, the value of the embedded derivative is immaterial.

We incurred issuance costs related to the Notes of approximately $4.5 million, which were recorded as debt issuance cost and are presented as a reduction to the Notes on our Consolidated Balance Sheets and are amortized to interest expense using the effective interest method over the term of the Notes, resulting in an effective interest rate of 1.6%.

As of December 31, 2021, the net carrying amount of the liability for the Notes is recorded as convertible senior notes, net in the Consolidated Balance Sheets as follows (in thousands):

Principal amount	$	900,000
Unamortized debt issuance costs		(3,933)
Net carrying amount	$	896,067

For the year ended December 31, 2021, interest expense for the Notes was as follows (in thousands):

Contractual interest expense	$	11,812
Amortization of debt issuance costs		532
Total interest expense	$	12,344

As of December 31, 2021, the estimated fair value (Level 2) of the Notes was $787.5 million. The fair value of the Notes is estimated using a pricing model that is primarily affected by the trading price of our common stock and market interest rates.

NOTE 8. COMMITMENTS AND CONTINGENCIES

Leases

We record operating lease right-of-use assets and liabilities on our Consolidated Balance Sheets for all leases with a term of more than 12 months. In connection with the acquisition of Omniome, we acquired $18.1 million in right-of-use assets and liabilities on our Consolidated Balance Sheets. The operating lease right-of-use assets and liabilities are calculated as the present value of remaining minimum lease payments over the remaining lease term using our estimated secured incremental borrowing rates at the commencement date. Lease payments included in the measurement of the lease liability comprise the fixed rent per the term of the Lease. All of our leases are operating leases. Lease payments comprise the base rent per the term of the Lease. Lease expense for these leases is recognized on a straight-line basis over the lease term, with variable lease payments, such as common area maintenance fees, recognized in the period those payments are incurred.

We often have options to renew lease terms for buildings. For the O'Brien Lease, the renewal option is 5 years and the rent will be based on fair market value at the time of renewal and was not included in the lease term. In addition, certain lease arrangements may be terminated prior to their original expiration date at our discretion. We evaluate renewal and termination options at the lease commencement date to determine if we are reasonably certain to exercise the option on the basis of economic factors.

The following table presents information as to the amount and timing of cash flows arising from our operating leases as of December 31, 2021:

Maturity of Lease Liabilities	**Amount**
Years ending December 31,	**(in thousands)**
2022	$ 11,326
2023	11,851
2024	12,040
2025	12,328
2026	12,437
Thereafter	9,930
Total undiscounted operating lease payments	69,912
Less: imputed interest	(12,232)
Present value of operating lease liabilities	57,680
Balance Sheet Classification	
Operating lease liabilities, current	7,710
Operating lease liabilities, non-current	49,970
Total operating lease liabilities	57,680

We use our incremental borrowing rate to determine the present value of lease payments, as the implicit rates in our leases are not readily determinable. The weighted average discount rate used to measure our operating lease liabilities was 6.7%. The weighted average remaining lease term for our operating leases as of December 31, 2021 was 5.7 years.

Cash Flows

Cash paid for amounts included in the present value of operating lease liabilities was $8.2 million and $7.2 million for the years ended December 31, 2021 and 2020, respectively and were included in operating cash flow.

Operating Lease Costs

Operating lease costs were $7.2 million and $6.2 million for the years ended December 31, 2021 and 2020, respectively. For both 2021 and 2020 the total lease costs primarily related to our operating leases, but also included immaterial amounts for variable leases.

Contingencies

We may become involved in legal proceedings, claims and assessments from time to time in the ordinary course of business. We accrue liabilities for such matters when it is probable that future expenditures will be made and such expenditures can be reasonably estimated.

Legal Proceedings

U.S. District Court Proceedings

On September 26, 2019, Personal Genomics of Taiwan, Inc. ("PGI") filed a complaint in the U.S. District Court for the District of Delaware against us for patent infringement (C.A. No. 19-cv-1810) (the "PGI District Court matter"). The matter from this complaint is based on PGI's U.S. Patent No. 7,767,441 (the "'441 Patent"). We plan to vigorously defend in this matter. On November 20, 2019, we filed our answer to the complaint, denying infringement and seeking a declaratory judgement of invalidity of the '441 Patent.

On June 22, 2020, we filed a petition requesting institution of an inter-partes review (IPR) to the Patent Trial and Appeals Board (the "Board") at the United States Patent Office requesting the Board to find a set of claims in the '441 Patent invalid. On June 27, 2020, we filed a second petition requesting institution of an IPR requesting the Board to find another set of claims in the '441 Patent invalid. The two petitions (the "PacBio IPR Petitions") requesting IPRs assert that all of the claims relevant to the PGI complaint are invalid. On January 19, 2021, the Board ordered that both PacBio IPR Petitions are instituted on all grounds presented. On January 18, 2022, the Board issued decisions on the two IPRs. In one IPR, all challenged claims were found unpatentable including PGI's core device claims. In the second IPR, the board did not find the disputed claims unpatentable. We are appealing the decision in the second IPR to the U.S. Court of Appeals for the Federal Circuit.

On August 19, 2020, the court ordered a stay of the PGI District Court matter based on a joint stipulation by the parties pending a final written decision on the IPRs. Following the final decision on the IPRs described above, on February 2, 2022, the judge ordered that the PGI District Court matter be reopened. We plan to vigorously defend against the remaining claims.

Proceedings in China

On May 12, 2020, PGI filed a complaint in the Wuhan Intermediate People's Court in China alleging infringement of one or more claims of China patent No. CN101743321B (the "CN321 Patent"), which is related to the '441 Patent. We were served on January 20, 2021 and plan to vigorously defend in this matter. On November 23, 2020 we filed an Invalidation Petition at the China National Intellectual Property Administration (CNIPA) demonstrating the invalidity of the claims in the CN321 Patent on grounds of insufficient disclosure, and the lack of support, essential technical features, clarity, novelty, and inventiveness. A hearing in the invalidation proceeding at the CNIPA was held on April 29, 2021. On September 2, 2021, the CNIPA issued its decision on the Invalidation Petition and determined that all claims (1-61) of the CN321 patent were invalid. We have filed a petition with the Wuhan Intermediate People's court requesting dismissal of the infringement action. On December 1, 2021, PGI filed an appeal with the Beijing IP Court, contesting the CNIPA decision.

Other Proceedings

From time to time, we may also be involved in a variety of other claims, lawsuits, investigations and proceedings relating to securities laws, product liability, patent infringement, contract disputes, employment and other matters that arise in the normal course of our business. In addition, third parties may, from time to time, assert claims against us in the form of letters and other communications. We record a provision for contingent losses when it is both probable that a liability has been incurred and the amount of the loss can be reasonably estimated. We currently do not believe that the ultimate outcome of any of the matters described above is probable or reasonably estimable, or that these matters will have a material adverse effect on our business; however, the results of litigation and claims are inherently unpredictable. Regardless of the outcome, litigation can have an adverse impact on us because of litigation and settlement costs, diversion of management resources and other factors.

Indemnification

Pursuant to Delaware law and agreements entered into with each of our directors and officers, we may have obligations, under certain circumstances, to hold harmless and indemnify each of our directors and officers against losses suffered or incurred by the indemnified party in connection with their service to us, and judgements, fines, settlements and expenses related to claims arising against such directors and officers to the fullest extent permitted under Delaware law, our bylaws and our certificate of incorporation. We also enter and have entered into indemnification agreements with our directors and

officers that may require us to indemnify them against liabilities that arise by reason of their status or service as directors or officers, except as prohibited by applicable law. In addition, we may have obligations to hold harmless and indemnify third parties involved with our fundraising efforts and their respective affiliates, directors, officers, employees, agents or other representatives against any and all losses, claims, damages and liabilities related to claims arising against such parties pursuant to the terms of agreements entered into between such third parties and us in connection with such fundraising efforts. To the extent that any such indemnification obligations apply to the lawsuits described above, any associated expenses incurred are included within the related accrued litigation expense amounts. No additional liability associated with such indemnification obligations has been recorded as of December 31, 2021.

NOTE 9. INCOME TAXES

We are subject to income taxes in the United States and certain states in which we operate, and we use estimates in determining our provisions for income taxes. Significant management judgement is required in determining our provision for income taxes, deferred tax assets and liabilities and valuation allowances recorded against net deferred tax assets in accordance with U.S. GAAP. These estimates and judgements occur in the calculation of tax credits, benefits, and deductions, and in the calculation of certain tax assets and liabilities, which arise from differences in the timing of recognition of revenue and expense for tax and financial statement purposes, as well as the interest and penalties related to uncertain tax positions. Significant changes to these estimates may result in an increase or decrease to our tax provision in the current or subsequent period.

We assess all material positions taken in any income tax return, including all significant uncertain positions, in all tax years that are still subject to assessment or challenge by relevant taxing authorities. Assessing an uncertain tax position begins with the initial determination of the position's sustainability and is measured at the largest amount of benefit that is greater than 50% likely of being realized upon ultimate settlement. As of each balance sheet date, unresolved uncertain tax positions must be reassessed, and we will determine whether the factors underlying the sustainability assertion have changed and the amount of the recognized tax benefit is still appropriate.

We account for Global Intangible Low-taxed Income as a period cost.

During the years ended December 31, 2021, 2020 and 2019 income (loss) before taxes from U.S. operations were ($275.4) million, $28.9 million and ($84.8) million, respectively, and income before taxes from foreign operations was $0.8 million, $0.6 million and $0.9 million, respectively.

Income tax provision (benefit) related to continuing operations differ from the amounts computed by applying the statutory income tax rate of 21% to pretax income or loss as follows:

	Years ended December 31,		
	2021	**2020**	**2019**
Statutory tax rate	21.0 %	21.0 %	21.0 %
State tax rate, net of federal benefit	5.5	(8.3)	4.9
Change in valuation allowance	(4.9)	6.3	(27.5)
Tax credits	2.5	(3.6)	2.2
Stock-based compensation	10.9	(15.2)	(0.8)
Merger Expenses	(0.9)	-	-
Other	(0.1)	(0.2)	0.2
Total	34.0%	0.0%	(0.0)%

Deferred income taxes reflect the net tax effects of loss and credit carry forwards and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of our deferred tax assets for federal and state income taxes are as follows (in thousands):

	December 31,	
Deferred tax assets:	**2021**	**2020**
Net operating loss carryforwards	$ 378,035	$ 233,225
Research and development credits	60,672	49,179
Accruals and reserves	10,822	6,337
Stock-based compensation	12,838	9,717
ASC 842 Operating lease liability	13,105	9,870
Total deferred tax assets	475,472	308,328
Less: Valuation allowance	(366,940)	(300,505)
Total deferred tax assets:	108,532	7,823
Intangibles	(97,345)	—
Fixed assets	(1,523)	(786)
ASC 842 Operating lease right-of-use assets	(10,502)	(7,037)
Total deferred tax liabilities	(109,370)	(7,823)
Net deferred tax assets	$ (838)	$ —

At December 31, 2021, we maintained a full valuation allowance against all of our deferred tax assets which totaled $366.9 million, including net operating loss carryforwards and research and development credits of $378.0 million and $60.7 million, respectively.

A valuation allowance is recorded when it is more likely than not that all or some portion of the deferred income tax assets will not be realized. We regularly assess the need for a valuation allowance against our deferred income tax assets by considering both positive and negative evidence related to whether it is more likely than not that our deferred income tax assets will be realized. In evaluating our ability to recover our deferred income tax assets within the jurisdiction from which they arise, we consider all available positive and negative evidence, including scheduled reversals of deferred income tax liabilities, projected future taxable income, tax-planning strategies, and results of recent operations. A deferred income tax benefit of $93.6 million for the year ended December 31, 2021, is related to the release of the valuation allowance for deferred tax assets due to the recognition of deferred tax liabilities in connection with the Omniome and Circulomics acquisitions. We maintain a valuation allowance on the net deferred tax assets of our U.S. entities as we have concluded that it is more likely than not that we will not realize our deferred tax assets. Accordingly, this benefit from income taxes is reflected on our Consolidated Statements of Operations and Comprehensive (Loss) Income for the year ended December 31, 2021.

For the year ended December 31, 2021, our valuation allowance increased to $366.9 million, primarily because of an increase in our net operating losses, credits and acquisition of deferred tax assets that were fully offset by a valuation allowance. For the year ended December 31, 2020, our valuation allowance increased to $300.5 million, primarily because of an increase in our net operating losses and tax credits offset by a decrease to our stock-based compensation deferred tax asset.

As of December 31, 2021, we had a net operating loss carryforward for federal income tax purposes of approximately $1,491.3 million, of which $774.9 million will begin to expire in 2024 if not utilized. We had a total state net operating loss carryforward of approximately $997.4 million, which are subject to annual expirations. Utilization of some of the federal and state net operating loss and credit carryforwards are subject to annual limitations due to the “change of ownership” provisions of the Internal Revenue Code of 1986 and similar state provisions. The annual limitations may result in the expiration of net operating losses and credits before utilization.

We have federal credits of approximately $39.1 million, which will begin to expire in 2024 if not utilized and state research credits of approximately $36.9 million which have no expiration date. These tax credits are subject to the same limitations discussed above.

As of December 31, 2021, our total unrecognized tax benefit was $8.3 million.

A reconciliation of the beginning and ending unrecognized tax benefit balance is as follows (in thousands):

Balance as of December 31, 2018	$	20,447
Decrease in balance related to tax positions taken in prior year		—
Increase in balance related to tax positions taken during current year		1,532
Balance as of December 31, 2019	$	21,979
Decrease in balance related to tax positions taken in prior year		(17,255)
Increase in balance related to tax positions taken during current year		1,230
Balance as of December 31, 2020	$	5,954
Increase in balance related to tax positions taken in prior year		189
Increase in balance related to tax positions taken during current year		2,192
Balance as of December 31, 2021	$	8,335

Our practice is to recognize interest and/or penalties related to income tax matters in income tax expense. As of both December 31, 2021 and 2020, we had no accrued interest or penalties due to our net operating losses available to offset any tax adjustment. If total unrecognized tax benefits were realized in the future, it would not result in any tax benefit as we currently have a full valuation allowance. We file U.S. federal and various state income tax returns. For U.S. federal and state income tax purposes, the statute of limitations currently remains open for the years ending December 31, 2018 to present and December 31, 2017 to present, respectively. In addition, all of the net operating losses and research and development credit carryforwards that may be utilized in future years may be subject to examination. We are not currently under examination by income tax authorities in any jurisdiction.

On December 27, 2020, the U.S. government enacted the Consolidated Appropriations Act, 2021, which enhances and expands certain provisions of the CARES Act. This legislative act did not have a material impact on the Company's consolidated financial results.

On March 11, 2021, the American Rescue Plan Act of 2021 ("American Rescue Plan") was signed into law to provide additional relief in connection with the ongoing COVID-19 pandemic. The American Rescue Plan includes, among other things, provisions relating to PPP loan expansion, defined pension contributions, excessive employee remuneration, and the repeal of the election to allocate interest expense on a worldwide basis. Under ASC 740, the effects of new legislation are recognized upon enactment. Accordingly, the American Rescue Plan is effective beginning in the quarter that includes March 11, 2021. These provisions did not have a material impact on the Company's Consolidated Financial Statements.

NOTE 10. STOCKHOLDERS' EQUITY

Preferred Stock

Our Certificate of Incorporation, as amended and restated in October 2010 in connection with the closing of our initial public offering, authorizes us to issue 1,000,000,000 shares of $0.001 par value common stock and 50,000,000 shares of $0.001 par value preferred stock. As of December 31, 2021 and 2020, there were no shares of preferred stock issued or outstanding.

Common Stock

Common stockholders are entitled to dividends when and if declared by our board of directors. There have been no dividends declared to date. The holder of each share of common stock is entitled to one vote.

Underwritten Public Equity Offerings

In August 2020, we entered into an underwriting agreement, relating to the public offering of 19,430,000 shares of our common stock, $0.001 par value per share, at a price to the public of $4.47 per share. Under the terms of the underwriting agreement, we also granted the underwriters a 30-day option to purchase up to an additional 2,914,500 shares of our common stock, which was subsequently exercised in full, and the offering including the sale of shares of common stock

subject to the underwriters' option, closed in August 2020. In total, we sold 22.3 million shares of our common stock. We paid a commission equal to 6% of the gross proceeds from the sale of shares of our common stock. The total net proceeds to us from the offering after deducting the underwriting discount were approximately $93.9 million, excluding approximately $0.3 million of offering expenses.

In November 2020, we entered into an underwriting agreement, relating to the public offering of 6,096,112 shares of our common stock, $0.001 par value per share, at a price to the public of $14.25 per share. Under the terms of the underwriting agreement, we also granted the underwriters a 30-day option to purchase up to an additional 914,416 shares of our common stock, which was subsequently exercised in full, and the offering including the sale of shares of common stock subject to the underwriters' option, closed in November 2020. In total, we sold 7.0 million shares of our common stock. We paid a commission equal to 6% of the gross proceeds from the sale of shares of our common stock. The total net proceeds to us from the offering after deducting the underwriting discount were approximately $93.9 million, excluding approximately $0.3 million of offering expenses.

In total, for the year ended December 31, 2020, we issued 29.4 million shares of our common stock through our two underwritten public offerings with an average offering price of $6.40. The total net proceeds to us from the two offerings, after deducting the underwriting commission and offering expenses, were approximately $187.2 million.

Private Placement of Common Stock

On July 19, 2021, in connection with the Omniome acquisition, we entered into a purchase agreement with certain qualified institutional buyers and institutional accredited investors, pursuant to which we agreed to sell an aggregate of 11,214,953 shares of common stock, at a price of $26.75 per share, for aggregate gross proceeds of approximately $300 million. The transaction closed on September 20, 2021. We registered the private placement shares for resale following the closing of the merger.

Equity Plans

The 2020 Equity Incentive Plan (the "2020 Plan"), the 2020 Inducement Equity Incentive Plan (the "Inducement Plan") and the 2021 adopted Omniome Equity Incentive Plan of Pacific Biosciences of California, Inc. (the "Omniome Plan") allow for the issuance of stock options, restricted units and awards and performance-based awards.

On August 4, 2020, stockholders approved the 2020 Plan and reserved 11,000,000 shares of our common stock for issuance pursuant to equity awards granted under the 2020 Plan.

On December 2, 2020, the Board of Directors (the "Board") adopted the Inducement Plan and reserved 2,500,000 shares of our common stock for issuance pursuant to equity awards granted under the Inducement Plan. On April 18, 2021 and November 22, 2021, the Board amended the Inducement Plan to reserve an additional 750,000 and 360,000 shares, respectively.

On September 20, 2021, in connection with the acquisition of Omniome, we adopted the Omniome Equity Incentive Plan of Pacific Biosciences of California, Inc. (the "Omniome Plan"). Under the Omniome Merger Agreement, each unvested option to purchase Omniome common stock, granted under the Omniome Plan held by employees continuing with us, were assumed by PacBio and converted into an option to purchase shares of our common stock. The terms and conditions of the converted options are substantially the same (including vesting and exercisability), except that (A) the assumed options cover shares of PacBio's common stock; (B) the number of shares of our common stock subject to the assumed option is equal to the product of (i) the number of shares of Omniome common stock subject to the corresponding unvested option, multiplied by (ii) the exchange ratio (as defined below), with any resulting fractional share rounded down to the nearest whole share; and (C) the exercise price per share of the assumed options is equal to the quotient of (i) the exercise price per share of the corresponding unvested option to purchase shares of Omniome common stock, divided by (ii) the exchange ratio (as defined below), with any resulting fractional cent rounded up to the nearest whole cent. The exchange ratio was equal to 0.259204639. We reserved 2,494,128 shares of our common stock for issuance pursuant to equity awards under the Omniome Plan.

2020 Equity Incentive Plan

Under the 2020 Plan, with the approval of the Board of Directors or the Compensation Committee of the Board of Directors, we may grant equity-based awards, including non-statutory stock options, restricted stock units ("RSUs"), restricted stock, stock appreciation rights, performance shares and performance units. Stock options granted under the 2020 Plan may be either incentive stock options **("**ISOs") within the meaning of Internal Revenue code Section 422 or non-qualified stock options ("NSOs"). Stock options under the 2020 Plan may be granted with a term of up to ten years and at prices no less than the fair market value of our common stock on the date of grant. To date, stock options granted to existing employees generally vest over four years on a monthly basis and stock options granted to new employees vest at a rate of 25% upon the first anniversary of the vesting commencement date and 1/48th per month thereafter, in each case, subject to continued service with us through the applicable vesting dates.

2020 Inducement Equity Incentive Plan

Under the Inducement Plan, with the approval of the Board of Directors or the Compensation Committee of the Board of Directors, we may grant equity-based awards, including non-statutory stock options, restricted stock units, restricted stock, stock appreciation rights, performance shares and performance units. The terms of the Inducement Plan are substantially similar to the 2020 Plan, including with respect to treatment of equity awards in the event of a "merger" or "change in control" as defined under the Inducement Plan, but with such other terms and conditions intended to comply with the NASDAQ Inducement Award exception. 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 employees or non-employee directors of the Company (or following such individuals' bona fide period of non-employment with the Company), as an inducement material to the individuals' entry into employment with the Company or in connection with a merger or acquisition, to the extent permitted by Rule 5635(c)(3) of the NASDAQ Listing Rules.

As of December 31, 2021, we had 8.1 million shares remaining and available for future issuance under the 2020 Plan, Inducement Plan, and the Omniome Plan.

Stock Options

Time-based stock options

The following table summarizes time-based stock option activity for all of our equity compensation plans for the year ended December 31, 2021 (in thousands, except per share amounts):

	Stock Options Outstanding		
	Number of shares	**Exercise price**	**Weighted average exercise price**
Outstanding at December 31, 2020	14,638	$ 1.16 – 20.90	$ 5.53
Granted	2,489	23.06 – 46.37	33.78
Assumed Omniome options	339	2.05 – 4.90	4.43
Exercised	(4,766)	1.16 – 15.98	5.31
Canceled	(541)	2.54 – 46.37	5.25
Outstanding at December 31, 2021	12,159	$ 1.16 – 46.37	$ 11.38

The expired options during the year ended December 31, 2021 totaled 0.02 million with exercise prices ranging from $2.54 to $46.37 per share and a weighted average exercise price per share of $9.80.

Performance-based stock options

The following table summarizes performance-based stock option activity for all of our equity compensation plans for the year ended December 31, 2021 (in thousands, except per share amounts):

	Stock Options Outstanding		
	Number of shares	Exercise price	Weighted average exercise price
Outstanding at December 31, 2020	—	$ —	$ —
Granted	—	—	—
Assumed Omniome options	304	4.71 - 4.90	4.71
Exercised	—	—	—
Canceled	—	—	—
Outstanding at December 31, 2021	304	$ 4.71 - 4.90	$ 4.71

The following table summarizes information with respect to stock options outstanding and exercisable under our equity compensation plans at December 31, 2021:

	Options Outstanding			Options Exercisable	
Exercise price	Number outstanding (in 000s)	Weighted average remaining contractual life (Years)	Weighted average exercise price	Number vested (in 000s)	Weighted average exercise price
$ 0.00 - 4.64	3,676	5.37	$ 2.91	3,508	$ 2.91
$ 4.64 - 9.27	5,480	5.88	$ 6.64	4,010	$ 6.68
$ 9.27 - 13.91	702	6.69	$ 9.81	427	$ 9.94
$ 13.91 - 18.55	35	8.79	$ 14.34	14	$ 14.34
$ 18.55 - 23.19	180	9.38	$ 21.86	25	$ 20.90
$ 23.19 - 27.82	320	9.50	$ 24.22	—	$ —
$ 27.82 - 32.46	472	9.43	$ 28.77	52	$ 27.90
$ 32.46 - 37.10	1,380	9.00	$ 36.18	—	$ —
$ 41.73 - 46.37	218	9.13	$ 46.37	45	$ 46.37
	12,463	6.47	$ 11.22	8,081	$ 5.63

The aggregate intrinsic value of the outstanding and exercisable options presented in the table above totaled $147.9 million and $121.4 million, respectively. The aggregate intrinsic value represents the total pretax intrinsic value (i.e., the difference between $20.46, our closing stock price on the last trading day of our fourth quarter of 2021 and the exercise price, multiplied by the number of in-the-money options) that would have been received by the option holders had all option holders exercised their options on December 31, 2021. The aggregate intrinsic value changes at each reporting date based on the fair market value of our common stock. The weighted average remaining contractual life for exercisable options is 5.12 years.

The vested and expected to vest options as of December 31, 2021 totaled 11,535,217, with aggregate intrinsic value of $141.9 million, weighted average exercise price per share of $10.46 and weighted average remaining contractual life of 6.28 years.

The total intrinsic value of stock options exercised during the years ended December 31, 2021, 2020 and 2019 was $146.1 million, $63.1 million and $2.6 million, respectively.

The weighted-average grant-date fair value of all options granted with exercise prices equal to fair market value was $18.36 in 2021 and $4.14 in 2020 determined by the Black-Scholes option valuation method. No stock options were granted in 2019.

Time-based RSUs

Each RSU represents one equivalent share of our common stock to be issued after satisfying the applicable continued service-based vesting criteria over a specified period. These RSUs vest over four years at a rate of 25% annually. The fair value for these RSUs is based on the closing price of our common stock on the date of grant. We measure compensation expense for these RSUs at fair value on the date of grant and recognize the expense over the expected vesting period on a straight-line basis. The RSUs do not entitle participants to the rights of holders of common stock, such as voting rights, until the shares are issued. RSUs that are expected to vest are net of estimated future forfeitures.

The following table summarizes the time-based RSUs activity for the year ended December 31, 2021 (in thousands, except per share amounts):

	Number of shares	Weighted average grant date fair value
RSUs outstanding at December 31, 2020	5,919	$ 5.25
RSUs granted	3,744	35.33
RSUs released	(1,798)	5.13
RSUs forfeited	(473)	16.68
Unvested RSUs outstanding at December 31, 2021	7,392	$ 19.78

Performance-based RSUs

The Compensation Committee of the Board of Directors approved awards of RSUs with performance-based vesting under the 2010 Plan to certain employees which expired on July 29, 2020. Performance-based RSUs are governed under the 2020 Plan.

The following table summarizes the performance-based RSUs activity for the year ended December 31, 2021 (in thousands, except per share amounts):

	Number of shares	Weighted average grant date fair value
PSUs outstanding at December 31, 2020	94	$ $ 2.63
PSUs granted	—	—
PSUs released	—	—
PSUs forfeited	(94)	2.63
Unvested PSUs outstanding at December 31, 2021	—	$ —

2010 Employee Stock Purchase Plan

As of December 31, 2021, a total of 21.5 million shares of our common stock have been reserved for issuance under our 2010 Employee Stock Purchase Plan (ESPP). The ESPP permits eligible employees to purchase common stock at a discount through payroll deductions during defined offering periods. Each offering period will generally consist of four purchase periods, each purchase period being approximately six months. The price at which the stock is purchased is equal to the lower of 85% of the fair market value of the common stock at the beginning of an offering period or at the end of a purchase period. Each offering period will generally end and the shares will be purchased twice yearly on March 1 and September 1. If the stock price at the end of the purchase period is lower than the stock price at the beginning of the offering period, that offering period will then be terminated and new offering period comes to place. The ESPP provides for an annual increase to the shares available for issuance at the beginning of each fiscal year equal to the lessor of 2% of the common shares then outstanding, 4,000,000 shares, or an amount determined by the ESPP's administrator.

Pursuant to the terms of the then-in-process Merger Agreement with Illumina, offerings under our 2010 ESPP were suspended after the completion of the purchase period ended March 1, 2019. After the merger with Illumina was terminated in January 2020, we began offerings under the ESPP again starting with the offering period beginning March 1, 2020.

For the years ended December 31, 2021, 2020 and 2019, 1,913,968 shares, 834,677 shares and 1,306,329 shares of common stock were purchased under the ESPP, respectively. As of December 31, 2021, 7,810,673 shares of our common stock remain available for issuance under our ESPP.

Stock-based Compensation

Total stock-based compensation expense consists of the following (in thousands):

	Years Ended December 31,		
	2021	**2020**	**2019**
Cost of revenue	$ 6,126	$ 2,236	$ 1,857
Research and development	20,275	7,061	7,699
Sales, general and administrative	35,403	8,236	6,845
Merger-related expenses - stock-settled	6,349	—	—
Merger-related expenses - milestone	5,202	—	—
Stock-based compensation	73,355	17,533	16,401
Merger-related expenses - cash-settled	7,373	—	—
Total stock-based compensation expense	$ 80,728	$ 17,533	$ 16,401

As of December 31, 2021 and 2020, $0.9 million and $0.3 million of stock-based compensation cost was capitalized in inventory on our consolidated balance sheets, respectively.

The tax benefit of stock-based compensation expense was immaterial for the years ended December 31, 2021, 2020 and 2019.

Determining Fair Value

We estimate the fair value of share options granted using the Black-Scholes valuation method and a single option award approach. This fair value is then amortized on a straight-line basis over the requisite service periods of the awards, which is generally the vesting period. The fair market value of RSU awards granted is the closing price of our shares on the date of grant and is generally recognized as compensation expense on a straight-line basis over the respective vesting period. For shares purchased under our Employee Stock Purchase Plan, or ESPP, we estimate the grant-date fair value, and the resulting stock-based compensation expense, using the Black-Scholes option-pricing model.

Expected Term - The expected term used in the Black-Scholes valuation method represents the period that the stock options are expected to be outstanding and is determined based on historical experience of similar awards, giving consideration to the contractual terms of the stock options and vesting schedules.

Expected Volatility - The expected volatility used in the Black-Scholes valuation method is derived from the implied volatility related to our share price over the expected term.

Expected Dividend - We have never paid dividends on our shares and, accordingly, the dividend yield percentage is zero for all periods.

Risk-Free Interest Rate - The risk-free interest rate used in the Black-Scholes valuation method is the implied yield currently available on U.S. Treasury constant maturities issued with a term equivalent to the expected terms.

Stock Options

We estimated the fair value of employee stock options using the Black-Scholes option pricing model. The fair value of employee stock options is being amortized on a straight-line basis over the requisite service period of the awards. For the year ended December 31, 2019, we did not grant any stock options.

When determining the current share prices underlying the stock options for calculating the grant-date fair value, we reference observable market prices of similar or identical instruments in active markets.

For the years ended December 31, 2021, 2020 and 2019, the fair value of employee stock options was estimated using the following weighted average assumptions:

	Years Ended December 31,		
	2021	2020	2019
Expected term in years	2.1 - 4.6	5.0 years	—
Expected volatility	67% - 80%	70.7%	—
Risk-free interest rate	0.05% – 1.10%	0.3%	—
Dividend yield	—	—	—
Weighted average grant date fair value per share	$ 15.53	$ 7.20	—

Cash received from option exercises for the years ended December 31, 2021, 2020 and 2019 was $25.4 million, $43.9 million and $5.9 million, respectively.

ESPP

We estimate the fair value of shares to be issued under the ESPP using the Black-Scholes option pricing model. For the years ended December 31, 2021, 2020 and 2019, the fair value of shares to be issued under the ESPP was estimated using the following assumptions:

	Years Ended December 31,		
	2021	2020	2019
Expected term in years	0.5 - 2.0	0.5 - 2.0	—
Expected volatility	67% - 68%	57% - 71%	—
Risk-free interest rate	0.1% - 0.2%	0.1%-1.0%	—
Dividend yield	—	—	—
Weighted average grant date fair value per share	$ 25.07	$ 1.87	—

Cash received through the ESPP for the years ended December 31, 2021, 2020 and 2019 was $6.4 million, $2.4 million and $2.7 million, respectively.

As of December 31, 2021, $122.9 million of total unrecognized compensation expense related to stock options, restricted stock and ESPP shares was expected to be recognized over a weighted-average period of 2.9 years.

NOTE 11. NET (LOSS) INCOME PER SHARE

Basic net (loss) income per share and diluted net (loss) income per share are presented for the three years presented. Basic net (loss) income per share is computed by dividing net (loss) income by the weighted average number of shares of common stock outstanding during the period. Diluted net (loss) income per share is computed using the weighted average number of shares of common stock outstanding and potential shares assuming the dilutive effect of outstanding stock options, restricted stock units and common stock issuable pursuant to our ESPP, using the treasury stock method.

The following table presents the calculation of weighted average shares of common stock used in the computations of basic and diluted net (loss) income per share amounts presented in the accompanying consolidated statements of operations and comprehensive (loss) income (in thousands, except per share amounts):

	Years Ended December 31,		
	2021	2020	2019
Numerator:			
Net (loss) income	$ (181,223)	$ 29,403	$ (84,134)
Denominator:			
Basic			
Weighted average shares used in computing basic net income (loss) per share	204,136	165,187	152,527
Basic net (loss) income per share	$ (0.89)	$ 0.18	$ (0.55)
Diluted			
Weighted average shares used in computing basic net (loss) income per share	204,136	165,187	152,527
Add: weighted average stock options	—	6,092	—
Add: weighted average restricted stock units	—	2,324	—
Add: weighted average common stock issuable pursuant to our ESPP	—	1,367	—
Weighted average shares used in computing diluted net (loss) income per share	204,136	174,970	152,527
Diluted net (loss) income per share	$ (0.89)	$ 0.17	$ (0.55)

The following shares issuable upon conversion of convertible senior notes, options outstanding, time-based RSUs, performance-based RSUs and ESPP shares to purchase common stock were excluded from the computation of diluted net loss per share for the periods presented because the effect of including such shares would have been antidilutive:

	Years Ended December 31,		
(in thousands)	**2021**	**2020**	**2019**
Shares issuable upon conversion of convertible senior notes	18,026	—	—
Options to purchase common stock	12,463	4,908	22,697
RSUs with time-based vesting	7,392	100	1,086
RSUs with performance-based vesting	—	94	138
ESPP shares	1,564	2,890	—

NOTE 12. SEGMENT AND GEOGRAPHIC INFORMATION

We are organized as, and operate in, one reportable segment: the development, manufacturing and marketing of an integrated platform for genetic analysis. Our chief operating decision-maker is our Chief Executive Officer. The Chief Executive Officer reviews financial information presented on a consolidated basis for purposes of evaluating financial performance and allocating resources, accompanied by information about revenue by geographic regions. Our assets are primarily located in the United States of America and not allocated to any specific region and we do not measure the performance of geographic regions based upon asset-based metrics. Therefore, geographic information is presented only for revenue. Revenue by geographic region is based on the ship to address on the customer order.

A summary of our revenue by geographic location for the years ended December 31, 2021, 2020 and 2019 is as follows:

	Years Ended December 31,		
(in thousands)	**2021**	**2020**	**2019**
North America	$ 64,521	$ 37,277	$ 44,681
Europe (including the Middle East and Africa)	30,271	19,065	19,600
Asia Pacific	35,721	22,551	26,610
Total	$ 130,513	$ 78,893	$ 90,891

A summary of our revenue by category for the years ended December 31, 2021, 2020 and 2019 is as follows:

(in thousands)	Years Ended December 31, 2021	2020	2019
Instrument revenue	$ 61,324	$ 34,282	$ 45,126
Consumable revenue	52,181	31,142	32,616
Product revenue	113,505	65,424	77,742
Service and other revenue	17,008	13,469	13,149
Total revenue	$ 130,513	$ 78,893	$ 90,891

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, our chief financial officer, and our principal accounting officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a–15(e) and 15d–15(e) of the Exchange Act) as of the end of the period covered by this Annual Report on Form 10–K. 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 our 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 judgement in evaluating the cost-benefit relationship of possible controls and procedures. Based on this evaluation, our chief executive officer, chief financial officer and our principal accounting officer concluded that our disclosure controls and procedures were effective as of the end of the period covered by this report.

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 Rules 13a-15(f). Pacific Biosciences of California, Inc's internal control over financial reporting is designed to provide reasonable assurance to the Company's management and board of directors regarding the preparation and fair presentation of published financial statements. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Therefore, even those systems determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation. Management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2021. In making this assessment, management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). Based on our assessment, we concluded that, as of December 31, 2021, the Company's internal control over financial reporting was effective based on those criteria.

Management's assessment of and conclusion on the effectiveness of internal control over financial reporting did not include the internal controls of Omniome, Inc. and Circulomics, Inc., which are included in our 2021 consolidated financial statements and constituted 2% of total assets as of December 31, 2021 and approximately 1% of consolidated revenues for the year then ended. The Company's internal control over financial reporting as of December 31, 2021 has been audited by Ernst &Young LLP, the independent registered public accounting firm who also audited the Company's financial statements. Ernst &Young's attestation report on the Company's internal control over financial reporting appears on page 106 hereof.

Changes in Internal Control Over Financial Reporting

An evaluation was performed under the supervision and with the participation of our management, including our Chief Executive Officer, Chief Financial Officer and Principal Accounting Officer to determine whether any change in our internal control over financial reporting occurred during the fiscal quarter ended December 31, 2021 that materially affected, or is reasonably likely to materially affect, our internal control over financial reporting. There were no material changes in our internal control over financial reporting during the year ended December 31, 2021, that have materially affected, or were reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Pacific Biosciences of California, Inc.

Opinion on Internal Control over Financial Reporting

We have audited Pacific Biosciences of California, Inc.'s internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Pacific Biosciences of California, Inc. (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on the COSO criteria.

As indicated in the accompanying Management's Report on Internal Control Over Financial Reporting, management's assessment of and conclusion on the effectiveness of internal control over financial reporting did not include the internal controls of Omniome, Inc. and Circulomics, Inc., which are included in the 2021 consolidated financial statements of the Company and constituted 2% of total assets as of December 31, 2021 and 1% of revenues for the year then ended. Our audit of internal control over financial reporting of the Company also did not include an evaluation of the internal control over financial reporting of Omniome, Inc. and Circulomics, Inc.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the 2021 consolidated financial statements of the Company and our report dated February 28, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

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 (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) 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 (3) 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/ Ernst & Young LLP

Redwood City, California
February 28, 2022

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

Information responsive to this item is incorporated herein by reference to our definitive proxy statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

ITEM 11. EXECUTIVE COMPENSATION

Information responsive to this item is incorporated herein by reference to our definitive proxy statement with respect to our 2022 Annual Meeting of Stockholder to be filed with the SEC within 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

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

Information responsive to this item is incorporated herein by reference to our definitive proxy statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

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

Information responsive to this item is incorporated herein by reference to our definitive proxy statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

Information responsive to this item is incorporated herein by reference to our definitive proxy statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K.

PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES.

(a) The following documents are filed as part of, or incorporated by reference into, this Annual Report on Form 10-K:

1. *Financial Statements*: See Index to Consolidated Financial Statements under Item 8 of this Annual Report on Form 10-K.

2. *Financial Statement Schedules*: All schedules are omitted because they are not required, are not applicable or the information is included in the consolidated financial statements or notes thereto.

3. *Exhibits*: We have filed or incorporated by reference into this Annual Report on Form 10-K, the exhibits listed on the accompanying Exhibit Index immediately below.

(b) Financial Statement Schedules: See Item 15(a)(2), above.

(c) Exhibits: Refer to the Exhibit Index that follows.

Exhibit Index

Exhibit Number	Description	Incorporated by reference herein		
		Form	Exhibit No.	Filing Date
3.1	Amended and Restated Certificate of Incorporation	10-K	3.1	March 23, 2011
3.2	Second Amended and Restated Bylaws of Pacific Biosciences of California, Inc.	8-K	3.1	November 5, 2018
4.1	Specimen Common Stock Certificate	S-1/A	4.1	October 1, 2010
4.2	Description of Registrant's securities registered under Section 12 of the Exchange Act	10-K	4.2	February 28, 2020
4.3	Indenture, dated February 16, 2021, between Pacific Biosciences of California, Inc. and U.S. Bank National Association, as Trustee	8-K	4.1	February 17, 2021
4.4	Form of 1.50% Convertible Senior Notes due 2028 (included in Exhibit 4.3)	8-K	4.1	February 17, 2021
10.1+	Form of Director and Executive Officer Indemnification Agreement	S-1	10.1	August 16, 2010
10.2+	2010 Equity Incentive Plan	S-1	10.4	August 16, 2010
10.3+	2010 Equity Incentive Plan forms of agreement	10-Q	10.1	May 2, 2018
10.4+	2010 Employee Stock Purchase Plan and forms of agreement thereunder	S-1	10.5	August 16, 2010
10.5+	2010 Outside Director Equity Incentive Plan	S-1	10.6	August 16, 2010
10.6+	2010 Outside Director Equity Incentive Plan forms of agreement	10-Q	10.2	May 2, 2018
10.7+	2020 Equity Incentive Plan and related forms of agreement	8-K	10.1	August 5, 2020
10.8+	Pacific Biosciences of California, Inc. 2020 Inducement Equity Incentive Plan, as amended, and forms of agreement thereunder	8-K	10.1	April 19, 2021
10.12+	Letter Relating to Employment Terms by and between the Registrant and Susan G. Kim effective September 28, 2020	10-Q	10.2	November 3, 2020
10.13+	Change in Control and Severance Agreement by and between the Registrant and Susan G. Kim effective September 28, 2020	10-Q	10.3	November 3, 2020
10.14+	Form of Change in Control and Severance Agreement for executive officers	10-K	10.14	February 26, 2021
10.15+	Letter Relating to Employment Terms by and between the Registrant and Christian O. Henry effective September 14, 2020	10-K	10.15	February 26, 2021
10.16+	Change in Control and Severance Agreement by and between the Registrant and Christian O. Henry effective September 14, 2020	10-K	10.16	February 26, 2021
10.17+	Amended Change in Control and Severance Agreement by and between the Registrant and Christian O. Henry dated February 3, 2021	10-K	10.17	February 26, 2021
10.18+	Letter Relating to Employment Terms by and between the Registrant and Mark Van Oene effective January 8, 2021	10-K	10.18	February 26, 2021
10.19+	Letter Relating to Employment Terms by and between the Registrant and Peter Fromen effective January 8, 2021	10-K	10.19	February 26, 2021
10.20+	Lease Agreement by and between the Registrant and Menlo Park Portfolio II, LLC, dated July 22, 2015.	10-Q	10.2	August 5, 2015
10.21†	First Amendment to Lease Agreement by and between the Registrant and Menlo Park Portfolio II, LLC, dated December 23, 2016.	10-K	10.50	March 6, 2017
10.22††	Development and Commercialization Agreement by and between the Registrant and Invitae Corporation dated January 12, 2021	10-K	10.23	February 26, 2021
10.23††	Amendment to Development and Commercialization Agreement, dated as of June 3, 2021, by and between Pacific Biosciences of California, Inc. and Invitae Corporation	10-Q	10.6	August 6, 2021

10.24	Investment Agreement, dated as of February 9, 2021, between Pacific Biosciences of California, Inc. and SB Northstar LP.	8-K	10.1	February 10, 2021
10.25††	Exclusive License Agreement by and between the Registrant and Cornell Research Foundation, Inc., dated as of February 1, 2004	S-1/A	10.8	October 22, 2010
10.26+	Letter Relating to Employment Terms by and between the Registrant and Michele Farmer effective May 17, 2021	10-Q	10.2	August 6, 2021
10.27	Agreement and Plan of Merger of Reorganization among Pacific Biosciences of California, Inc., Apollo Acquisition Corp., Apollo Acquisition Sub, LLC, Omniome, Inc. and Shareholder Representative Services, LLC, as securityholder representative, dated as of July 19, 2021	8-K	10.1	July 20, 201
10.28	Securities Purchase Agreement, dated as of July 19, 2021, by and between Pacific Biosciences of California, Inc. and each of the Investors	8-K	10.2	July 20, 201
10.29	Registration Rights Agreement, dated as of July 19, 2021, by and between Pacific Biosciences of California, Inc. and each of the Investors	8-K	10.3	July 20, 2021
21.1	List of Subsidiaries of the Registrant			Filed herewith
23.1	Consent of Independent Registered Public Accounting Firm			Filed herewith
31.1	Certification of Chief Executive Officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002			Filed herewith
31.2	Certification of Chief Financial Officer pursuant to Exchange Act Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002			Filed herewith
32.1*	Certification of Chief Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002			Furnished herewith
32.2*	Certification of Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002			Furnished 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 Labels Linkbase Document			Filed herewith
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document			Filed herewith
104	Cover Page Interactive File (formatted as inline XBRL and contained in Exhibit 101)			Filed herewith

---

+ Indicates management contract or compensatory plan.

† Confidential treatment has been requested for portions of this exhibit. These portions have been omitted and have been filed separately with the Securities and Exchange Commission.

†† Certain confidential information contained in this Exhibit was omitted by means of marking such portions with brackets because the identified confidential information (i) is not material and (ii) would be competitively harmful if publicly disclosed.

* The certifications attached as Exhibit 32.1 and 32.2 that accompany this Annual Report on Form 10-K are deemed furnished and not filed with the Securities and Exchange Commission and are not to be incorporated by reference into any filing of Pacific Biosciences of California, Inc. under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, whether made before or after the date of this Annual Report on Form 10-K, irrespective of any general incorporation language contained in such filing.

ITEM 16. FORM 10-K SUMMARY

None.

Signatures

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized.

Pacific Biosciences of California, Inc.

Date: February 28, 2022

By: /s/ Christian O. Henry
Christian O. Henry
Chief Executive Officer and President

Date: February 28, 2022

By: /s/ SUSAN G. Kim
Susan G. Kim
Chief Financial Officer

Date: February 28, 2022

By: /s/ Michele Farmer
Michele Farmer
Vice President and Chief Accounting Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below hereby constitutes and appoints Christian O. Henry, Susan G. Kim, Brett Atkins and Michele Farmer, and each of them, as his or her true and lawful attorney-in-fact and agent, with full power of substitution and resubstitution, for each individual in any and all capacities, to sign any and all amendments to this Annual Report on 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, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully for all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or the individual's substitute, may lawfully do or cause to be done by virtue hereof.

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

Signature	Title	Date
/s/ Christian O. Henry Christian O. Henry	Director, Chief Executive Officer and President (Principal Executive Officer)	February 28, 2022
/s/ Susan G. Kim Susan G. Kim	Chief Financial Officer (Principal Financial Officer)	February 28, 2022
/s/ Michele Farmer Michele Farmer	Vice President and Chief Accounting Officer (Principal Accounting Officer)	February 28, 2022
/s/ John F. Milligan John F. Milligan	Chairman of the Board of Directors	February 28, 2022
/s/ David Botstein David Botstein	Director	February 28, 2022
/s/ William W. Ericson William W. Ericson	Director	February 28, 2022
/s/ Hannah A. Valantine Hannah A. Valantine	Director	February 28, 2022
/s/ Randall S. Livingston Randall S. Livingston	Director	February 28, 2022
/s/ Marshall L. Mohr Marshall L. Mohr	Director	February 28, 2022
/s/ Kathy Ordoñez Kathy Ordoñez	Director	February 28, 2022

/s/ Lucy Shapiro Lucy Shapiro	Director	February 28, 2022

Exhibit 21.1

LIST OF SUBSIDIARIES

Subsidiary name	Jurisdiction	Type
Pacific Biosciences International LLC	Delaware	Domestic
Pacific Biosciences Canada Limited	Canada (New Brunswick)	Foreign
Pacific Biosciences Germany GmbH	Germany (Munich)	Foreign
Pacific Biosciences Japan GK	Japan (Tokyo)	Foreign
Pacific Biosciences (Shanghai) Co., Ltd.	China (Shanghai)	Foreign
PacBio Singapore PTE, Limited	Singapore	Foreign
Pacific Biosciences UK Limited	United Kingdom (London)	Foreign
Omniome, Inc.	Delaware	Domestic
Circulomics, Inc.	Maryland	Domestic

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the following Registration Statements:

(1) Registration Statements (Forms S-8 Nos. 333-170211, 333-179810, 333-186065, 333-193437, 333-201678, 333-209157, 333-215746, 333-222696, 333- 229368, 333-236061, 333-241687, 333-170211, 333-179810, 333-186065, 333-193437, 333-201678, 333-209157, 333-215746, 333-222696, 333-229368, 333-236061, 333-251153, 333-253669, 333-255342, 333-259671 and 333-261251) pertaining to the Pacific Biosciences of California, Inc. 2010 Equity Incentive Plan, the Pacific Biosciences of California, Inc. 2010 Employee Stock Purchase Plan, the Pacific Biosciences of California, Inc. 2010 Outside Director Equity Incentive Plan, the Pacific Biosciences of California, Inc. 2020 Equity Incentive Plan, the Pacific Biosciences of California, Inc. 2020 Inducement Equity Incentive Plan, and the Omniome Equity Incentive Plan of Pacific Biosciences of California, Inc., and

(2) Registration Statements (Forms S-3 Nos. 333-239071, 333-249999, 333-255324, 333-259670 and 333-259672) and related Prospectuses of Pacific Biosciences of California, Inc.;

of our reports dated February 28, 2022, with respect to the consolidated financial statements of Pacific Biosciences of California, Inc. and the effectiveness of internal control over financial reporting of Pacific Biosciences of California, Inc. included in this Annual Report (Form 10-K) of Pacific Biosciences of California, Inc. for the year ended December 31, 2021.

/s/ Ernst & Young LLP

Redwood City, California
February 28, 2022

Exhibit 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER PURSUANT TO SECURITIES EXCHANGE ACT RULES 13a-15(e), AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Christian Henry, certify that:

1. I have reviewed this annual report on Form 10-K of Pacific Biosciences of California, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2022

By: /s/ Christian Henry

Christian Henry
Chief Executive Officer and President
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER PURSUANT TO SECURITIES EXCHANGE ACT RULES 13a-15(e), AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Susan Kim, certify that:

1. I have reviewed this annual report on Form 10-K of Pacific Biosciences of California, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2022

By: /s/ Susan Kim

Susan Kim
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

Certification of CEO Furnished Pursuant to 18 U.S.C. Section 1350,
As Adopted Pursuant To
Section 906 of The Sarbanes-Oxley Act of 2002

In connection with the Annual Report of Pacific Biosciences of California, Inc. (the "Company") on Form 10-K for the period ended December 31, 2021, as filed with the Securities and Exchange Commission on the date hereof, I, Christian Henry, Chief Executive Officer of the Company, certify for the purposes of section 1350 of chapter 63 of title 18 of the United States Code, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge,

(i) the Annual Report of the Company on Form 10-K for the period ended December 31, 2021 (the "Report"), fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934, and

(ii) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 28, 2022

/s/ Christian Henry

Christian Henry
Chief Executive Officer and President
(Principal Executive Officer)

Exhibit 32.2

Certification of CFO Furnished Pursuant to 18 U.S.C. Section 1350,
As Adopted Pursuant To
Section 906 of The Sarbanes-Oxley Act of 2002

In connection with the Annual Report of Pacific Biosciences of California, Inc. (the "Company") on Form 10-K for the period ended December 31, 2021, as filed with the Securities and Exchange Commission on the date hereof, I, Susan Kim, Chief Financial Officer of the Company, certify for the purposes of section 1350 of chapter 63 of title 18 of the United States Code, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge,

(i) the Annual Report of the Company on Form 10-K for the period ended December 31, 2021 (the "Report"), fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934, and

(ii) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 28, 2022

/s/ Susan Kim

Susan Kim
Chief Financial Officer
(Principal Financial Officer)