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, 2020

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 o No x

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	o	Accelerated filer	o
Non-accelerated filer	x	Smaller reporting company	x
		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 o No x

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, 2020, based upon the closing price of Common Stock on such date as reported by NASDAQ Global Select Market, was approximately $498,891,052. 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, 2021: 193,102,689

DOCUMENTS INCORPORATED BY REFERENCE:

Portions of the registrant's definitive Proxy Statement relating to its 2021 Annual Meeting of Stockholders to be held on June 16, 2021 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

		Page
PART I		
Item 1.	Business	1
Item 1A.	Risk Factors	9
Item 1B.	Unresolved Staff Comments	34
Item 2.	Properties	34
Item 3.	Legal Proceedings	34
Item 4.	Mine Safety Disclosures	34
PART II		
Item 5.	Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities	35
Item 6.	Selected Financial Data	37
Item 7.	Management's Discussion and Analysis of Financial Condition and Results of Operations	38
Item 7A.	Quantitative and Qualitative Disclosures about Market Risk	46
Item 8.	Financial Statements and Supplementary Data	47
Item 9.	Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	73
Item 9A.	Controls and Procedures	73
Item 9B.	Other Information	73
PART III		
Item 10.	Directors, Executive Officers and Corporate Governance	73
Item 11.	Executive Compensation	73
Item 12.	Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters	73
Item 13.	Certain Relationships and Related Transactions, and Director Independence	73
Item 14.	Principal Accountant Fees and Services	73
PART IV		
Item 15.	Exhibits, Financial Statement Schedules	73
Item 16.	Form 10-K Summary	73
Signatures		73

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

Discussions under the captions "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. Such statements may be signified by terms 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.

ITEM 1. BUSINESS

Overview

We develop solutions that allow scientists to fundamentally transform how data from living systems are acquired, processed, and interpreted. Our products provide the most accurate and complete views of the genetic code of all living things, empowering scientists to improve the human condition – from curing diseases, to feeding a hungry world, to conserving our planet's ecosystems.

Based on our novel Single Molecule, Real-Time (SMRT®) sequencing technology, our products enable: de novo genome assembly to finish genomes in order to more fully identify, annotate and decipher genomic structures; full-length transcript analysis to improve annotations in reference genomes, characterize alternatively spliced isoforms in important gene families, and find novel genes; targeted sequencing to more comprehensively characterize genetic variations; and real-time kinetic information for epigenome characterization. Our technology provides highly accurate, long reads, otherwise referred to as HiFi reads, with uniform coverage and the ability to simultaneously detect epigenetic changes. PacBio® sequencing systems, including associated consumables and software, provide a simple and fast end-to-end workflow for SMRT sequencing.

Our current products include our Sequel II and Sequel IIe instruments, which when used together with our SMRT Cell 8M, are capable of sequencing up to approximately eight million DNA molecules simultaneously, and our previous generation Sequel instrument, which when used together with our SMRT Cell 1M, are capable of sequencing up to approximately one million DNA molecules simultaneously.

Our customers and our scientific collaborators have published over 8000 peer-reviewed articles in journals including Nature, Science, Cell, PNAS and The New England Journal of Medicine highlighting the power and applications of SMRT sequencing in projects such as finishing genomes, structural variation discovery, isoform transcriptome characterization, rare mutation discovery and the identification of chemical modifications of DNA related to virulence and pathogenicity. Our research and development efforts are focused on developing new products and further improving our existing products including continuing chemistry and sample preparation improvements to increase throughput and expand our supported applications.

Pacific Biosciences of California, Inc., formerly Nanofluidics, Inc., was incorporated in the State of Delaware in 2000. Our executive offices are located at 1305 O'Brien Drive, Menlo Park, California 94025, and our telephone number is (650) 521-8000.

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 human 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. Within these chromosomes are approximately 23,000 smaller regions, called genes, which contain the blueprints for protein production. The proteins synthesized from these blueprints essentially underlie the operation of all biological systems.

The first few whole-genome sequencing studies of disease have shown that rare mutations play a critical role in human disease, which has contributed to the burgeoning field of genomics. Since then, recent discoveries have highlighted additional complexities in the building blocks of DNA and ribonucleic acid, or RNA, including the presence of modified bases, the discovery of new modified bases, and the processing of RNA, molecules after such molecules are transcribed from the genome, thereby affecting the synthesis of proteins.

Recent advances in our understanding of biological complexity have highlighted the need for advanced tools, such as our Sequel® System, Sequel II System, and Sequel IIe System, to study DNA, RNA, and proteins. Incremental technological advances in nucleic acid sequencing have provided novel insights into the structure and function of the genome. With our technology, we hope to help scientists to one day fully characterize genomes in both humans and other living organisms.

Evolution of Sequencing

In order to understand the limitations of current nucleic acid sequencing technologies, it is important to understand the sequencing process. This process consists of three phases: sample preparation, physical sequencing, and analysis. In the sample preparation phase, the target genome is broken into multiple small fragments and, depending on the amount of sample DNA available, these fragments may be copied multiple times through a process known as amplification, using a variety of molecular methods. In the physical sequencing phase, the individual bases in each fragment are identified in order, creating individual reads. The number of individual bases identified contiguously is defined as read length. In the analysis phase, bioinformatics software is used to align overlapping reads, which allows the original genome to be assembled into contiguous sequence. The longer the read length, the easier it is to accurately assemble the genome.

Sanger Sequencing

The first automated sequencing methodology, often referred to as "Sanger sequencing," was developed by Frederick Sanger in 1977. With this technology, during sample preparation, scientists first make different sized fragments of DNA each starting from the same location. Each fragment ends with a particular base that is labeled with one of four fluorescent dyes corresponding to that particular

base. Then all of the fragments are distributed in order of their length by driving them through a gel. Information regarding the last base is used to determine the original sequence. Under standard conditions, this method results in a read length that is approximately 700 bases on average, but may be extended to 1,000 bases. These are relatively long read lengths compared with many next-generation sequencing methods. However, Sanger sequencing is limited by the small amounts of data that can be processed per unit of time, referred to as throughput.

Short-read Sequencing

Several commercial DNA sequencing tools emerged in 2005 in response to the low throughput of Sanger sequencing. Now commonly referred to as "short-read sequencing", these methods achieve much higher throughput by sequencing a large number of DNA molecules in parallel, but with the tradeoff of shorter read lengths.

In most short-read sequencing methodologies, tens of thousands of identical strands are anchored to a given location to be read in a process consisting of successive flushing and scanning operations. The "flush and scan" sequencing process involves sequentially flushing in reagents, such as labeled nucleotides, incorporating nucleotides into the DNA strands, stopping the incorporation reaction, washing out the excess reagent, scanning to identify the incorporated base and finally treating that base so that the strand is ready for the next "flush and scan" cycle. This cycle is repeated until the reaction is no longer viable.

Due to the large number of flushing, scanning and washing cycles required, the time to result for short-read sequencing methods can be longer, sometimes taking days. This repetitive process also limits the average read length produced by most of these systems under standard sequencing conditions to approximately 35 to 600 bases.

The short-read sequencing technologies require a large number of DNA molecules during the sequencing process. To generate enough DNA molecules, a copying method called PCR amplification is required during the sample preparation phase. This amplification process can introduce errors known as amplification bias. The effect of this bias is that resulting copies are not uniformly representative of the original template DNA. In cases where the original template DNA contains regions of relatively high G-C content or relatively high A-T content, the PCR amplification process tends to under-represent these regions. As a result, these regions, which may contain entire genes, can be completely missed.

In summary, while short-read sequencing methods can offer very high throughput and low cost per identified base, their disadvantages can include limited read length, variation in sequence coverage with regard to representation bias and accuracy, dependence on amplification, long time to result, and/or a need for many samples to justify machine operation.

The PacBio Solution — Single Molecule, Real-Time Technology

We have developed our SMRT technology, which enables single molecule, real-time detection of nucleic acid sequences, to address many of the limitations of previous sequencing technologies. By providing long read lengths, elimination of the dependence on amplification during sample preparation (which can result in amplification bias), very high consensus accuracy, and the ability to detect DNA base modifications, PacBio's systems can provide more comprehensive and higher quality information of DNA and RNA sequence as well as epigenetic regulation and DNA damage.

Pacific Biosciences' SMRT Technology

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, enzymes measuring approximately 15 nanometers (nm) in diameter. DNA polymerases attach themselves to a strand of DNA to be replicated, examines the individual base at the point it is attached, and then determines which of four building blocks, or nucleotides, is required to complement that individual base. After determining which nucleotide is required, the polymerases incorporate that nucleotide into the growing strand being produced. After incorporation, the enzyme advances to the next base to be replicated and the process is repeated.

To overcome the challenges inherent in real-time observation of the natural activity of the DNA polymerase, we offer and support four key innovations:

- The SMRT Cell
- Phospholinked nucleotides
- The Sequel, Sequel II, or Sequel IIe instruments
- Circular Consensus Sequencing or "HiFi Reads"

The SMRT Cell

One of the fundamental challenges with observing a single DNA polymerase molecule working in real time is the ability to detect the incorporation of a single nucleotide, taken from a large pool of potential nucleotides, during DNA synthesis. To resolve this problem, we utilize our nanoscale innovation, the zero-mode waveguide, or ZMW.

The ZMWs in our SMRT Cells consist of holes in an opaque layer, measuring only tens of nanometers in diameter forming nanoscale wells. The small size of the ZMW causes the intensity of visible laser light, which has a wavelength of approximately 600nm, to decay exponentially in the ZMW. Therefore, laser light shined into the ZMW from below is blocked from reaching the sequencing

solution above the ZMW, providing selective illumination of only the bottom portion of the nanoscale well. DNA polymerases are anchored to the bottom of the glass surface of the nanoscale wells using proprietary techniques. Nucleotides, each type labeled with a different colored fluorophore, are then flooded above an array of ZMWs at the required concentration. When the labeled nucleotides diffuse into the bottom portion of the nanoscale wells, which contain the anchored DNA polymerases, their fluorescence can be monitored. When the correct nucleotide is detected by the polymerase, it is incorporated into the growing DNA strand in a process that takes milliseconds in contrast to simple diffusion which takes microseconds. This difference in time results in higher signal intensity for incorporated versus unincorporated nucleotides, which creates a high signal-to-noise ratio. Thus, the ZMW provides the ability to detect a single incorporation event against the background of fluorescently labeled nucleotides at biologically relevant concentrations. Our DNA sequencing is performed on proprietary SMRT Cells, each having an array of ZMWs. The SMRT Cells for the Sequel System each contain approximately one million ZMWs and the SMRT Cells for the Sequel II or IIe System contain approximately eight million ZMWs. Each ZMW is capable of containing a DNA polymerase molecule bound to a single DNA template. Currently, our immobilization process randomly distributes polymerases into ZMWs across the SMRT Cell, typically resulting in approximately one-third to two-thirds of the ZMWs having a single template.

Phospholinked Nucleotides

Our proprietary phospholinked nucleotides have a fluorescent dye attached to the phosphate chain of the nucleotide rather than to the base. As a natural step in the synthesis process, the phosphate chain is cleaved when the nucleotide is incorporated into the DNA strand. Thus, upon incorporation of a phospholinked nucleotide, the DNA polymerase naturally frees the dye molecule from the nucleotide when it cleaves the phosphate chain. Upon cleaving, the label quickly diffuses away, leaving a natural piece of DNA without evidence of labeling.

The Sequel, Sequel II and Sequel IIe Instruments

The 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, or QVs.

HiFi Reads

We enable our customers to achieve very high accuracy on long, individual DNA fragments using our Circular Consensus Sequencing method, whereby the same DNA fragment is repetitively read to overcome random errors that can occur on each pass. This proprietary method of producing what we call "HiFi reads" differentiates PacBio sequencing from other long-read technologies. Users who generate HiFi reads with PacBio systems can sequence single molecule DNA fragments up to 25,000 base pairs in length with an average accuracy of 99.9%.

SMRT Sequencing Advantages

Sequencing based on our SMRT technology offers the following key benefits:

- *Longer read lengths*

SMRT technology has been demonstrated to produce read lengths that are significantly longer than those of previous sequencing technologies. With reads of tens of kilobases in length, users can assemble complete genomes and sequence full-length transcripts. Long read lengths are an important factor in enabling a comprehensive view of the genome, as they can reveal multiple types of genetic variation such as structural variants.

- *High accuracy*

Users of SMRT technology can achieve very high accuracy due to the attributes of SMRT sequencing, including accurate mapping of long reads, lack of reliance on amplification during sample preparation (which can result in amplification bias), and lower systematic bias. In addition, using PacBio's proprietary Circular Consensus Sequencing method, our customers can generate HiFi reads on single molecule DNA fragments up to 25,000 base pairs in length with an average accuracy of 99.9%. This accuracy provides the information users need to confidently call and detect all types of variants.

- *More uniformity and less systematic error*

The sample preparation step for SMRT sequencing is compatible with but does not require amplification; when amplification is not used during sample preparation, the reads are not subject to amplification bias. Importantly, this allows for uniform identification of all bases present in a DNA sample and uniform sequence coverage. As a result, SMRT sequencing can detect and identify regions and entire genes that may be missed by short-read sequencing technologies. In addition, SMRT sequencing can achieve high accuracy when sequencing through complex and highly repetitive regions, whereas other sequencing methods are unable to resolve such regions, which can often result in poor accuracy.

- *Ability to observe and capture kinetic information*

The ability to observe the activity of a DNA polymerase in real time enables the PacBio RS II, Sequel, and Sequel II Systems to collect, measure and assess the dynamics and timing of nucleotides being added to a growing DNA strand, referred to as kinetics. It is well established in the scientific community that chemical modification of DNA such as the addition of a methyl group, known as methylation, can alter the biological activity of the affected nucleotide. The Sequel and Sequel II Systems detect changes in kinetics automatically by capturing and recording changes in the duration of, and time period between, each of the fluorescent pulses during a typical sequencing analysis. Integrated software can then translate these kinetic signatures into uniquely characterized modified bases such as 6-mA, 4-mC and 5-mC. Other sequencing systems, which rely on a sample preparation amplification step or are limited by signal resolution, are unable to directly measure this type of kinetic data.

- *Flexibility*

Our sequencing systems have the ability to scale the throughput and cost of sequencing across a range of small to large projects. They can be used with a variety of sample types and can output a range of DNA lengths.

Our Products

We entered the market with our first commercial product, the PacBio *RS* System, during the second quarter of 2011 and launched the higher performance PacBio RS II System during the second quarter of 2013. In September 2015, we announced the Sequel System, which is based on the same underlying SMRT technology as the PacBio RS II System, but the Sequel System can achieve up to approximately seven times the throughput using the SMRT Cell 1M chip. In April 2019, we introduced the Sequel II System, which can achieve approximately eight times the throughput of the Sequel System, utilizing our new SMRT Cell 8M chip. Coupled with chemistry and software improvements for the Sequel II System released during the fourth quarter of 2019, customers commonly generate up to 15 times as much throughput on Sequel II Systems, compared with the throughput generated on Sequel systems. Our sequencing systems provide access to a wide range of applications and are designed for expandable improvements to performance capability and new application capabilities through chemistry and software enhancements without necessitating changes to instrument hardware. 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.

PacBio's Systems

The PacBio RS II, Sequel, Sequel II and Sequel IIe Systems conduct, monitor, and analyze biochemical sequencing reactions. PacBio systems are integrated units that include high performance optics, automated liquid handling, a touchscreen control interface and computational hardware and software. Each instrument's high performance optics monitor the ZMWs in a SMRT Cell in real time. The automated liquid handling system performs reagent mixing and prepares SMRT Cells. Each instrument's touchscreen control interface is the user's primary control center to design and monitor experiments. The computational hardware and software in each instrument is responsible for processing the sequencing data produced by the SMRT Cells. The PacBio Systems have been designed to allow for performance improvements to be easily integrated into the systems. We no longer manufacture the PacBio RS II instrument.

Consumables

Customers must 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. SMRT Cells are individually and hermetically sealed, then packaged together into a streamlined four-pack tray.

We offer several reagent kits, each designed to address a specific step in the 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 sequencing kits contain reagents required for on-instrument, real-time sequencing, including the phospholinked nucleotides.

Product Enhancements

Since the introduction of our products in 2011, we have continued to significantly enhance the performance of PacBio sequencing systems through a combination of sample preparation protocol enhancements, software releases, and new sequencing reagent chemistries. By providing an increasing number of longer reads per instrument run, the new chemistries have enabled users to assemble more genomes to a high quality. We have continually improved our software to expand the number of supported applications such as large genome assembly, structural variant analysis, variant detection, sequencing of transcript isoforms produced from genes, metagenomics, and phasing of haplotypes in large amplicons.

Market for Our Products

Our customers use our products for sequencing genomes and transcriptomes across a wide range of organisms. Initially, customers in research, government and commercial markets used PacBio Systems to generate more complete assemblies of small and medium size genomes, such as bacteria and fungi, and for sequencing targeted regions of larger genomes such as humans and plants. As throughput and read lengths have increased, the complexity and size of genomes being resolved with SMRT sequencing have grown. Scientists now use SMRT sequencing to generate genome assemblies of numerous plant, human and other animal genes, including characterization of

transcriptomes through full-length isoform sequencing, and phase complex genomic regions like full-length human leukocyte antigen, or HLA, genes. With continued performance improvements of our products, we anticipate increasing both mindshare and market share within research, government and commercial markets such as human biomedical research, plant and animal sciences, microbiology & infectious disease, and immunogenomics.

There are a number of emerging markets for sequencing-based tests, including molecular diagnostics, which represent significant potential opportunities for our products. The development of these markets is subject to variability driven by ongoing changes in the competitive landscape, evolving regulatory requirements, government funding of research and development activities, and macroeconomic conditions. Introductions of new technologies and products, while positive to the overall development of these markets, may result in greater competition for the limited financial resources available. As we continue to expand into these emerging markets, the development of our business will be impacted by the variability of the factors affecting the growth of these markets.

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. Our sales strategy involves the use of a combination of sales personnel and field application scientists. The role of our sales personnel is to educate customers on the advantages of SMRT technology and the applications that our technology makes possible. The role of our field application scientists is to provide on-site training and scientific technical support to prospective and existing customers and to encourage customer utilization of our SMRT sequencing technology. Our field application scientists are technical experts, often with advanced degrees, and generally have extensive experience in academic research and core sequencing lab experience.

Service for our instruments is performed by field service engineers. These field service engineers are trained by experienced personnel to test, trouble-shoot, and service instruments installed at customer sites.

In addition, we maintain an applications lab team in Menlo Park, California composed of scientific experts who can transfer knowledge from the research and development team to the field application scientists. The applications lab team also runs foundational scientific collaborations and proof of principle studies, which help demonstrate the value of our product offering to prospective customers.

Our business is subject to seasonal trends. See “Risk Factors— Seasonality may cause fluctuations in our revenue and results of operations” for additional information.

Customers

Our customers include research institutions, commercial laboratories, genome centers, clinical, government and academic institutions, genomics service providers, pharmaceutical companies and agricultural companies. In general, our customers will isolate, prepare and analyze genetic samples using PacBio sequencing systems in their own research labs, 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, 2020, 2019 and 2018, one customer, Gene Company Limited, our primary distributor for China and Hong Kong, accounted for approximately 14%, 17% and 26% 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.

We currently sell our products to a number of customers outside the United States, including customers in other areas of North America, Europe, Middle East, Africa, Asia Pacific and South America. Revenue from customers outside the United States totaled $43.1 million, or 55% of our total revenue during fiscal 2020, compared to $48.1 million, or 53% of our total revenue during fiscal 2019 and $44.7 million, or 57% of our total revenue during fiscal 2018.

Backlog

As of December 31, 2020, our instrument backlog was approximately $10.1 million, compared to $6.6 million as of December 31, 2019. 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 2021; 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

Our principal manufacturing activities are performed at our headquarters in Menlo Park, California. We currently perform some of the manufacturing and all of the final integration of our instruments in-house, while outsourcing most sub-assemblies to third-party manufacturers. With respect to the manufacture of SMRT Cells, we subcontract wafer fabrication and processing to semiconductor processing facilities, but conduct critical surface treatment processes internally. We also subcontract the packaging of SMRT Cells, and bring them back in-house for final testing. In addition, we manufacture critical reagents in-house, including our phospholinked nucleotides and our DNA polymerase.

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. If the capabilities of our suppliers and component manufacturers are limited or stopped, due to disasters, quality, regulatory, or other reasons, it could negatively impact our ability to manufacture our products.

Research and Development

Our SMRT technology requires the blending of a number of unique disciplines, namely nanofabrication, physics, photonics, optics, molecular biology, engineering, signal processing, high performance computing, and bioinformatics. Our research and development team is a blend of these disciplines creating a single, cross-functional /operating unit. We have also established productive working relationships with technology industry leaders, as well as leading academic centers, to augment and complement our internal research and development efforts. We plan to continue our investment in research and development to enhance the performance and expand the application of our current products, and introduce additional products based on our SMRT technology. Our goals include further improvements in sequencing read length and mappable data per SMRT Cell, chemistry and software enhancements, and enhancements in sample preparation and bioinformatics tools that take advantage of the capabilities of our products. In addition, our engineering teams will continue their focus on increasing instrument component and system reliability, reducing costs, and implementing additional system flexibility and versatility through the enhancement of existing products and development of new products.

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. 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, 2020, we own or hold exclusive licenses to 332 issued U.S. patents, 64 pending U.S. patent applications, 220 granted foreign patents and 63 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 2021 and 2038. 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, and Qiagen N.V. (“Qiagen”). Many of these companies currently have greater financial, technical, research and/or other resources than we do. They also have larger and more established manufacturing capabilities and marketing, sales and support functions. 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, including single molecule, real-time resolution, the combination of very high consensus accuracy and long read lengths with the ability to detect real-time kinetic information, fast time to result and flexibility, as well as the breadth and depth of current and future products and applications.

Government Regulation

Our products are not currently subject to U.S. Food and Drug Administration (FDA) clearance or approval since they are not intended or labeled for use in the diagnosis, prevention, or treatment of any disease, and are labeled and promoted as “For Research Use Only” (RUO) products. 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.

As we expand product lines to potentially address clinical applications including the diagnosis of disease, regulation by governmental authorities in the United States and other countries may become an increasingly significant factor in development, testing,

production, and marketing. In the future, products that we 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. 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 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.

If our products that are labeled as RUO are or could be used for the diagnosis of disease, the regulatory requirements related to marketing, selling, and supporting such products could be uncertain. This is true 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.

Certain of our products are currently available through laboratories that are certified under the Clinical Laboratory Improvements Amendments (CLIA) of 1988. These products are commonly called “laboratory developed tests” (LDTs). For a number of years, the FDA has exercised its regulatory enforcement discretion not to regulate LDTs as medical devices if created and used within a single laboratory. However, the FDA is continually reexamining this regulatory approach and changes to the agency’s handling of LDTs could impact our business in ways that we cannot predict at this time. We cannot predict the nature or extent of the FDA's final guidance or regulation of LDTs, in general, or with respect to our or our customers’ LDTs, in particular.

Certification of CLIA laboratories includes standards in the areas of personnel qualifications, administration, and participation in proficiency testing, patient test management, and quality control procedures. CLIA also mandates that, for high complexity labs such as ours, to operate as a lab, we must have an accreditation by an organization recognized by CLIA such as the College of American Pathologists (CAP), which we have obtained and must maintain. If we were to lose our CLIA certification or CAP accreditation, our business, financial condition, or results of operations could be adversely affected. In addition, state laboratory licensing and inspection requirements may also apply to our products, which, in some cases, are more stringent than CLIA requirements.

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, 2020, we had 412 full-time employees. Of these employees, 158 were in research and development, 94 were in operations and service, 101 were in marketing, sales and customer support, and 59 were in general and administration. With the exception of our field-based sales, marketing and service teams, the majority of our employees are based out of our headquarters in Menlo Park, 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 2020, we have been successful in hiring key positions throughout the organization that will help advance the company’s growth. This includes an appointment of a new Chief Executive Officer, Chief Financial Officer, Chief Operating Officer, and Chief Commercial 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 create investment in our workforce by offering competitive compensation and benefits package. We provide employees with compensation packages that include base salary, annual incentive bonuses, 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 package.

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.

These investments and the prioritization of employee health, safety, and wellness took on particular significance in 2020 in light of COVID-19. To protect and support our essential team members, we have implemented health and safety measures that included 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. In response to local stay-at-home orders and in alignment with CDC recommendations, we have limited our manufacturing and commercial operations based in Menlo Park, California. 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 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. In 2020, we implemented a global training program on diversity awareness to help employees understand, recognize, respond, and prevent bias at all levels of our organization. This is the first of our multi-pronged approach in building an inclusive culture. 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 as a channel of distribution for important company information. 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). Information on or that can be accessed through our website or our Twitter account 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.

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 COVID-19 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 recent coronavirus outbreak;
- 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 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 consumable kits 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;
- 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 recent coronavirus outbreak.

Our business could be adversely impacted by the effects of COVID-19 or other epidemics or pandemics. As a result of COVID-19, our 2020 financial results were impacted negatively as our customers in multiple regions around the world suspended their normal operations in efforts to curb the spread of the COVID-19 pandemic. However, a significant number of our customer sites that had shut down due to COVID-19 have re-opened. In addition, a significant number of customers have delayed purchases of capital 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 negative impacts of COVID-19 on our customers will likely continue to adversely impact our revenues during the first half of 2021. The inability to receive or accept shipment 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 have

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 monitoring this rapidly evolving situation.

Our manufacturing partners and suppliers could also 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. At this point in time, there is significant uncertainty relating to the potential 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.

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, 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.

We have limited commercial sales to date and the commercialization and sales of our current or future products may be unsuccessful or less successful than anticipated.

Our first commercial product launched in 2011 and we have had limited sales to date. As such, we have limited historical financial data upon which to base our projected revenue and planned operating expenses or upon which to evaluate our company and our commercial prospects. Furthermore, 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. Based on our limited 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;
- drive adoption of our current and future products, including the Sequel II/IIe Systems;
- 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;
- grow our share by marketing and selling our products for new and additional applications;
- 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. 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), and December 31, 2020 (as a result of recognition of gain relating to the Reverse Termination Fee), 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. While we achieved profitability for the quarter ended March 31, 2020, this result was largely due to income recognition of the Continuation Advances. Even if profitability is achieved in the future, we may not be able to sustain profitability on a consistent basis. Excluding the recognition in October 2020 of gain relating to the Reverse Termination Fee and the recognition in the first quarter of 2020 of gain relating to the Continuation Advances, 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 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. 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. Our existing resources 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.

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 recently 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.

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.

If we are unable to successfully develop and timely manufacture our current and future products, including with respect to the Sequel System, the SMRT Cell 8M and Sequel II/IIe Systems 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 the SMRT Cell 8M, reagents and Sequel II/IIe Systems, 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 System, and may need to develop in the future, other customized SMRT Cells and consumables for our future products, including the SMRT Cell 8M for the Sequel II/IIe Systems. Our production of the SMRT Cells for the Sequel System has been and may in the future be below desired levels, 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 recent COVID–19 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 with respect to 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 Corporation 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, we may incur significant costs during these transitions, and they 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 and also 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 the SMRT Cell 8M and Sequel II/IIe Systems, 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.

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

We have recently 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 Eric E. Schaefer was appointed effective May 26, 2020, 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. 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 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. 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 assure that we can successfully acquire additional customers. Furthermore, we cannot guarantee that our products will be satisfactory to potential customers we seek to reach or that our products will perform in accordance with customer expectations.

These 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 they will be receptive to any of our products. 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, including with respect to the SMRT Cell 8M and Sequel II/IIe Systems. 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 precision in 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 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. For our current and future sole source third-party manufacturing and supply collaborators, we may be unable to negotiate binding agreements with them or find replacement manufacturers to support our development and commercial activities at commercially reasonable terms in the event that their services to us becomes interrupted for any reason. 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 do not timely provide sufficient quantities to us. 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 will 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 could be disrupted by conditions unrelated to our business or operations or that are beyond our control, including but not limited to international trade restrictions 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. Our current manufacturing process is characterized by long lead times between the placement of orders for and delivery of our products. If we have received 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 consumable kits, including SMRT Cells, 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, has been and may in the future be below desired levels, and 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, we may not be able to increase manufacturing to meet anticipated demand or may experience downtime in our manufacturing facilities. 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, financial condition and results of operations.

Rapidly changing technology in life sciences and 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, 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 year ended December 31, 2020, 2019 and 2018, one of our customers, Gene Company Limited, accounted for approximately 14%, 17% and 26% 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. 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.

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 cycles 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 such funds remain unspent at such fiscal year-end. Furthermore, celebrations of the Lunar New Year, which occurs during our first quarter, may last for a week or longer, during which time many of our customers' offices in China and elsewhere in the Asia-Pacific region may be closed due to the holiday, and have in the past caused, and may in the future cause, decreased sales of our consumables during such 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 become in the future, 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”) and 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, 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 affect 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 ONT and 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 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, even when we hope not. 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 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 not currently subject to U.S. Food and Drug Administration (“FDA”) clearance or approval since they are not intended or labeled for use in the diagnosis, prevention, or treatment of any disease, and are labeled and promoted as research use only (RUO) products. 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. 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 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.

Recently, as part of the Trump Administration's efforts to combat COVID-19 and consistent with the President's direction in 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, for an LDT may nonetheless voluntarily submit a premarket approval application, 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. While this action by HHS is expected to reduce the regulatory burden on clinical laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 that develop LDTs, it is unclear how this action as well as future legislation by federal and state governments and the FDA will impact the industry, including our business and that of our customers. Such HHS measure may compel the FDA to formalize earlier enforcement discretionary policies and informal guidance through notice-and-comment rulemaking and/or impose further restrictions on LDTs. HHS' rescission policy may change over time. Congress could also enact legislation restricting LDTs. Any restrictions on LDTs by the FDA, HHS, Congress, or state regulatory authorities may decrease the demand for our products. The adoption of new restrictions on RUO products, whether by the FDA or Congress, could adversely affect demand for our specialized reagents and instruments. Further, we could be required to obtain premarket clearance or approval before we can sell our products to certain customers.

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 premarket approval application (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 U.S., 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. 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. Therefore, it is possible that our ability to export our products may be restricted in the future, most notably China.

If we commercialize any of our products outside of the United States, 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.

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 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.

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 COVID-19, 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.

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). 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 make cash payments 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 COVID-19 as discussed above, the overall demand for nucleic acid sequencing products may be particularly vulnerable to unfavorable economic conditions. A global financial crisis 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 COVID-19
- 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;
- 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 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, the U.K. and the 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 United Kingdom from the European Union;
- 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;
- 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 ("GDPR") which took effect in the European Union 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. Generally Accepted Accounting Principles ("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, such as during this presidential election year. 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, 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, 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, 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 other. 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.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

As of December 31, 2020, we lease approximately 180,000 square feet in Menlo Park, California, where we house our headquarters, and our laboratory, in-house manufacturing, service and support functions. We also lease a sales office facility in Singapore, and engineering support facilities in Allen, Texas.

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 6. 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, 2021, there were approximately 20 stockholders of record of our common stock, although we believe that there are a significantly larger number of beneficial owners of our common stock.

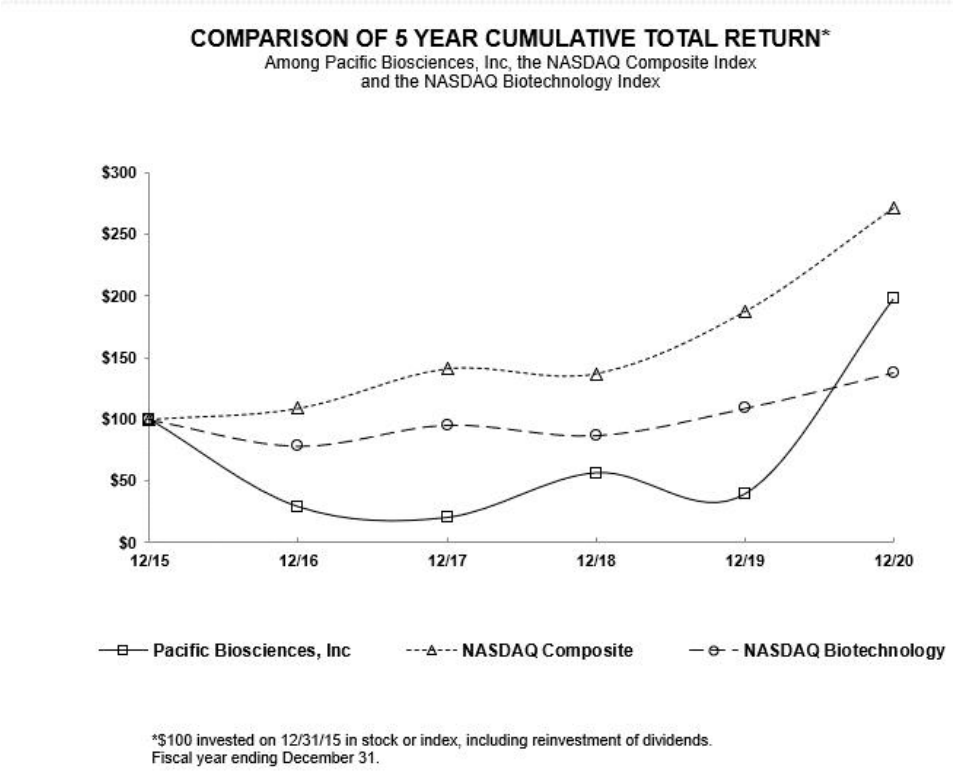
Dividend Policy

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, 2015 through December 31, 2020 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

None.

ITEM 6. SELECTED FINANCIAL DATA

Our historical results are not necessarily indicative of the results to be expected for any future period. The following selected financial data should be read in conjunction with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our consolidated financial statements and related notes included elsewhere in this Annual Report on Form 10-K.

	Year Ended December 31,				
	2020	2019	2018	2017	2016
	(in thousands except per share amounts)				
Total revenue	$ 78,893	$ 90,891	$ 78,626	$ 93,468	$ 90,714
Total cost of revenue	46,327	56,315	53,530	58,809	46,554
Gross profit	32,566	34,576	25,096	34,659	44,160
Total operating expense	136,951	135,121	126,083	124,443	115,404
Operating loss	(104,385)	(100,545)	(100,987)	(89,784)	(71,244)
Gain from Reverse Termination Fee from Illumina (1)	98,000	—	—	—	—
Gain from Continuation Advances from Illumina (1)	34,000	18,000	—	—	—
Net Income (loss)	$ 29,403	$ (84,134)	$ (102,562)	$ (92,189)	$ (74,375)
Net loss per share:					
Net income (loss) per share					
Basic	$ 0.18	$ (0.55)	$ (0.76)	$ (0.87)	$ (0.83)
Diluted	$ 0.17	$ (0.55)	$ (0.76)	$ (0.87)	$ (0.83)
Weighted average shares outstanding used in calculating net income (loss) per share					
Basic	165,187	152,527	135,094	105,682	89,148
Diluted	174,970	152,527	135,094	105,682	89,148

	As of December 31,				
	2020	2019	2018	2017	2016
	(in thousands)				
Cash, cash equivalents and investments	$ 318,814	$ 49,099	$ 102,354	$ 62,872	$ 71,978
Working capital	317,085	31,893	104,775	72,984	75,237
Total assets	413,980	147,985	170,275	144,084	137,884
Total liabilities	78,489	93,068	56,214	57,981	53,216
Total stockholders' equity (2)	$ 335,491	$ 54,917	$ 114,061	$ 86,103	$ 84,668

(1) In accordance with the terms of the Merger Agreement, Illumina paid us cash payments ("Continuation Advances"), of $34.0 million and $18.0 million for the year ended December 31, 2020 and 2019, respectively, which we reflected as a part of Other income for the year ended December 31, 2020 and 2019, respectively. In addition, as part of the Termination Agreement, Illumina paid us a Reverse Termination Fee of $98.0 million, which we reflected as a part of other income for the year ended December 31, 2020. Please see "Note 2. Termination of Merger with Illumina" in Part II, Item 8 of this Annual Report on Form 10-K for additional information.

(2) 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. Please see "Note 8. Stockholders' Equity" in Part II, Item 8 of this Annual Report on Form 10-K for additional information.

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.

Overview

We design, develop and manufacture sequencing systems to help scientists resolve genetically complex problems. Based on our novel Single Molecule, Real-Time (SMRT®) sequencing technology, our products enable: de novo genome assembly to finish genomes in order to more fully identify, annotate and decipher genomic structures; full-length transcript analysis to improve annotations in reference genomes, characterize alternatively spliced isoforms in important gene families, and find novel genes; targeted sequencing to more comprehensively characterize genetic variations; and real-time kinetic information for epigenome characterization. Our technology provides high accuracy, ultra-long reads, uniform coverage and the ability to simultaneously detect epigenetic changes. PacBio® sequencing systems, including consumables and software, provide a simple and fast end-to-end workflow for SMRT sequencing.

Our current products include the Sequel II and Sequel IIe instruments, and SMRT Cell 8M, which when used together are capable of sequencing up to approximately eight million DNA molecules simultaneously, and the previous generation Sequel instrument and Sequel SMRT Cell 1M, which, when used together are capable of sequencing up to approximately one million DNA molecules simultaneously. 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.

Our customers and our scientific collaborators have published numerous peer-reviewed articles in journals including Nature, Science, Cell, PNAS and The New England Journal of Medicine highlighting the power and applications of SMRT sequencing in projects such as finishing genomes, structural variation discovery, isoform transcriptome characterization, rare mutation discovery and the identification of chemical modifications of DNA related to virulence and pathogenicity. Our research and development efforts are focused on developing new products and further improving our existing products including continuing chemistry and sample preparation improvements to increase throughput and expand our supported applications. By providing access to genetic information that was previously inaccessible, we enable scientists to confidently increase their understanding of biological systems.

Senior Management

Our President and Chief Executive Officer Christian O. Henry was appointed effective September 14, 2020, succeeding Dr. Michael Hunkapiller who announced his retirement, which was effective at the end of the year 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 Vice President and Chief Accounting Officer Eric E. Schaefer was appointed effective May 26, 2020, and our Chairman of the Board Dr. John F. Milligan was appointed effective September 14, 2020. On December 31, 2020, the Board of Directors appointed Mark Van Oene to the role of Chief Operating Officer and designated him as the Company's principal operating officer, and appointed Peter Fromen to the role of Chief Commercial Officer, effective in each case upon his commencement of employment with the Company on January 8, 2021.

2021 Strategic Objectives

For 2021, we have outlined three strategic objectives:

- Expand our commercial reach;
- Accelerate our product development pipeline; and
- Drive market leadership in whole-genome clinical sequencing

Expanding our commercial reach includes hiring senior level team members with extensive commercial experience. From December 2020 through January 2021, we hired a Chief Commercial Officer, a Vice President of Commercial Operations, a Vice President of Strategic Marketing, a Vice President of Product Marketing, and a Senior Director of Product Marketing. During 2021, we expect to more than double our number of quota-carrying field sales personnel from 22 at the end of 2020 to more than double by the end of 2021. In addition, we plan to expand our commercial support activities and invest in more sales tools. We also intend to invest more heavily in marketing programs to increase the awareness of our products to a broader number of potential customers. As a result of these commercial expansion activities, we expect our sales, general, and administrative expense to increase significantly in 2021 as compared to 2020.

Accelerating our product development pipeline includes significantly expanding our research and development team in an effort to accelerate the development of multiple new products. In association with the collaboration we entered into with Invitae Corporation ("Invitae") in January 2021, as described below, we plan to develop a new platform with production-scale high-throughput capability, which will be in addition to other new products we already have in development. In order to develop these multiple products in parallel, we anticipate hiring over 50 additional people into our Research and Development departments. In addition, we expect to increase our spending on outside development costs. As a result, we expect our research and development expense to increase significantly in 2021 as compared to 2020.

We believe that with the capabilities of our SMRT technology, we can be a market leader in whole-genome clinical sequencing. Leading institutions such as Children's Mercy Kansas City, Invitae and Stanford University have adopted the use of our products to study rare and inherited disease. We believe the market opportunity for clinical sequencing is very large, and could drive significant revenue growth for the company. In an effort to accelerate this growth, we entered into the collaboration with Invitae, who is a market leader in medical genetic testing, and has the desire to sequence hundreds of thousands of genomes annually with our technology. We will continue to pursue additional partnerships to further drive the adoption of whole-genome clinical sequencing.

Cash Position

Cash, cash equivalents and investments, excluding short-term and long-term restricted cash, at December 31, 2020 totaled $318.8 million, compared to $49.1 million at December 31, 2019. In February 2021, we issued the 1.50% Convertible Senior Notes due 2028 (the "Notes") in the aggregate principal amount of $900.0 million. Please refer to the Liquidity and Capital Resources section below for additional details relating to the Notes and other financing and cash considerations.

Invitae Collaboration

In January 2021 we entered into a multi-year collaboration with Invitae Corporation, or Invitae, to begin development of a production-scale high-throughput sequencing platform, or Program Products, leveraging the power of PacBio's highly accurate HiFi sequencing to expand Invitae's whole genome testing capabilities in the future. In connection with the development of the Program Products, Invitae will provide funds to the Company equal to certain development costs incurred by the Company. Under the development agreement, we will be primarily responsible for conducting a development program to develop the Program Products pursuant to a schedule and budget. We will make decisions regarding the development program jointly with Invitae. The development program is expected to last approximately sixty months, but may be shorter or longer. We have the right to broadly commercialize Program Products with other customers.

As a benefit of its contribution, Invitae will be entitled to preferred pricing on the Program Products if and when they are available for commercial sale. Each Program Product will have a preferential pricing period. During the initial period of preferred pricing for each Program Product, Invitae may purchase the Program Product at a substantially reduced margin until it has recouped a mutually agreed multiple of its contributed funds. Subsequently, for up to three years after the initial period of preferred pricing, Invitae has the right to purchase the Program Product at a price higher than the initial preferred pricing period but within a specified price range.

We and Invitae may terminate our collaboration if the other party remains in material breach of agreement following a cure period to remedy the material breach. In addition, our agreement with Invitae includes certain other circumstances for termination by each party, including circumstances where Invitae may terminate for delays, IP concerns, change in control, or without cause.

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

We expect to incur significant development costs over the duration of the collaboration, including $20-25 million expected to be incurred during 2021. The Company is still evaluating the accounting impact of the agreement, including whether the funding received by the Company from Invitae represents discounts toward future supplies, funding of development efforts, or a combination of both. There can be no assurances that the development program will be successful or that the Program Products will become ready for commercial sale.

COVID-19 Update

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. The financial results for the year ended December 31, 2020 were impacted negatively as many of our customers in multiple regions around the world shut down operations for various periods of time in efforts to curb the spread of the COVID-19 pandemic. This resulted in lower product revenues for the year ended December 31, 2020 as compared to 2019. A significant number of our customer sites that had shut down due to COVID-19 have re-opened. In addition, a significant number of customers have delayed purchases or difficulties obtaining funding for capital expenditures 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 associate consumables and software. 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 based in Menlo Park, California. We will, however, 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.

A discussion of our comparison between 2020 and 2019 is presented below. A discussion of the changes in our results of operations between the years ended December 31, 2019 and December 31, 2018 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, 2019, filed with the Securities and Exchange Commission on February 28, 2020, 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, 2020 and 2019

	Year Ended December 31,			
	2020	2019	$ Change	% Change
Revenue:	(in thousands, except percentages)			
Product revenue	$ 65,424	$ 77,742	$ (12,318)	(16%)
Service and other revenue	13,469	13,149	320	2%
Total revenue	78,893	90,891	(11,998)	(13%)
Cost of Revenue:				
Cost of product revenue	35,424	44,771	(9,347)	(21%)
Cost of service and other revenue	10,903	11,544	(641)	(6%)
Total cost of revenue	46,327	56,315	(9,988)	(18%)
Gross profit	32,566	34,576	(2,010)	(6%)
Operating Expense:				
Research and development	64,152	59,630	4,522	8%
Sales, general and administrative	72,799	75,491	(2,692)	(4%)
Total operating expense	136,951	135,121	1,830	1%
Operating loss	(104,385)	(100,545)	(3,840)	(4%)
Gain from reverse termination fee from Illumina	98,000	—	98,000	—
Gain from continuation advances from Illumina	34,000	18,000	16,000	89%
Interest expense	(267)	(2,611)	2,344	90%
Other income, net	2,055	1,022	1,033	101%
Net income (loss)	$ 29,403	$ (84,134)	$ 113,537	135%

Revenue

Total revenue for the year ended December 31, 2020 was $78.9 million compared to $90.9 million for 2019.

Product revenue for the year ended December 31, 2020 was $65.4 million, compared to $77.7 million for the year ended December 31, 2019. Product revenue of $65.4 million for the year ended December 31, 2020 consisted of $34.3 million from sales of Sequel, Sequel II and Sequel IIe instruments and $31.1 million from sales of consumables, compared to total product revenue of $77.7 million for the same period during 2019, consisting of $45.1 million from sales of Sequel and Sequel II instruments and $32.6 million from sales of consumables. The decrease in instrument sales was primarily attributable to a lower number of instrument shipments and installations due to COVID-19 as discussed above. The decrease in consumable sales was primarily attributable to lower utilization of the installed base of instruments during certain periods of 2020 due to COVID-19 as discussed above. The negative impact of COVID-19 on our customers will likely continue to adversely impact our revenues during 2021.

Service and other revenue was $13.5 million and $13.1 million for the years ended December 31, 2020 and 2019, respectively, and was primarily derived from product maintenance agreements sold for our installed instrument base.

Gross Profit

Gross profit for the year ended December 31, 2020 was $32.6 million, resulting in a gross margin of 41% while gross profit for the year ended December 31, 2019 was $34.6 million, resulting in a gross margin of 38%. Gross margin for the year ended December 31, 2019 was negatively impacted by product transition costs, including inventory reserves taken in connection with the transition from Sequel to Sequel II.

Cost of product revenue was $35.4 million for the year ended December 31, 2020, compared to $44.8 million for 2019. Cost of product revenue decreased by $9.4 million for the year ended December 31, 2020 compared to 2019 primarily resulting from lower product shipments. In addition, during the year ended December 31, 2019, we incurred product transition costs including an inventory reserve taken in connection with the transition from Sequel to Sequel II.

Cost of service revenue was $10.9 million for the year ended December 31, 2020, compared to $11.5 million for 2019.

Research and Development Expense

Research and development expense for the year ended December 31, 2020 increased by $4.5 million, or 8%, compared to 2019. The increase in research and development expense was primarily driven by an increase of $3.4 million in compensation expenses and an increase of $1.7 million of higher product development costs. Research and development expenses included stock-based compensation expenses of $7.1 million and $7.7 million for the years ended December 31, 2020 and December 31, 2019, respectively.

We expect research and development expenses to increase significantly in 2021, as we intend to hire a significant number of additional personnel in our research and development departments. We estimate costs associated with the Invitae collaboration will amount to $20 - $25 million during 2021. Stock-based compensation included in research and development expense is expected to increase significantly in 2021.

Sales, General and Administrative Expense

Sales, general and administrative expense for the year ended December 31, 2020 decreased by $2.7 million, or 4%, to $72.8 million compared to $75.5 million for the year ended December 31, 2019. The decrease in sales, general and administrative expense was primarily attributable to a decrease in professional services of $6.7 million, primarily resulting from $12.7 million higher acquisition-related legal and professional fees incurred for the year ended December 31, 2019, partially offset by a $6.0 million merger advisory fee incurred in the first quarter of 2020; an increase of $2.9 million in salary and bonus expenses for the year ended December 31, 2020 and an increase of $1.0 million in stock-based compensation as a result of resuming the Employee Stock Purchase Plan ("ESPP") in 2020 and higher executive-level stock-based compensation. Sales, general and administrative expense included stock-based compensation expense of $8.2 million and $6.8 million during the year ended December 31, 2020 and 2019, respectively.

We expect sales, general, and administrative expense to increase significantly in 2021, as we added a number of senior level executives to our commercial organization in early 2021, and we plan to more than double our number of quota-carrying sales representatives during the year. Stock-based compensation included in sales, general, and administrative expense is expected to increase significantly in 2021.

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.

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 and $18.0 million as a part of other income for the year ended December 31, 2020 and 2019, respectively.

Up to the full $52.0 million of Continuation Advances paid to us are repayable without interest to Illumina if, within two years of March 31, 2020, we enter into, or consummate a Change of Control Transaction or raise 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 our 1.50% Convertible Senior Notes due 2028, $52.0 million of Continuation Advances were paid without interest to Illumina in February 2021. Refer to Note 11. "Subsequent Events" within the Consolidated Financial Statements on Item 8 of this report for additional details.

Interest Expense

Interest expense for the year ended December 31, 2020 decreased $2.3 million compared to 2019, as the debt agreement with Deerfield entered into in February 2013 (the "Facility Agreement") matured in February 2020.

Other Income, Net

The increase in Other income, net was primarily driven by a $1.0 million foreign exchange gain recognized for the year ended December 31, 2020 compared to a $0.1 million foreign exchange loss recognized for the year ended December 31, 2019.

Liquidity and Capital Resources

Cash, cash equivalents and investments at December 31, 2020 totaled $318.8 million, compared to $49.1 million at December 31, 2019. The increase was attributable to the proceeds from our public offerings of common stock completed in August 2020 and November 2020, as well as the Reverse Termination Fee and Continuation Advances we received from Illumina, partially offset by cash used in operations and a $16.0 million repayment of debt in the first quarter of 2020. We believe that our existing cash, cash equivalents and investments will be sufficient to fund our projected operating 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, 2020.

As part of the Termination Agreement with Illumina, up to $52.0 million of the Continuation Advances that we received from Illumina are repayable without interest to Illumina if, within two years of March 31, 2020, we enter into, or consummate a Change of Control Transaction or raise at least $100 million in a single equity or debt financing (may have multiple closings), with the amount repayable dependent on the amount raised by us.

On February 9, 2021, we entered into an 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 the Company's 1.50% Convertible Senior Notes due 2028 (the "Notes"). As a result of the Notes, $52.0 million of Continuation Advances were paid without interest to Illumina in February 2021. Refer to Note 11. "Subsequent Events" within the Consolidated Financial Statements on Item 8 of this report for additional details.

Factors that may affect our capital needs include, but are not limited to, 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; future acquisitions; 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; and other factors. There can be no assurance that funds will be available on favorable terms, or at all.

Operating Activities

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

In 2020, cash provided by operating activities was $19.5 million, reflecting a net income of $29.4 million, which include 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.

In 2019, cash used in operating activities was $78.3 million, reflecting a net loss of $84.1 million, adjusted for non-cash items such as stock-based compensation of $16.4 million and depreciation of $7.3 million. The change in net operating assets and liabilities was primarily attributed to a decrease of $3.9 million in inventory, partially offset by an increase of $6.7 million in accounts receivable.

Investing Activities

Our investing activities consist primarily of capital expenditures and investment purchases, sales and maturities.

In 2020, net cash used in investing activities was $219.3 million, comprised of net purchases of investments of $218.3 million and purchases of property and equipment of $1.0 million.

In 2019, net cash provided by investing activities was $62.0 million, comprised of net purchase of investments of $64.8 million and net purchase of property and equipment of $2.8 million.

Financing Activities

In 2020, cash provided by financing activities was $251.8 million, comprised of total 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.

In 2019, cash provided by financing activities was $26.5 million, comprised of $18.0 million of Continuation Advances from Illumina and net proceeds of $8.5 million from the issuance of common stock through our equity compensation plans.

Underwritten Public Equity Offering

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, $0.2 million of which was unpaid as of December 31, 2020.

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.

Debt Facility Agreement

In February 2013, we entered into a debt facility agreement with Deerfield, pursuant to which we received $20.5 million in funding and issued promissory notes in the aggregate principal amount of $20.5 million. The promissory notes bore simple interest at a rate of 8.75% per annum, payable quarterly in arrears commencing on April 1, 2013 and on the first business day of each January, April, July and October thereafter. The debt facility agreement had a maximum term of seven years. We received net proceeds of $20.0 million, representing $20.5 million of gross proceeds, less a $500,000 facility fee, before deducting other expenses of the transaction. On June 23, 2017, pursuant to a partial exercise by the promissory notes holders of their right to elect to receive up to 25% of the net proceeds from any financing that includes an equity component, we paid $4.5 million of outstanding principal, together with accrued and unpaid interest, to one of the promissory notes holders with proceeds from our underwritten public equity offering. As of December 31, 2019, a balance of $16.0 million aggregate principal amount of debt remained outstanding under this facility and was presented as "Notes payable, current" on the consolidated balance sheet as of December 31, 2019.

In February 2020, upon the maturity of the debt, we repaid the remaining outstanding principal of $16.0 million and interest to Deerfield.

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. Taxes we collect concurrent with revenue-producing activities are excluded from revenue.

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 ("SSP"). The SSP is determined based on observable prices at which we separately sell the products and services. If a SSP 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.

Contract liabilities and contract assets - Contract liabilities consist of deferred revenue. We record deferred revenues when cash payments are received or due in advance of our performance for product maintenance agreements. Deferred revenue is recognized over the related performance period, generally one year to three 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.

Other practical expedients and exemptions - Customers generally are invoiced upon acceptance of the system, which is also the start of the one year service period. As such, there is typically not more than a one year difference between the receipt of cash and the provision of services. Therefore, we apply the practical expedient and do not account for any potential significant financing benefit. However, it is noted that some customers will pre-order extended service periods at the time of the initial system sale. These customers may choose to make quarterly or annual payments or prepay multiple years of service upfront but there is no pricing difference between these different payment options. As such, no significant financing component is believed to exist with any of our existing arrangements.

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.

Recent Accounting Pronouncements

Please see "Note 3. Summary of 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.

Contractual Obligations, Commitments and Contingencies

The following table provides our future contractual obligations as of December 31, 2020:

	Payments due by period (in thousands)						
	Total	2021	2022	2023	2024	2025	After
Operating lease obligations (1)	$ 54,054	$ 7,330	$ 7,502	$ 7,704	$ 7,920	$ 8,136	$ 15,462
Total contractual obligations	$ 54,054	$ 7,330	$ 7,502	$ 7,704	$ 7,920	$ 8,136	$ 15,462

(1) Maintenance, insurance, taxes and contingent rent obligations are excluded.

Other Purchase Commitments

In addition, we had other purchase commitments of an estimated amount of approximately $18.2 million as of December 31, 2020, consisting 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, and acquisition and licensing of intellectual property. 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.

License Agreements

Payments related to licensing and other arrangements not included in the contractual obligations table include amounts related to 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.

The table above reflects only payment obligations that are fixed and determinable. Future royalties under our license agreements are not included in the table above because we cannot, at this time, determine when or if the events triggering any such payment obligations will occur or the amounts that will become potentially payable.

Legal Proceedings

Please see Item 3 “Legal Proceedings” of this Annual Report on Form 10-K for additional information.

Off-Balance Sheet Arrangements

As of December 31, 2020, 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 negligent 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 such third parties and us in connection with such fundraising efforts. To the extent that such indemnification obligations apply to the lawsuits described in “Note 6. Commitments and Contingencies” in Part II, Item 8 of this Annual Report on 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 at December 31, 2020.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Interest Rate and Market Risk

Our exposure to market risk is confined to our cash, cash equivalents and our investments. 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. Because of the short-term maturities of our investments, we do not believe that an increase in market rates would have any material negative impact on the value of our investment portfolio.

Foreign Exchange Risk

The majority of our revenue, expense, and capital purchasing activities are transacted in U.S. dollars. However, a portion of our operations consists of development and sales activities outside of the United States therefore we have foreign exchange exposures relating to non-U.S. dollar revenue, operating expense, accounts receivable, accounts payable and currency balances. Our primary exposure is with 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, 2020 would have resulted in a $0.5 million decrease in the carrying amounts of those net assets. Actual gains and losses in the future may differ materially from the hypothetical gains and losses discussed above 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

	Page(s)
Report of Independent Registered Public Accounting Firm	48
Consolidated Financial Statements	
Consolidated Balance Sheets	50
Consolidated Statements of Operations and Comprehensive Income (Loss)	51
Consolidated Statements of Stockholders' Equity	52
Consolidated Statements of Cash Flows	53
Notes to Consolidated Financial Statements	54

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, 2020 and 2019, the related consolidated statements of operations and comprehensive income (loss)**,** stockholders' equity and cash flows for each of the three years in the period ended December 31, 2020, 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, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020, in conformity with U.S. generally accepted accounting principles.

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 Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

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 Matter
The critical audit matter communicated below is a matter arising from the current period audit of the financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. The communication of the critical audit matter 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 matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Revenue recognition – Non-standard revenue contracts

Description of the Matter As described in Note 3 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 Company enters into non-standard sales arrangements for which significant discounts may be offered on the different components of the bundled arrangements and for which historical information for similar sales may not be available. As part of the Company's identification of performance obligations and the resulting determination of the allocation of contract consideration, the Company considers if these discounts represent a material right when compared to the estimated standalone selling prices, and therefore a performance obligation to be included in the allocation of the contract value. The Company also estimates the standalone selling price of each performance obligation to determine the allocation of consideration. To estimate the selling price of each performance obligation, the Company uses historical sales data, as well as management judgment.

Auditing the Company's estimated standalone selling price, their determination of whether there are material rights that represent performance obligations and the resulting allocation of the contract value for non-standard sales arrangements is complex and required a higher level of judgment due to the level of estimation and subjectivity in establishing the standard selling price of each performance obligation.

How We Addressed the Matter in Our Audit	We tested the completeness of the identified performance obligations and tested the accuracy of the allocation of the total contract consideration among the identified performance obligations. In order to do this, our audit procedures included, among others, evaluating the accuracy and completeness of the underlying data used in management's calculation of the standard selling price for each performance obligation by agreeing the data to historical transactions and contract pricing for backlog orders. We tested the identification of performance obligations and the allocation of contract consideration using the standard selling price of each performance obligation for a sample of arrangements by reading the contracts with the customers and evaluating whether terms of the contracts (including future purchase options) resulted in material rights. 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 standard selling price for the performance obligations.

/s/ Ernst & Young LLP

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

Redwood City, California
February 26, 2021

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Balance Sheets

(in thousands, except per share amounts)	December 31, 2020	December 31, 2019
Assets		
Current assets		
Cash and cash equivalents	$ 81,611	$ 29,627
Investments	237,203	19,472
Accounts receivable	16,837	15,266
Inventory	14,230	13,312
Prepaid expenses and other current assets	4,870	3,069
Short-term restricted cash	836	300
Total current assets	355,587	81,046
Property and equipment, net	24,899	30,070
Operating lease right-of-use assets, net	29,951	32,827
Long-term restricted cash	3,500	4,000
Other long-term assets	43	42
Total assets	$ 413,980	$ 147,985
Liabilities and Stockholders' Equity		
Current liabilities		
Accounts payable	$ 3,579	$ 8,368
Accrued expenses	17,350	13,242
Deferred revenue, current	8,722	7,610
Operating lease liabilities, current	4,332	3,837
Notes payable, current	—	15,871
Other liabilities, current	4,519	225
Total current liabilities	38,502	49,153
Deferred revenue, non-current	1,568	1,951
Operating lease liabilities, non-current	37,667	41,964
Other liabilities, non-current	752	—
Total liabilities	78,489	93,068
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 192,294 and 153,119 shares at December 31, 2020 and December 31, 2019, respectively	192	153
Additional paid-in capital	1,372,083	1,120,999
Accumulated other comprehensive income	85	5
Accumulated deficit	(1,036,869)	(1,066,240)
Total stockholders' equity	335,491	54,917
Total liabilities and stockholders' equity	$ 413,980	$ 147,985

See accompanying notes to the consolidated financial statements.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Statements of Operations and Comprehensive Income (Loss)

(in thousands, except per share amounts)	Years Ended December 31, 2020	2019	2018
Revenue:			
Product revenue	$ 65,424	$ 77,742	$ 66,355
Service and other revenue	13,469	13,149	12,271
Total revenue	78,893	90,891	78,626
Cost of Revenue:			
Cost of product revenue	35,424	44,771	42,053
Cost of service and other revenue	10,903	11,544	11,477
Total cost of revenue	46,327	56,315	53,530
Gross profit	32,566	34,576	25,096
Operating Expense:			
Research and development	64,152	59,630	62,594
Sales, general and administrative	72,799	75,491	63,489
Total operating expense	136,951	135,121	126,083
Operating loss	(104,385)	(100,545)	(100,987)
Gain from Reverse Termination Fee from Illumina	98,000	—	—
Gain from Continuation Advances from Illumina	34,000	18,000	—
Interest expense	(267)	(2,611)	(2,423)
Other income, net	2,055	1,022	848
Net income (loss)	29,403	(84,134)	(102,562)
Other comprehensive income (loss):			
Unrealized gain (loss) on investments	80	41	(4)
Comprehensive income (loss)	$ 29,483	$ (84,093)	$ (102,566)
Net income (loss) per share:			
Basic	$ 0.18	$ (0.55)	$ (0.76)
Diluted	$ 0.17	$ (0.55)	$ (0.76)
Weighted average shares outstanding used in calculating net income (loss) per share			
Basic	165,187	152,527	135,094
Diluted	174,970	152,527	135,094

See accompanying notes to the consolidated financial statements.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Consolidated Statements of Stockholders' Equity

(in thousands)	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2017	116,277	$ 116	$ 965,752	$ (32)	$ (879,733)	$ 86,103
Net loss	—	—	—	—	(102,562)	(102,562)
Other comprehensive income (loss)	—	—	—	(4)	—	(4)
ASC606 adoption effect					189	189
Issuance of common stock in conjunction with equity plans	3,357	4	9,648	—	—	9,652
Issuance of common stock from Underwritten Public Equity Offerings, net of issuance costs	30,610	30	97,500	—	—	97,530
Stock-based compensation expense	—	—	23,153	—	—	23,153
Balance at December 31, 2018	150,244	150	1,096,053	(36)	(982,106)	114,061
Net loss	—	—	—	—	(84,134)	(84,134)
Other comprehensive income (loss)	—	—	—	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 income (loss)	—	—	—	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

See accompanying notes to the consolidated financial statements.

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

(in thousands)	Years Ended December 31, 2020	2019	2018
Cash flows from operating activities			
Net income (loss)	$ 29,403	$ (84,134)	$ (102,562)
Adjustments to reconcile net loss to net cash used in operating activities			
Gain from Continuation Advances from Illumina	(34,000)	(18,000)	—
Depreciation	6,428	7,265	7,215
Amortization of right-of-use assets	2,876	2,683	—
Amortization of debt discount and financing costs	129	1,212	1,024
Stock-based compensation	17,533	16,401	23,153
(Gain) loss from derivative	—	(16)	(167)
Amortization and accretion for investment premium (discount)	(107)	(913)	(758)
Loss on disposition of equipment	—	194	—
Changes in assets and liabilities			
Accounts receivable	(1,603)	(6,671)	4,838
Inventory	(1,096)	3,915	3,623
Prepaid expenses and other assets	(1,063)	(523)	(290)
Accounts payable	(5,072)	1,713	(2,239)
Accrued expenses	4,102	2,333	183
Deferred revenue	729	2,134	33
Operating lease liabilities	(3,802)	(3,428)	—
Other liabilities	5,046	(2,477)	(483)
Net cash provided by (used in) operating activities	19,503	(78,312)	(66,430)
Cash flows from investing activities			
Purchase of property and equipment	(1,039)	(2,836)	(1,854)
Purchase of investments	(373,283)	(57,727)	(122,183)
Sales of investments	1,400	1,500	2,442
Maturities of investments	153,600	121,110	83,180
Net cash provided by (used in) in investing activities	(219,322)	62,047	(38,415)
Cash flows from financing activities			
Continuation Advances from Illumina	34,000	18,000	—
Proceeds from issuance of common stock from equity plans	46,360	8,548	9,652
Notes payable principal payoff	(16,000)	—	—
Proceeds from issuance of common stock from underwritten public equity offerings, net of issuance costs	187,479	—	97,530
Net cash provided by financing activities	251,839	26,548	107,182
Net increase in cash and cash equivalents and restricted cash	52,020	10,283	2,337
Cash and cash equivalents and restricted cash at beginning of period	33,927	23,644	21,307
Cash and cash equivalents and restricted cash at end of period	$ 85,947	$ 33,927	$ 23,644
Cash and cash equivalents at end of period	81,611	29,627	18,844
Restricted cash at end of period	4,336	4,300	4,800
Cash and cash equivalents and restricted cash at end of period	$ 85,947	$ 33,927	$ 23,644
Supplemental disclosure of cash flow information			
Interest paid	$ 491	$ 1,400	$ 1,400
Supplemental disclosure of non-cash investing and financing activities			
Inventory transferred to property and equipment	1,097	2,062	1,871
Property and equipment transferred to inventory	(919)	(1,536)	(343)

See accompanying notes to the consolidated financial statements.

NOTE 1. OVERVIEW

We design, develop and manufacture sequencing systems to help scientists resolve genetically complex problems. Based on our novel Single Molecule, Real-Time (SMRT®) sequencing technology, our products enable: *de novo* genome assembly to finish genomes in order to more fully identify, annotate and decipher genomic structures; full-length transcript analysis to improve annotations in reference genomes, characterize alternatively spliced isoforms in important gene families, and find novel genes; targeted sequencing to more comprehensively characterize genetic variations; and real-time kinetic information for epigenome characterization. Our technology provides high accuracy, ultra-long reads, uniform coverage and the ability to simultaneously detect epigenetic changes. PacBio® sequencing systems, including associated consumables and software, provide a simple and fast end-to-end workflow for SMRT sequencing.

Our current products include the Sequel II and Sequel IIe instruments and SMRT Cell 8M, which when used together are capable of sequencing up to approximately eight million DNA molecules simultaneously, and the previous generation Sequel instrument and Sequel SMRT Cell 1M, which when used together are capable of sequencing up to approximately one million DNA molecules simultaneously. 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.

Our research and development efforts are focused on developing new products and further improving our existing products including continuing chemistry and sample preparation improvements to increase throughput and expand our supported applications. By providing access to genetic information that was previously inaccessible, we enable scientists to confidently increase their understanding of biological systems.

The names “Pacific Biosciences,” “PacBio,” “SMRT,” “SMRTbell,” “Sequel” and our logo are our trademarks.

NOTE 2. TERMINATION OF MERGER WITH ILLUMINA

On November 1, 2018, we entered into an Agreement and Plan of Merger (as amended, the “Merger Agreement”) with Illumina, Inc. (“Illumina”) and FC Ops Corp., a wholly owned subsidiary of Illumina (“Merger Subsidiary”). On January 2, 2020, we, Illumina and Merger Subsidiary, 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 a part of other income in the consolidated statements of operations and comprehensive income (loss) for the year ended December 31, 2020 and 2019, respectively. Please refer to “Note 4. Financial Instruments” for the accounting treatment of the Continuation Advances.

Up to the full $52.0 million of Continuation Advances paid to us are repayable without interest to Illumina if, within two years of March 31, 2020, we enter into, or consummate a Change of Control Transaction or raise 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. Please see “Note 11. Subsequent Events” for additional information.

Reverse Termination Fee from Illumina

As part of the Termination Agreement, Illumina paid us a $98.0 million termination fee (“Reverse Termination Fee”), from which we paid our financial advisor associated fees of $6.0 million in April 2020. We recorded the $6.0 million of associated fees we paid to our financial advisor in the “Sales, general and administrative” expense line in the consolidated statements of operations and comprehensive income (loss) for the year ended December 31, 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. If such Change of Control Transaction was not consummated by the two year anniversary of the execution of the definitive agreement for such Change of Control Transaction, then we would not have been required to repay the Reverse Termination Fee. 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 other income in the consolidated statements of operations and comprehensive income (loss) for the year ended December 31, 2020.

NOTE 3. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation and Consolidation

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. Translation adjustments resulting from translating foreign subsidiaries' results of operations and assets and liabilities into U.S. dollars are immaterial for all periods presented.

COVID-19

We are subject to risks and uncertainties as a result of the novel coronavirus pandemic (COVID-19). The extent of the impact of the COVID-19 pandemic on our business is highly uncertain as responses to the pandemic can change quickly and information is rapidly evolving. We considered the impact of COVID-19 on the assumptions and estimates used to determine the results reported and asset valuations as of December 31, 2020.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires us to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes to the financial statements. Our estimates include, but are not limited to, the valuation of inventory, the determination of stand-alone selling prices for revenue recognition, the valuation of a financing derivative and long-term notes, the probability of repaying the Continuation Advances and Reverse Termination Fee to Illumina, the valuation and recognition of share-based compensation, the expected renewal period for service contracts to derive the amortization period for capitalized commissions, the useful lives assigned to long-lived assets, the recognition and measurement of current and deferred income tax assets, along with the assessment of recoverability and the determination of the internal borrowing rate used in calculating the operating lease right-of-use assets and operating lease liabilities. Actual results could differ materially from these estimates.

Reclassifications

Certain prior year amounts in the consolidated financial statements have been reclassified to conform to the current year presentation with *no* effect on previously reported net loss, comprehensive loss, cash flows or stockholders' equity.

Accounting Changes

In June 2016, the Financial Accounting Standards Board, or FASB, issued Accounting Standards Update, or ASU, 2016-13 *Financial Instruments - Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments* ("Topic 326"), which replaces existing incurred loss impairment guidance and establishes a single allowance framework for financial assets carried at amortized cost. We adopted Topic 326 on January 1, 2020, using a modified retrospective transition method, which requires a cumulative-effect adjustment to the opening balance of retained earnings/accumulated deficit to be recognized on the date of adoption with prior periods not restated. The adoption of Topic 326 did not have a material impact on our financial statements and our bad debt expense was immaterial as of December 31, 2020.

Cash, Cash Equivalents and Investments

We consider all highly liquid investments purchased with an original maturity of three months or less to be cash equivalents. We have designated all investments as available-for-sale and therefore, such investments are reported at fair value, with unrealized gains and losses recognized in accumulated other comprehensive income (loss) ("OCI") in stockholders' equity. The cost of marketable securities is adjusted for the amortization of premiums and discounts to expected maturity. Premium and discount amortization is included in other income, net. Realized gains and losses, as well as interest income, on available-for-sale securities are also included in other income, net. The cost of securities sold is based on the specific identification method. We include all of our available-for-sale securities in current assets.

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 of its investments and their maturities 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.

We perform periodic evaluations of the relative credit standing of these financial institutions. In addition, we perform periodic evaluations of the relative credit quality of its investments. All of our investments are subject to a periodic impairment review. We recognize an impairment charge when a decline in the fair value of our investments below the cost basis is judged to be other-than-temporary. Factors considered in determining whether a loss is temporary include the length of time and the extent to which an investment's fair value has been less than its cost basis, the financial condition and near-term prospects of the investee, the extent of the loss related to credit of the issuer, the expected cash flows from the security, our intent to sell the security and whether or not we will be required to sell the security before the recovery of its amortized cost. For the years ended December 31, 2020, 2019 and 2018, we did not have any impairment charges on our investments as it is more likely than not that we will recover their amortized cost basis upon sale or maturity.

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, 2020, 2019 and 2018, one customer, Gene Company Limited, accounted for approximately 14%, 17% and 26% our total revenue, respectively.

As of December 31, 2020 and 2019, 43% and 55% of our accounts receivable were from domestic customers, respectively. 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. As of December 31, 2019, customer, Gene Company Limited, represented approximately 11% of our net accounts receivable.

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. However, 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 enter into inventory purchases and commitments so that we can 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, in order 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, net of accumulated depreciation and any impairment charges. Depreciation is computed using the straight-line method over the estimated useful life of the asset, generally two years to three years for computer equipment, three years to five years for software, three years to seven years for furniture and fixtures and three years to five years for lab equipment. 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.

Impairment of 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 lease administrative, manufacturing and laboratory facilities under operating leases. Lease agreements may include rent holidays, rent escalation clauses and tenant improvement allowances. We recognize scheduled rent increases on a straight-line basis over the lease term beginning with the date we take possession of the leased space. Leasehold improvements are capitalized at cost and depreciated over the shorter of their expected useful life or the life of the lease. On January 1, 2019, we adopted ASC 842, which requires the recognition of the right-of-use assets and related operating and finance lease liabilities on the consolidated balance sheet. Operating lease assets and liabilities are reflected within "Operating lease right-of-use assets, net", "Operating lease liabilities, current" and "Operating lease liabilities, non-current" on the consolidated balance sheets. These assets and liabilities are recognized at the commencement date based on the present value of remaining minimum lease payments over the lease term using our estimated secured incremental borrowing rates at the effective date of January 1, 2019.

Leases with terms of 12 months or less are expensed on a straight-line basis over the term and are not recorded in the consolidated balance sheets.

Short-term Restricted Cash

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

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, on May 1, 2019 the $4.5 million in restricted cash was reduced to $4.0 million and on May 1, 2020 the $4.0 million in restricted cash was reduced to $3.5 million.

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 primarily consists 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. Taxes we collect concurrent with revenue-producing activities are excluded from revenue.

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 ("SSP"). The SSP is determined based on observable prices at which we separately sell the products and services. If a SSP 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.

Contract liabilities and contract assets - Contract liabilities consist of deferred revenue. We record deferred revenues when cash payments are received or due in advance of our performance for product maintenance agreements. Deferred revenue is recognized over the related performance period, generally one year to three 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.

Other practical expedients and exemptions - Customers generally are invoiced upon acceptance of the system, which is also the start of the one year service period. As such, there is typically not more than a one year difference between the receipt of cash and the provision of services. Therefore, we apply the practical expedient and do not account for any potential significant financing benefit. However, it is noted that some customers will pre-order extended service periods at the time of the initial system sale. These customers may choose to make quarterly or annual payments or prepay multiple years of service upfront but there is no pricing difference between these different payment options. As such, no significant financing component is believed to exist with any of our existing arrangements.

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 SMRT Sequencing technology, the design and development of our future products and current product enhancements. These expenses also include prototype-related expenditures, development equipment and supplies, 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 December 31, 2020.

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 not required as of December 31, 2020.

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.

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. 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 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 would 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 on the date of grant using an option-pricing model. See Note 8 for further information regarding stock-based compensation.

Other Comprehensive Income (loss)

Other comprehensive income (loss) 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 Issued Accounting Standards

In August 2020, the FASB issued 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 are currently evaluating the impact of the provisions of this guidance on our consolidated financial statements.

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 will be effective for our annual reporting periods beginning after December 15, 2020, including interim reporting periods within those fiscal years. We have evaluated the effect that this guidance will have on our Consolidated Financial Statements and determined it will not have a material impact.

Recently Adopted Accounting Standards

In June 2016, the Financial Accounting Standards Board, or FASB, issued Accounting Standards Update, or ASU, 2016-13 *Financial Instruments - Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments* ("Topic 326"), which replaces existing incurred loss impairment guidance and establishes a single allowance framework for financial assets carried at amortized cost. We adopted Topic 326 on January 1, 2020, using a modified retrospective transition method, which requires a cumulative-effect adjustment to the opening balance of retained earnings/accumulated deficit to be recognized on the date of adoption with prior periods not restated. The adoption of Topic 326 did not have a material impact on our financial statements and our bad debt expense was immaterial as of December 31, 2020.

NOTE 4. FINANCIAL INSTRUMENTS

Fair Value of Financial Instruments

The fair value hierarchy established under U.S. 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, 2020 and 2019, respectively (in thousands):

(in thousands)	December 31, 2020				December 31, 2019			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Assets								
Cash and cash equivalents:								
Cash and money market funds	$ 43,040	$ —	$ —	$ 43,040	$ 18,644	$ —	$ —	$ 18,644
Commercial paper	—	32,537	—	32,537	—	10,983	—	10,983
U.S. government & agency securities	—	170	—	170	—	—	—	—
U.S. Treasury security	—	5,864	—	5,864	—	—	—	—
Total cash and cash equivalents	43,040	38,571	—	81,611	18,644	10,983	—	29,627
Investments:								
Commercial paper	—	112,644	—	112,644	—	16,971	—	16,971
Corporate debt securities	—	17,456	—	17,456	—	2,501	—	2,501
U.S. government & agency securities	—	107,103	—	107,103	—	—	—	—
Total investments	—	237,203	—	237,203	—	19,472	—	19,472
Short-term restricted cash:								
Cash	836	—	—	836	300	—	—	300
Long-term restricted cash:								
Cash	3,500	—	—	3,500	4,000	—	—	4,000
Total assets measured at fair value	$ 47,376	$ 275,774	$ —	$ 323,150	$ 22,944	$ 30,455	$ —	$ 53,399
Liabilities								
Financing Derivative	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
Continuation Advances	—	—	—	—	—	—	—	—
Total liabilities measured at fair value	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —

Estimated fair value of the Financing Derivative liability

The estimated fair value of the Financing Derivative liability (as defined in the "Notes payable, current" section in "Note 5. Balance Sheet Components") was determined using Level 3 inputs, or significant unobservable inputs. Changes to the estimated fair value of the Financing Derivative are recorded in "Other income, net" in the consolidated statements of operations and comprehensive loss.

The estimated fair value of the Financing Derivative was determined by comparing the difference between the fair value of the promissory notes from the debt facility that we entered into during the first quarter of 2013 with and without the Financing Derivative by calculating the respective present values from future cash flows using a 6.5% discount rate at December 31, 2019. The estimated fair value of the Financing Derivative as of December 31, 2019 was $0.

In February 2020, upon maturity of the promissory notes, the Financing Derivative was extinguished. Refer to the "Notes payable, current" section in "Note 5. Balance Sheet Components" for a detailed description and valuation approach.

Estimated fair value of the Continuation Advances liability

In accordance with the terms of the Merger Agreement, we received Continuation Advances of $34.0 million and $18.0 million from Illumina during the year ended December 31, 2020 and 2019, respectively.

We determined that the Continuation Advances, which are subject to repayment under certain circumstances as discussed below, constitute a financial liability.

The fair value option was elected for the financial liability because management believes that among all measurement methods allowed by Accounting Standards Codification, or ASC, 825, *Financial Instruments*, the fair value option would most fairly represent the value of such a financial liability. Management applied the income approach to estimate the fair value of this financial liability. The estimated fair value of the liability related to the Continuation Advances was determined using Level 3 inputs, or significant unobservable inputs. Management estimated that there would be no future cash outflows associated with this financial instrument because the probabilities of either of the following events occurring and requiring repayment to Illumina were evaluated as being remote as of December 31, 2020 and December 31, 2019:

- we enter into a Change of Control Transaction within two years following March 31, 2020; or
- we raise $100 million or more in a single equity or debt financing (that may have multiple closings) within two years following March 31, 2020.

As a result, the estimated fair value of the liability associated with the contingent repayment of the Continuation Advances received was assessed to be zero as of December 31, 2020 and 2019, respectively, with a resulting non-operating gain of $34.0 million and $18.0 million recorded as "Gain from Continuation Advances from Illumina" for the year ended December 31, 2020 and 2019, respectively.

For the year ended December 31, 2020, 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.

Cash, Cash Equivalents and Investments

The following table summarizes our cash, cash equivalents and investments as of December 31, 2020 and 2019 (in thousands):

	As of December 31, 2020			
	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

	As of December 31, 2019			
	Amortized Cost	Gross unrealized gains	Gross unrealized losses	Fair Value
Cash and cash equivalents:				
Cash and money market funds	$ 18,644	$ —	$ —	$ 18,644
Commercial paper	10,983	—	—	10,983
Total cash and cash equivalents	29,627	—	—	29,627
Investments:				
Commercial paper	16,971	1	(1)	16,971
Corporate debt securities	2,496	5	—	2,501
Total investments	19,467	6	(1)	19,472
Total cash, cash equivalents and investments	$ 49,094	$ 6	$ (1)	$ 49,099
Short-term restricted cash:				
Cash	$ 300	$ —	$ —	$ 300
Long-term restricted cash:				
Cash	$ 4,000	$ —	$ —	$ 4,000

The following table summarizes the contractual maturities of our cash equivalents and available-for-sale investments, excluding money market funds, as of December 31, 2020:

	Fair Value
Due in one year or less	$ 255,207
Due after one year through 5 years	20,567
Total investments	$ 275,774

Our marketable debt investments are classified as current based on the nature of the investments and their availability for use in current operations.

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

NOTE 5. BALANCE SHEET COMPONENTS

Inventory

As of December 31, 2020 and 2019, our inventory consisted of the following components:

(in thousands)	December 31, 2020	December 31, 2019
Purchased materials	$ 3,531	$ 3,966
Work in process	6,651	4,594
Finished goods	4,048	4,752
Inventory	$ 14,230	$ 13,312

Property and Equipment, Net

As of December 31, 2020 and 2019, our property and equipment, net, consisted of the following components:

(in thousands)	December 31, 2020	2019
Laboratory equipment and machinery	$ 24,948	$ 25,173
Leasehold improvements	29,931	29,902
Computer equipment	12,400	11,851
Software	4,940	4,747
Furniture and fixtures	2,434	2,422
Construction in progress	137	193
	74,790	74,288
Less: Accumulated depreciation	(49,891)	(44,218)
Property and equipment, net	$ 24,899	$ 30,070

Depreciation expense during the years ended December 31, 2020, 2019 and 2018 was $6.4 million, $7.3 million and $7.2 million, respectively.

Accrued Expenses

As of December 31, 2020 and 2019, our accrued expenses consisted of the following components:

(in thousands)	December 31, 2020	2019
Salaries and benefits	$ 15,261	$ 9,748
Accrued product development costs	415	67
Accrued Tenant Improvements for Menlo Park building	—	998
Inventory accrual	218	229
Accrued professional services and legal fees	726	943
Other	730	1,257
Accrued expenses	$ 17,350	$ 13,242

Deferred Revenue

As of December 31, 2020, we had a total of $10.3 million of deferred revenue from our service contracts, $8.7 million of which was recorded as “Deferred revenue, current” to be recognized over the next year and the remaining $1.6 million was recorded as “Deferred revenue, non-current” to be recognized in the next 3 years. Revenue recorded in the year ended December 31, 2020 includes $7.6 million, respectively, of previously deferred revenue that was included in “Deferred revenue, current” as of December 31, 2019. Contract assets as of December 31, 2020 and December 31, 2019 were not material.

As of December 31, 2020, 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.

Notes payable, current

As of December 31, 2019, a balance of $16.0 million aggregate principal amount of debt remained outstanding under the debt agreement with Deerfield entered into in February 2013 and was presented as “Notes payable, current” on the consolidated balance sheet as of December 31, 2019.

In February 2020, upon the maturity of the debt agreement, we repaid the remaining outstanding principal of $16.0 million and interest.

Financing Derivative

A number of features embedded in the promissory notes required accounting for them as a derivative, including the indemnification of certain withholding taxes and the acceleration of debt upon (i) a qualified financing, (ii) an event of default, (iii) a Major Transaction (as such term is defined in the Facility Agreement), and (iv) the exercise of the warrant via offset to the debt principal. These features represent a single derivative (the “Financing Derivative”) that was bifurcated from the debt instrument and accounted for as a liability at fair value, with changes in fair value between reporting periods recorded in other income (expense), net.

The estimated fair value of the Financing Derivative was determined by comparing the difference between the fair value of the promissory notes with and without the Financing Derivative by calculating the respective present values from future cash flows using a 6.5% discount rate at December 31, 2019. The estimated fair value of the Financing Derivative as of December 31, 2019 was $0.

In February 2020, after we repaid the remaining outstanding principal of $16.0 million and interest to Deerfield, the related Financing Derivative expired.

Other liabilities, current

As of December 31, 2020 and 2019, our Other liabilities, current consisted of the following components:

	December 31,	
(in thousands)	**2020**	**2019**
Accrued ESPP	$ 2,037	$ —
Other	2,482	225
Other liabilities, current	$ 4,519	$ 225

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, resulting in the balance for “Accrued ESPP” being $0 as of December 31, 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.

NOTE 6. COMMITMENTS AND CONTINGENCIES

Lease

In July 2015 we entered into a lease agreement with respect to our facility located at 1305 O’Brien Drive, Menlo Park, California. The term of the O’Brien Lease is one hundred thirty-two (132) months. In December 2016, we entered into an amendment to the O’Brien Lease which defined the commencement date of the lease to be October 25, 2016, notwithstanding that such substantial completion did not occur until the first quarter of 2017. Base monthly rent was abated for the first six (6) months of the lease term and thereafter was $540,000 per month during the first year of the lease term, with specified annual increases thereafter until reaching $711,000 per month during the last twelve (12) months of the lease term. If the rent is not received within five days of the due date, there will be an additional sum equal to 5% of the amount overdue as a late charge. Any amount not paid within 10 days after receipt of landlord’s written notice will bear interest from the date due until paid, at the lesser rate of (1) the prime rate of interest as published in the Wall Street Journal, plus 2% or (2) the maximum rate allowed by law, in addition to the late payment charge. 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, on May 1, 2019 the $4.5 million in restricted cash was reduced to $4.0 million and on May 1, 2020 the $4.0 million in restricted cash was reduced to $3.5 million.

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 weighted average remaining lease term for our operating leases as of December 31, 2020 was 6.8 years.

The discount rate implicit within our leases is generally not determinable and therefore we determine the discount rate based on our incremental borrowing rate. The incremental borrowing rate for our leases is determined based on lease term and currency in which lease payments are made, adjusted for impacts of collateral. The weighted average discount rate used to measure our operating lease liabilities as of December 31, 2020 was 7.9%.

The following table presents information as to the amount and timing of cash flows arising from our operating leases as of December 31, 2020:

Maturity of Lease Liabilities	**Amount**
Years ending December 31,	**(in thousands)**
2021	$ 7,330
2022	7,502
2023	7,704
2024	7,920
2025	8,136
Thereafter	15,462
Total undiscounted operating lease payments	54,054
Less: imputed interest	(12,055)
Present value of operating lease liabilities	41,999
Balance Sheet Classification	
Operating lease liabilities, current	4,332
Operating lease liabilities, non-current	37,667
Total operating lease liabilities	41,999

Cash Flows

Cash paid for amounts included in the present value of operating lease liabilities was $7.2 million and $7.0 million for the year ended December 31, 2020 and 2019, respectively and were included in operating cash flow.

Operating Lease Costs

Operating lease costs were $6.2 million and $6.2 million for the year ended December 31, 2020 and 2019, respectively. For both 2020 and 2019 the operating 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

U.S. District Court Proceedings

On March 15, 2017, we filed a complaint in the U.S. District Court for the District of Delaware against ONT Inc. for patent infringement (C.A. No. 17-cv-275 (“275 Action”)). The complaint is based on our U.S. Patent No. 9,546,400 (the “’400 Patent”) which covers novel methods for nanopore sequencing of nucleic acid molecules using the signals from multiple monomeric units. We are seeking remedies including injunctive relief, damages and costs. On August 23, 2018, we filed an amended complaint, adding allegations of willful infringement and adding ONT Ltd. as a defendant in the 275 Action, which was granted on August 15, 2019.

On September 25, 2017, we filed a second complaint in the U.S. District Court for the District of Delaware against ONT Inc. for patent infringement (C.A. No. 17-cv-1353 (“1353 Action”)). The complaint is based on our U.S. Patent No. 9,678,056 (the “’056 Patent”) and U.S. Patent No. 9,738,929. We are seeking remedies including injunctive relief, damages and costs. On March 28, 2018, we added a claim for infringement of our U.S. Patent No. 9,772,323 (the “’323 Patent”). On August 23, 2018 we filed an amended complaint, adding allegations of willful infringement and adding ONT Ltd. as a defendant in the 1353 Action, which was granted on August 15, 2019.

A trial for the U.S. District Court matters was held from March 9 through March 18, 2020. The jury determined that ONT Inc. and ONT Ltd. infringed the ‘056 Patent, the ‘400 Patent, and the ‘323 Patent, but the jury declined to find these patents valid based on enablement and, in the case of claim one of the ’056 Patent, written description and indefiniteness. The jury declined to find valid or infringed U.S. Patent No. 9,738,929. We are pursuing an appeal of the decision at the U.S. Court of Appeals for the Federal Circuit.

Unrelated to the preceding matters, 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 matter from this complaint (the “PGI District Court matter”) 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 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 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 August 19, 2020, the court ordered a stay of the PGI District Court matter based on a joint stipulation by the parties. With the institution of the PacBio IPR Petitions described above, pursuant to the joint stipulation, the matter is now stayed pending a final written decision on the IPRs.

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.

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 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, 2020.

NOTE 7. 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, 2020, 2019 and 2018 income (loss) before taxes from U.S. operations were $28.9 million, ($84.8) million and ($103.1) million, respectively, and income before taxes from foreign operations was $0.6 million, $0.9 million and $0.8 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,		
	2020	2019	2018
Statutory tax rate	21.0 %	21.0 %	21.0 %
State tax rate, net of federal benefit	(8.3)	4.9	3.5
Stock-based compensation	(15.2)	(0.8)	(1.6)
Tax credits	(3.6)	2.2	2.0
Other	(0.2)	0.2	(0.1)
Change in valuation allowance	6.3	(27.5)	(24.8)
Total	- %	- %	- %

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:	2020	2019
Net operating loss carryforwards	$ 233,225	$ 226,911
Research and development credits	49,179	45,853
Accruals and reserves	6,337	8,024
Stock-based compensation	9,717	16,219
ASC842 Operating lease liability	9,870	10,837
Total deferred tax assets	308,328	307,844
Less: Valuation allowance	(300,505)	(298,658)
Total deferred tax assets:	7,823	9,186
Fixed assets	(786)	(1,425)
ASC842 Operating lease right-of-use assets	(7,037)	(7,761)
Total deferred tax liabilities	(7,823)	(9,186)
Net deferred tax assets	$ —	$ —

At December 31, 2020, we maintained a full valuation allowance against all of our deferred tax assets which totaled $300.5 million, including net operating loss carryforwards and research and development credits of $233.2 million and $49.2 million, respectively.

Due to uncertainties surrounding the realization of deferred tax assets through future taxable income, we have provided a full valuation allowance and, therefore, have not recognized any benefits from net operating losses and other deferred tax assets.

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. Accordingly, we have provided a full valuation allowance against our net deferred tax assets as of December 31, 2020 and 2019, respectively.

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. For the year ended December 31, 2019, our valuation allowance increased to $298.7 million, primarily because of an increase to our net operating losses, tax credits and changes in book to tax timing differences.

As of December 31, 2020, we had a net operating loss carryforward for federal income tax purposes of approximately $913.9 million, $755.9 million of which will begin to expire after 2024 and through 2037, and $158.0 million of which do not expire. We had a total state net operating loss carryforward of approximately $634.3 million, which have expiration dates of 2025 and beyond. 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 $30.7 million, which will begin to expire in 2024 if not utilized and state research credits of approximately $30.1 million which have no expiration date. These tax credits are subject to the same limitations discussed above.

As of December 31, 2020, our total unrecognized tax benefit was $6.0 million.

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

Balance as of December 31, 2017	$	18,786
Decrease in balance related to tax positions taken in prior year		—
Increase in balance related to tax positions taken during current year		1,661
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

Decrease in balance related to tax positions taken in prior years of $17.3 million in 2020 relates to the fact that we completed a research and development credit study in 2020 and adjusted our associated uncertain tax position accordingly for the 2004-2019 tax years.

Our practice is to recognize interest and/or penalties related to income tax matters in income tax expense. As of both December 31, 2020 and 2019, 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, 2017 to present and December 31, 2016 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.

In response to the COVID-19 pandemic, the Coronavirus Aid, Relief and Economic Securities Act (CARES Act) was signed into law in the US in March 2020. The CARES Act adjusted a number of provisions in the tax code, including the calculation and eligibility of certain deductions and the treatment of net operating losses and tax credits. The enactment of the CARES Act did not result in any material adjustments to our income tax provision for the year ended December 31, 2020, or to our net deferred tax assets as of December 31, 2020.

California Assembly Bill 85 (AB 85) was signed into law in June 2020. The legislation suspends the use of California Net Operating Loss deductions for 2020, 2021, and 2022 for certain taxpayers and imposes a limitation on the use of certain California Tax Credits for 2020, 2021, and 2022. The carryover periods for Net Operating Loss deductions disallowed by this provision will be extended. Given the Company’s net operating loss position in the current year, the new legislation will not impact the current year provision. The Company will continue to monitor possible California net operating loss and credit limitations in future periods.

NOTE 8. 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, 2020 and 2019, 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.

For the year ended December 31, 2018, we issued 30.6 million shares of our common stock through our two underwritten public offerings with an average offering price of $3.38 per share. The total net proceeds to us from the two offerings, after deducting the underwriting commissions and offering expenses, were approximately $97.5 million.

Equity Plans

As of December 31, 2019, we had two active equity plans: 1) the 2010 Equity Incentive Plan (the "2010 Plan") and 2) the 2010 Outside Director Equity Incentive Plan (the "2010 Director Plan"), both of which we adopted upon the effectiveness of our initial public offering in October 2010. 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.

As of June 30, 2020, in total, we had three active equity compensation plans: the 2010 Plan, the 2010 Director Plan and the 2010 ESPP. On July 29, 2020 our 2010 Plan and 2010 Director Plan expired.

On August 4, 2020, stockholders approved our new 2020 Equity Incentive Plan (the "2020 plan") and reserved 11,000,000 shares of the Company's 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 2020 Inducement Equity Incentive Plan (the "Inducement Plan") and reserved 2,500,000 shares of the Company's common stock for issuance pursuant to equity awards granted under the Inducement Plan.

2020 Equity Incentive Plan

Under the 2020 Plan, with the approval of 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 employee 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.

Inducement Plan

Under the Inducement Plan, with the approval of 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, and its terms 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, 2020, we had an aggregate of 10.3 million shares remained available for future issuance under the 2020 Plan and Inducement Plan.

Stock Options

The following table summarizes stock option activity for all of our stock option plans for the year ended December 31, 2020 (in thousands, except per share amounts):

	Stock Options Outstanding		
	Number of shares	Exercise price	Weighted average exercise price
Balances, December 31, 2019	22,697	$ 1.16 – 16.00	$ 5.57
Options granted	2,852	2.45 – 20.9	7.20
Options exercised	(8,078)	1.16 – 15.98	5.44
Options canceled	(2,833)	1.16 – 16	7.82
Balances, December 31, 2020	14,638	$ 1.16 – 20.90	$ 5.53

The expired options during the year ended December 31, 2020 totaled 2.4 million with exercise prices ranging from $1.16 to $16.00 and a weighted average exercise price per share of $8.49.

The following table summarizes information with respect to stock options outstanding and exercisable under the plans at December 31, 2020:

Exercise price	Options Outstanding: Number outstanding	Options Outstanding: Weighted average remaining contractual life (Years)	Options Outstanding: Weighted average exercise price	Options Exercisable: Number vested	Options Exercisable: Weighted average exercise price
$ 0.00 – 3.67	4,254,183	5.45	$ 2.53	3,253,267	$ 2.51
$ 3.67 – 7.34	7,560,966	6.18	$ 5.68	5,396,883	$ 5.42
$ 7.34 – 11.01	2,591,433	5.78	$ 9.05	2,191,433	$ 8.95
$ 11.01 – 14.68	131,375	2.99	$ 12.49	96,375	$ 11.82
$ 14.68 – 18.35	500	0.13	$ 15.98	500	$ 15.98
$ 18.35 – 22.02	100,000	9.95	$ 20.90	—	$ —
$ 22.02 – 25.69	—	—	$ —	—	$ —
$ 25.69 – 29.36	—	—	$ —	—	$ —
$ 29.36 – 33.03	—	—	$ —	—	$ —
$ 33.03 – 36.70	—	—	$ —	—	$ —
	14,638,457	5.90	$ 5.53	10,938,458	$ 5.32

The aggregate intrinsic value of the outstanding and exercisable options presented in the table above totaled $298.8 million and $225.6 million, respectively. The aggregate intrinsic value represents the total pretax intrinsic value (i.e., the difference between $25.94, our closing stock price on the last trading day of our fourth quarter of 2020 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, 2020. 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 4.89 years.

The vested and expected to vest options as of December 31, 2020 totaled 13,677,000, with aggregate intrinsic value of $279.0 million, weighted average exercise price per share of $5.54 and weighted average remaining contractual life of 5.73 years.

The total intrinsic value of stock options exercised during the years ended December 31, 2020, 2019 and 2018 was $63.1 million, $2.6 million and $5.3 million, respectively.

The weighted-average grant-date fair value of all options granted with exercise prices equal to fair market value was $4.14 in 2020, $0 in 2019, $1.50 in 2018 determined by the Black-Scholes option valuation method. There were no options granted with exercise prices lower than fair market value in 2020, 2019 and 2018.

Time-based RSUs

Each RSU represents one equivalent share of our common stock to be awarded 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, 2020 (in thousands, except per share amounts):

	Number of shares	Weighted average grant date fair value
RSUs outstanding at December 31, 2019	1,086	$ 6.12
RSUs granted	6,556	5.18
RSUs released	(1,000)	6.33
RSUs forfeited	(723)	4.40
Unvested RSUs outstanding at December 31, 2020	5,919	$ 5.25

For the years ended December 31, 2020, 2019 and 2018, we recognized compensation expense of $7.7 million, $4.9 and $0.2 million, respectively, related to time-based RSUs.

Performance-based RSUs

Starting 2018 the Compensation Committee of the Board of Directors approved awards of RSUs with performance-based vesting under the 2010 Plan to certain employees. Each RSU represents one equivalent share of our common stock to be awarded upon vesting at the end of the performance periods, if specific performance goals set by the Compensation Committee of the Board of Directors are achieved. No RSUs with performance-based vesting will vest if the performance goals are not met. The fair value of these RSUs is based on the closing price of our common stock on the date of grant. We make a quarterly probability assessment as to whether the performance goals will be achieved. Changes in our assessment of the probability of vesting results in adjustments to stock-based compensation, which may include either a cumulative catch-up of expense or a reduction of expense depending on whether the likelihood of vesting has increased or decreased, that is recognized in the period such determination is made. 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 performance-based RSUs activity for the year ended December 31, 2020 (in thousands, except per share amounts):

	Number of shares	Weighted average grant date fair value
PSUs outstanding at December 31, 2019	138	$ 2.63
PSUs granted	—	—
PSUs released	—	—
PSUs forfeited	(44)	2.63
Unvested PSUs outstanding at December 31, 2020	94	$ 2.63

2010 Employee Stock Purchase Plan

We adopted the ESPP in October 2010. Our 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 calendar year equal to 2% of the common shares then outstanding.

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, 2020, 2019 and 2018, 834,677 shares,1,306,329 shares and 1,674,960 shares of common stock were purchased under the ESPP, respectively. As of December 31, 2020, 5,878,770 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,		
	2020	2019	2018
Cost of revenue	$ 2,236	$ 1,857	$ 3,124
Research and development	7,061	7,699	10,076
Sales, general and administrative	8,236	6,845	9,953
Total stock-based compensation expense	$ 17,533	$ 16,401	$ 23,153

As of both December 31, 2020 and 2019, $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, 2020, 2019 and 2018.

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 option.

For the years ended December 31, 2020, 2019 and 2018, the fair value of employee stock options was estimated using the following weighted average assumptions:

	Years Ended December 31,		
	2020	2019	2018
Expected term (years)	5.0 years	—	5.2 years
Expected volatility	70.7%	—	66.8%
Risk-free interest rate	0.3%	—	2.6%
Dividend yield	—	—	—

We recorded stock-based compensation expense for stock options of $6.2 million, $11.0 million and $15.5 million for the years ended December 31, 2020, 2019 and 2018, respectively.

As of December 31, 2020, $9.9 million of total unrecognized compensation expense related to stock options was expected to be recognized over a weighted-average period of 3 years.

Cash received from option exercises for the years ended December 31, 2020, 2019 and 2018 was $43.9 million, $5.9 million and $6.3 million, respectively.

ESPP

We estimated the fair value of shares to be issued under the ESPP using the Black-Scholes option pricing model. For the years ended December 31, 2020, 2019 and 2018, weighted average fair value at grant date for shares to be issued under the ESPP was $1.68, $0 and $1.47, respectively.

For the years ended December 31, 2020, 2019 and 2018, the fair value of shares to be issued under the ESPP was estimated using the following assumptions:

	Years Ended December 31,		
	2020	2019	2018
Expected term (years)	0.5 - 2.0	—	0.5 - 2.0
Expected volatility	57% - 71%	—	65% - 67%
Risk-free interest rate	0.1%-1.0%	—	1.3%-2.7%
Dividend yield	—	—	—

We recorded stock-based compensation expense for ESPP of $3.4 million, $0.5 million and $6.8 million for the years ended December 31, 2020, 2019 and 2018, respectively.

Cash received through the ESPP for the years ended December 31, 2020, 2019 and 2018 was $2.4 million, $2.7 million and $3.4 million, respectively.

NOTE 9. NET INCOME (LOSS) PER SHARE

Basic net income (loss) per share and diluted net income (loss) per share are presented for the three years presented. Basic net income (loss) per share is computed by dividing net income (loss) by the weighted average number of shares of common stock outstanding during the period. Diluted net income (loss) 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 income (loss) per share amounts presented in the accompanying consolidated statements of operations and comprehensive income (loss) (in thousands, except per share amounts):

	Years Ended December 31,		
	2020	2019	2018
Numerator:			
Net income (Loss)	$ 29,403	$ (84,134)	$ (102,562)
Denominator:			
Basic			
Weighted average shares used in computing basic net income (loss) per share	165,187	152,527	135,094
Basic net income (loss) per share	$ 0.18	$ (0.55)	$ (0.76)
Diluted			
Weighted average shares used in computing basic net income (loss) per share	165,187	152,527	135,094
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 income (loss) per share	174,970	152,527	135,094
Diluted net income (loss) per share	$ 0.17	$ (0.55)	$ (0.76)

The following 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)	2020	2019	2018
Options to purchase common stock	4,908	22,697	25,176
RSUs with time-based vesting	100	1,086	371
RSUs with performance-based vesting	94	138	586
Common stock issuable pursuant to our ESPP	2,890	—	—

NOTE 10. 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, 2020, 2019 and 2018 is as follows:

	Years Ended December 31,		
(in thousands)	2020	2019	2018
North America	$ 37,277	$ 44,681	$ 35,598
Europe (including the Middle East and Africa)	19,065	19,600	13,958
Asia Pacific	22,551	26,610	29,070
Total	$ 78,893	$ 90,891	$ 78,626

A summary of our revenue by category for the years ended December 31, 2020, 2019 and 2018 is as follows:

	Year Ended December 31,		
(in thousands)	2020	2019	2018
Instrument revenue	$ 34,282	$ 45,126	$ 28,492
Consumable revenue	31,142	32,616	37,863
Product revenue	65,424	77,742	66,355
Service and other revenue	13,469	13,149	12,271
Total revenue	$ 78,893	$ 90,891	$ 78,626

NOTE 11. SUBSEQUENT EVENTS

Invitae Collaboration

On January 12, 2021 we entered into a multi-year Development and Commercialization Agreement (the "Development Agreement") with Invitae Corporation ("Invitae"), to begin development of a production-scale high-throughput sequencing platform, leveraging the power of PacBio's highly accurate HiFi sequencing to expand Invitae's whole genome testing capabilities.

In connection with the development of the Program Products, Invitae will provide to the Company amounts equal to certain development costs incurred by the Company. Under the Development Agreement, we will be primarily responsible for conducting a development program to develop the Program Products pursuant to a schedule and budget. We will make decisions regarding the development program jointly with Invitae. The development program is expected to last approximately sixty months, but may be shorter or longer. The Program Products will be sold to Invitae as they are developed and we have the right to broadly commercialize Program Products with other customers.

As a benefit of its contribution, Invitae will be entitled to preferred pricing on the Program Products if and when they are available for commercial sale. Each Program Product will have a preferential pricing period. During the initial period of preferred pricing for each Program Product, Invitae may purchase the Program Product at a substantially reduced margin until it has recouped a mutually agreed multiple of its contribution. Subsequently, for up to three years after the initial period of preferred pricing, Invitae has the right to purchase the Program Product at a higher price within a specified price range.

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. In addition, the Development Agreement includes certain other circumstances for termination by each party, including circumstances where Invitae may terminate for delays, IP concerns, 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 generated from the sale of the Program Products if and when they are commercialized until such time as Invitae has recouped the amounts reimbursed to us, and in certain circumstances, a mutually agreed return.

We expect to incur significant development costs over the duration of the collaboration agreement in 2021. We are still evaluating the accounting impact of the agreement, including whether the funding received by the Company from Invitae represents discounts toward future supplies, funding of development efforts, or a combination of both. There can be no assurances that the development program will be successful or that the Program Platform will become ready for commercial sale.

Issuance and Sale of 1.50% Convertible Senior Notes due February 15, 2028

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 the Company's 1.50% Convertible Senior Notes due February 15, 2028 (the "Notes"). The Notes were issued on February 16, 2021.

Issuance of Convertible Notes

The Notes are expected to be governed by an indenture (the "Indenture") between the Company and U.S. Bank National Association, as trustee (the "Trustee"). The Notes will 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 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 will be convertible into shares of the Company's 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.

On or after February 20, 2026, the Notes will be redeemable by the Company in the event that the closing sale price of the Company's 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 the Company provides the redemption notice at a redemption price of 100% of the principal amount of such Notes, plus accrued and unpaid interest to, but excluding, the redemption date.

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

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

Standstill Obligations

Pursuant to the Investment Agreement, the Purchaser has agreed, subject to certain exceptions, that from the Closing and until the earliest of (i) the three year anniversary of the Closing, (ii) the effective date of a change of control of the Company and (iii) 90 days after the date on which none of the members of the Purchaser or its affiliates beneficially own any Notes or shares of the Company's common stock received upon conversion of the Notes (the "Standstill Period"), the Purchaser will not, among other things: (i) make, or in any way participate in any "proxy contest" or other solicitation of proxies, (ii) form, join, influence or in any way participate in a voting trust or similar arrangement, (iii) acquire any securities of the Company if, immediately after such acquisition, the Purchaser or its affiliates would collectively own in the aggregate more than 19.99% of the then outstanding voting securities of the Company, (iv) sell, transfer or otherwise dispose of any voting securities of the Company to any person who is (or will become upon consummation of such sale, transfer or other disposition) a beneficial owner of 10% or more of the outstanding voting securities of the Company, (v) propose or seek to effect any tender or exchange offer, merger or other business combination involving the Company, or make any public statement with respect to such transaction, (vi) call or seek to call any meeting of stockholders or other referendum or consent solicitation, or (vii) take action to control or influence the Board of Directors or management of the Company.

Transfer Restrictions; Registration Rights

The Investment Agreement restricts the Purchaser's ability to transfer the Notes and the Company's common stock issuable or issued upon conversion of the Notes and enter into any hedging or other agreement that transfers the economic consequences of ownership of the Notes or the Company's common stock issuable or issued upon conversion of the Notes, subject to certain exceptions specified in the Investment Agreement and summarized below.

Except as described below, prior to the earlier of (i) the one year anniversary of the Closing or (ii) immediately prior to the consummation of a change of control of the Company, the Purchaser will be restricted from transferring or entering into any hedging or other agreement that transfers the economic consequences of ownership of the Notes or the Company's common stock issuable or issued upon conversion of the Notes. Exceptions include: (A) transfers to affiliates, (B) transfers to the Company or any of its subsidiaries, (C) transfers to a third party where the net proceeds of such sale are solely used to satisfy a margin call or repay a permitted loan or (D) transfers in connection with certain merger and acquisition events.

Subject to certain limitations, the Investment Agreement provides the Purchaser and any lender of a permitted loan to the Purchaser or its affiliates with certain registration rights for the shares of the Company's common stock issuable or issued upon conversion of the Notes.

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

None

ITEM 9A. CONTROLS AND PROCEDURES.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our chief executive officer, and our chief financial officer, evaluated the effectiveness of our disclosure controls and procedures (as 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). Under the supervision and with the participation of our management, including our Chief Executive Officer, Chief Financial Officer and Principal Accounting Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control — Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (COSO). Based on our evaluation under this framework our management concluded that our internal control over financial reporting was effective as of December 31, 2020.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a–15 or 15d–15 that occurred during our fourth fiscal quarter that have materially affected or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

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 2021 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 2021 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 2021 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 2021 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 2021 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 16, 2021
4.4	Form of 1.50% Convertible Senior Notes due 2028 (included in Exhibit 4.1)	8-K	4.1	February 16, 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+	2020 Inducement Equity Incentive Plan and related forms of agreement	8-K	10.1	December 4, 2020
10.9+	Change in Control Severance Agreement by and between the Registrant and Susan K. Barnes effective September 9, 2010	S-1/A	10.20	September 20, 2010
10.10+	Change in Control Severance Agreement by and between the Registrant and James Michael Phillips effective September 9, 2010	S-1/A	10.24	September 20, 2010
10.11+	Change in Control Severance Agreement by and between the Registrant and Michael Hunkapiller dated January 5, 2012	10-K	10.33	March 1, 2012
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 2, 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 2, 2020
10.14+	Form of Change in Control and Severance Agreement for executive officers			Filed herewith
10.15+	Letter Relating to Employment Terms by and between the Registrant and Christian O. Henry effective September 14, 2020			Filed herewith
10.16+	Change in Control and Severance Agreement by and between the Registrant and Christian O. Henry effective September 14, 2020			Filed herewith
10.17+	Amended Change in Control and Severance Agreement by and between the Registrant and Christian O. Henry dated February 3, 2021			Filed herewith
10.18+	Letter Relating to Employment Terms by and between the Registrant and Mark Van Oene effective January 8, 2021			Filed herewith
10.19+	Letter Relating to Employment Terms by and between the Registrant and Peter Fromen effective January 8, 2021			Filed herewith
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	Agreement by and among Pacific Biosciences of California, Inc., Illumina, Inc. and FC Ops Corp. dated January 2, 2020	8-K	10.1	January 2, 2020
10.23††	Development and Commercialization Agreement by and between the Registrant and Invitae Corporation dated January 12, 2021			Filed herewith
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 9, 2021
10.25††	Exclusive License Agreement by and between the Registrant and Cornell Research Foundation, Inc., dated as of February 1, 2004			Filed herewith

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, 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 26, 2021

By: /s/ SUSAN G. Kim

Susan G. Kim
Chief Financial Officer

Date: February 26, 2021

By: /s/ Eric E. Schaefer

Eric E. Schaefer
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 Eric E. Schaefer, jointly and severally, as his or her true and lawful attorney-in-fact and agent, with full power of substitution, each with power to act alone, to sign and execute on behalf of the undersigned any and all amendments to this Annual Report on Form 10-K, and to perform any acts necessary in order to file the same, with all exhibits thereto and other documents in connection therewith with the Securities and Exchange Commission, granting unto said attorney-in-fact and agent full power and authority to do and perform each and every act and thing requested and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorney-in-fact and agent, or their or his or her substitutes, shall do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed 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 26, 2021
/s/ Susan G. Kim Susan G. Kim	Chief Financial Officer (Principal Financial Officer)	February 26, 2021
/s/ Eric E. Schaefer Eric E. Schaefer	Vice President and Chief Accounting Officer (Principal Accounting Officer)	February 26, 2021
/s/ John F. Milligan John F. Milligan	Chairman of the Board of Directors	February 26, 2021
/s/ David Botstein David Botstein	Director	February 26, 2021
/s/ William W. Ericson William W. Ericson	Director	February 26, 2021
/s/ Michael Hunkapiller Michael Hunkapiller	Director	February 26, 2021
/s/ Randall S. Livingston Randall S. Livingston	Director	February 26, 2021
/s/ Marshall L. Mohr Marshall L. Mohr	Director	February 26, 2021
/s/ Kathy Ordoñez Kathy Ordoñez	Director	February 26, 2021
/s/ Lucy Shapiro Lucy Shapiro	Director	February 26, 2021

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

CHANGE IN CONTROL AND SEVERANCE AGREEMENT

This Change in Control and Severance Agreement (the "*Agreement*") is made and entered into by and between [_____] ("*Executive*") and Pacific Biosciences of California, Inc., a Delaware corporation (the "*Company*"), effective as of [_____], 202[ ] (the "*Effective Date*").

RECITALS

1. It is expected that the Company from time to time will consider the possibility of an acquisition by another company or other change in control. The Board of Directors of the Company (the "*Board*") recognizes that such considerations can be a distraction to Executive and can cause Executive to consider alternative employment opportunities. The Board has determined that it is in the best interests of the Company and its stockholders to assure that the Company will have the continued dedication and objectivity of Executive, notwithstanding the possibility, threat or occurrence of such a termination of employment or the occurrence of a Change in Control (as defined herein) of the Company.

2. The Board believes that it is in the best interests of the Company and its stockholders to provide Executive with an incentive to continue Executive's employment and to motivate Executive to maximize the value of the Company for the benefit of its stockholders.

3. The Board believes that it is imperative to provide Executive with certain severance benefits upon Executive's termination of employment in connection with a Change in Control. These benefits will provide Executive with enhanced financial security, incentive and encouragement to remain with the Company.

4. Certain capitalized terms used in the Agreement are defined in Section 6 below.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties hereto agree as follows:

5. Term of Agreement. This Agreement will have an initial term of three (3) years commencing on the Effective Date (the "*Initial Term*"). On the third anniversary of the Effective Date, this Agreement will renew automatically for additional one (1) year terms (each an "*Additional Term*"), unless either party provides the other party with written notice of non-renewal at least sixty (60) days prior to the date of automatic renewal. Notwithstanding the foregoing provisions of this paragraph, if a Change in Control occurs when there are fewer than twelve (12) months remaining during the Initial Term or an Additional Term, the term of this Agreement will extend automatically through the date that is twelve (12) months following the effective date of the Change in Control. If Executive becomes entitled to benefits under Section 3(a) or Section 3(b) during the term of this

Agreement, the Agreement will not terminate until all of the obligations of the parties hereto with respect to this Agreement have been satisfied.

6. At-Will Employment. The Company and Executive acknowledge that Executive's employment is and will continue to be at-will, as defined under applicable law. No payments, benefits, or provisions under this Agreement will confer upon Executive any right to continue Executive's employment with the Company, nor will they interfere with or limit in any way the right of the Company or Executive to terminate such relationship at any time, with or without cause, to the extent permitted by applicable laws.

7. Severance Benefits.

(a) Termination without Cause or Other than Death or Disability or Resignation for Good Reason Other than During the Change in Control Period. If a Qualifying Termination occurs other than during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

Base Salary Severance. Executive will receive continuing payments of Salary, less any applicable withholdings, for a period of twelve (12) months following the date of such termination of employment, to be paid periodically in accordance with the Company's normal payroll policies.

Continued Employee Benefits. If Executive elects continuation coverage pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended ("*COBRA*") for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, Executive will receive Company-paid group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, at the coverage levels in effect immediately prior to the termination of Executive's employment (the "*COBRA Severance*") until the earliest of: (A) a period of twelve (12) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

(b) Termination without Cause or Other than Death or Disability or Resignation for Good Reason On or Within Twelve Months Following a Change in Control. If a Qualifying Termination occurs during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

(i) Base Salary Severance. Executive will receive continuing payments of Salary, less any applicable withholdings, for a period of twelve (12) months following the date of such termination of employment, to be paid periodically in accordance with the Company's normal payroll policies.

(ii) Prorated Target Bonus Severance. Executive will receive a lump sum cash payment equal to Executive's annualized target bonus in effect for the year in which the Qualifying Termination occurs, provided that such amount will be prorated based on a fraction, the numerator of which is the number of days during which Executive was employed with the Company (or its successor) in the year that the Qualifying Termination occurs, and the denominator of which is the total number of days in such year (the "*Prorated Bonus Severance*").

(iii) Continued Employee Benefits. If Executive elects continuation coverage pursuant to COBRA for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, the Company will provide the COBRA Severance until the earliest of: (A) a period of twelve (12) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

(iv) Equity. One hundred percent (100%) of the unvested portion of the Executive's then-outstanding equity awards (the "*Awards*") will immediately vest and, to the extent applicable, become exercisable, as of the date of such termination. To the extent that an Award is subject to performance-based vesting at the time of such termination, such performance goals will be deemed achieved at one hundred percent (100%) of target levels and all other terms and conditions met, unless specifically provided otherwise under the applicable Award agreement. The Awards will remain exercisable, to the extent applicable, following Executive's termination for the period prescribed in the applicable equity plan and agreement for each Award.

(c) Other Termination. If Executive's employment with the Company terminates other than as set forth in Section 3(a) or 3(b) above, then (i) all vesting will terminate immediately with respect to Executive's outstanding Awards, (ii) all payments of compensation by the Company to Executive hereunder will terminate immediately (except as to amounts already earned), and (iii) Executive will only be eligible for severance benefits in accordance with the Company's established policies, if any, as then in effect.

(d) Accrued Amounts. On any termination of Executive's employment with the Company, Executive will be entitled to receive all accrued but unpaid vacation, expense reimbursements, wages, and other benefits due to Executive under any Company-provided plans, policies, and arrangements.

(e) Non-duplication of Payment or Benefits. Notwithstanding any provision of this Agreement to the contrary, if Executive is entitled to any cash severance, continued health coverage severance benefits, vesting acceleration of any Awards, or other severance or separation benefits similar to those provided under this Agreement, by operation of applicable law or under a plan, policy, contract, or arrangement sponsored by or to which the Company is a party other than this Agreement ("Other Benefits"), then the corresponding severance payments and benefits under this Agreement will be reduced by the amount of Other Benefits paid or provided to Executive.

8. Conditions to Receipt of Severance.

(a) Release of Claims Agreement. The receipt of any severance payments or benefits pursuant to this Agreement is subject to Executive signing and not revoking a separation agreement and release of claims in a form acceptable to the Company (the "*Release*"), which must become effective and irrevocable no later than the sixtieth (60^{th}) day following Executive's termination of employment (the "*Release Deadline Date*"). If the Release does not become effective and irrevocable by the Release Deadline Date, Executive will forfeit any right to severance payments or benefits under this Agreement. No severance payments and benefits under Section 3(a) or 3(b) of this Agreement will be paid or provided until the Release becomes effective and irrevocable, and any such severance payments and benefits otherwise payable between the date of Executive's termination of employment and the date the Release becomes effective and irrevocable (including, if applicable, the lump sum cash payment under Section 4(c) below) will be paid, subject to the requirements of Section 4(d) below, on the Company's first regularly scheduled payroll date on or following the date the Release becomes effective and irrevocable. Any restricted stock units, performance units, performance shares, and/or similar full value awards that accelerate vesting under this Agreement ("*Full Value Awards*") will be settled (subject to Section 4(d) below and the terms of any award agreement or other Company plan, policy, or arrangement governing the settlement timing of such award to the extent such terms specifically require different payment timing in order to comply with the requirements of Section 409A, as applicable (the "*Full Value Settlement Provisions*"), on a date within ten (10) days following the date the Release becomes effective and irrevocable.

(b) Confidential Information and Invention Assignment Agreements. Executive's receipt of any payments or benefits under Sections 3(a) and 3(b) will be subject to Executive continuing to comply with the

terms of any confidential information and invention assignment agreement executed by Executive in favor of the Company and the provisions of this Agreement.

(c) COBRA Severance Limitations. Notwithstanding the provisions of Sections 3(a)(ii) and 3(b)(ii), if the Company determines in its sole discretion that it cannot provide the COBRA Severance without potentially violating applicable laws (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), then in lieu of such COBRA Severance, and subject to any delay required by this Section 4, the Company will provide to Executive a taxable lump sum cash payment in an amount equal to the product of (x) the number of months of Salary severance specified in Section 3(a)(i) or 3(b)(i), as applicable, multiplied by (y) the monthly COBRA premium that Executive otherwise would be required to pay to continue the group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, as in effect on the date of termination of Executive's employment (which amount will be based on the premium for the first month of COBRA coverage for Executive and Executive's eligible dependents), which payment will be made regardless of whether Executive elects COBRA continuation coverage (the "*Taxable Payment*"). For the avoidance of doubt, the Taxable Payment may be used for any purpose, including, but not limited to continuation coverage under COBRA, and will be subject to all applicable tax withholdings. Notwithstanding anything to the contrary under this Agreement, if the Company determines in its sole discretion at any time that it cannot provide the COBRA Severance or the Taxable Payment without violating applicable law (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), Executive will not receive any COBRA Severance or Taxable Amount under this Agreement.

(d) Section 409A.

(i) Notwithstanding anything to the contrary in this Agreement, no severance payments or benefits payable to Executive, if any, pursuant to this Agreement that, when considered together with any other severance payments or separation benefits, is considered deferred compensation under Internal Revenue Code Section 409A (together, the "*Deferred Payments*") will be payable until Executive has a "separation from service" within the meaning of Section 409A of the Internal Revenue Code of 1986, as amended (the "*Code*"), and the Treasury Regulations and guidance thereunder, and any applicable state law equivalent, as each may be promulgated, amended or modified from time to time ("*Section 409A*"). Similarly, no severance payable to Executive, if any, pursuant to this Agreement that otherwise would be exempt from Section 409A pursuant to Treasury Regulations Section 1.409A-1(b)(9) will be payable until Executive has a "separation from service" within the meaning of Section 409A. To the extent required to be exempt from or comply with Section 409A, references to the termination of Executive's employment or similar phrases used in this Agreement will mean Executive's "separation from service" within the meaning of Section 409A.

(ii) Any severance payments or benefits under this Agreement that would be considered Deferred Payments will be paid on, or, in the case of installments, will not commence until, the sixtieth (60^{th}) day following Executive's separation from service, or, if later, such time as required by Section 4(d)(iii) (or with respect to Full Value Awards, such time or times as required by any applicable Full Value Settlement Provisions). Except as required by Section 4(d)(iii) and any applicable Full Value Settlement Provisions, any Deferred Payments payable in installments that would have been made to Executive during the sixty (60) day period immediately following Executive's separation from service but for the preceding sentence will be paid to Executive on the sixtieth (60^{th}) day following Executive's separation from service and the remaining payments shall be made as provided in this Agreement.

(iii) Further, if Executive is a "specified employee" within the meaning of Section 409A at the time of Executive's separation from service (other than due to death), any Deferred Payments that otherwise are payable within the

first six (6) months following Executive's separation from service will become payable on the first payroll date that occurs on or after the date six (6) months and one (1) day following the date of Executive's separation from service. All subsequent Deferred Payments, if any, will be payable in accordance with the payment schedule applicable to each payment or benefit. Notwithstanding anything herein to the contrary, in the event of Executive's death following Executive's separation from service but prior to the six (6) month anniversary of Executive's separation from service (or any later delay date), then any payments delayed in accordance with this paragraph will be payable in a lump sum as soon as administratively practicable after the date of Executive's death and all other Deferred Payments will be payable in accordance with the payment schedule applicable to each payment or benefit. Each payment and benefit payable under the Agreement is intended to constitute a separate payment for purposes of Section 1.409A-2(b)(2) of the Treasury Regulations.

(iv) Any amount paid under this Agreement that satisfies the requirements of the "short-term deferral" rule set forth in Section 1.409A-1(b)(4) of the Treasury Regulations will not constitute Deferred Payments for purposes of clause (i) above. Any amount paid under this Agreement that qualifies as a payment made as a result of an involuntary separation from service pursuant to Section 1.409A-1(b)(9)(iii) of the Treasury Regulations that is within the limit set forth thereunder will not constitute Deferred Payments for purposes of clause (i) above.

(v) The foregoing provisions are intended to comply with, or be exempt from, the requirements of Section 409A so that none of the severance payments and benefits to be provided under the Agreement will be subject to the additional tax imposed under Section 409A, and any ambiguities and ambiguous terms herein will be interpreted to so comply or be exempt. Executive and the Company agree to work together in good faith to consider amendments to the Agreement and to take such reasonable actions which are necessary, appropriate or desirable to avoid imposition of any additional tax or income recognition prior to actual payment to Executive under Section 409A. In no event will the Company or any of its subsidiaries or other affiliates have any obligation, responsibility or liability to reimburse, indemnify or hold harmless Executive for any taxes imposed, or other costs incurred, as result of Section 409A.

9. Limitation on Payments. In the event that the severance and other benefits provided for in this Agreement or otherwise that Executive would receive from the Company or any other party whether in connection with the provisions of this Agreement or otherwise (the "*Payments*") would (i) constitute "parachute payments" within the meaning of Section 280G of the Code and (ii) but for this Section 5, would be subject to the excise tax imposed by Section 4999 of the Code, then the Payments will be either:

(a) delivered in full, or

(b) delivered as to such lesser extent which would result in no portion of such Payments being subject to excise tax under Section 4999 of the Code,

whichever of the foregoing amounts, taking into account the applicable federal, state and local income taxes and the excise tax imposed by Section 4999, results in the receipt by Executive on an after-tax basis, of the greatest amount of Payments, notwithstanding that all or some portion of such Payments may be taxable under Section 4999 of the Code. If a reduction in severance and other benefits constituting "parachute payments" is necessary so that benefits are delivered to a lesser extent, reduction will occur in the following order: (i) reduction of cash payments in reverse chronological order (that is, the cash payment owed on the latest date following the occurrence of the event triggering the excise tax under Code Section 4999 will be the first cash payment to be reduced); (ii) cancellation of equity awards granted "contingent on a change in ownership or control" (within the meaning of Code Section 280G) in the reverse order of date of grant of the equity awards (that is, the most recently granted equity awards will be cancelled first), (iii) reduction of accelerated vesting of equity awards in the reverse order of date of grant of the equity awards (that is, the vesting of the most recently granted equity awards

will be cancelled first); (iv) reduction of employee benefits in reverse chronological order (that is, the benefit owed on the latest date following the occurrence of the event triggering such excise tax will be the first benefit to be reduced). In no event will Executive have any discretion with respect to the ordering of Payment reductions. Executive will be solely responsible for the payment of all personal tax liability that is incurred as a result of the payments and benefits received under this Agreement, and neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to reimburse, indemnify or hold harmless Executive for any of those payments of personal tax liability.

Unless the Company and Executive otherwise agree in writing, any determination required under this Section 5 will be made in writing by a nationally recognized accounting or valuation firm (the "*Firm*") selected by the Company, whose determination will be conclusive and binding upon Executive and the Company for all purposes. For purposes of making the calculations required by this Section 5, the Firm may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and Executive will furnish to the Firm such information and documents as the Firm may reasonably request in order to make a determination under this Section. The Company will bear all costs and make all payments required to be made to the Firm for the Firm's services that are rendered in connection with any calculations contemplated by this Section 5. The Company will have no liability to Executive for the determinations of the Firm.

10. Definition of Terms. For purposes of this Agreement, the following terms referred to in this Agreement will have the following meanings:

(a) Cause. "*Cause*" means (i) conviction of any felony; (ii) conviction of any crime involving moral turpitude or dishonesty that causes, or is likely to cause, material harm to the Company; (iii) participation in a fraud or willful act of dishonesty against the Company that causes, or is likely to cause, material harm to the Company; (iv) intentional and material damage to the Company's property; or (v) material breach of the Company's Proprietary Information and Inventions Agreement.

(b) Change in Control. "*Change in Control*" means the first occurrence of any of the following on or after the Effective Date:

(i) A change in the ownership of the Company which occurs on the date that any one person, or more than one person acting as a group ("*Person*"), acquires ownership of the stock of the Company that, together with the stock held by such Person, constitutes more than 50% of the total voting power of the stock of the Company; provided, however, that for purposes of this subsection (i), the acquisition of additional stock by any one Person, who is considered to own more than 50% of the total voting power of the stock of the Company will not be considered a Change in Control. Further, if the stockholders of the Company immediately before such change in ownership continue to retain immediately after the change in ownership, in substantially the same proportions as their ownership of shares of the Company's voting stock immediately prior to the change in ownership, direct or indirect beneficial ownership of fifty percent (50%) or more of the total voting power of the stock of the Company or of the ultimate parent entity of the Company, such event will not be considered a Change in Control under this subsection (i). For this purpose, indirect beneficial ownership will include, without limitation, an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own the Company, as the case may be, either directly or through one or more subsidiary corporations or other business entities; or

(ii) A change in the effective control of the Company which occurs on the date that a majority of members of the Board (each, a "*Director*") is replaced during any twelve (12) month period by Directors whose appointment or election is not endorsed by a majority of the members of the Board prior to the date of the appointment or election. For purposes of this subsection (ii), if any Person is considered to be in effective control of the Company, the

acquisition of additional control of the Company by the same Person will not be considered a Change in Control; or

(iii) A change in the ownership of a substantial portion of the Company's assets which occurs on the date that any Person acquires (or has acquired during the twelve (12) month period ending on the date of the most recent acquisition by such Person) assets from the Company that have a total gross fair market value equal to or more than 50% of the total gross fair market value of all of the assets of the Company immediately prior to such acquisition or acquisitions; provided, however, that for purposes of this subsection (iii), the following will not constitute a change in the ownership of a substantial portion of the Company's assets: (A) a transfer to an entity that is controlled by the Company's stockholders immediately after the transfer, or (B) a transfer of assets by the Company to: (1) a stockholder of the Company (immediately before the asset transfer) in exchange for or with respect to the Company's stock, (2) an entity, 50% or more of the total value or voting power of which is owned, directly or indirectly, by the Company, (3) a Person, that owns, directly or indirectly, 50% or more of the total value or voting power of all the outstanding stock of the Company, or (4) an entity, at least 50% of the total value or voting power of which is owned, directly or indirectly, by a Person described in this subsection (iii)(B)(3). For purposes of this subsection (iii), gross fair market value means the value of the assets of the Company, or the value of the assets being disposed of, determined without regard to any liabilities associated with such assets.

For purposes of this definition of Change in Control, persons will be considered to be acting as a group if they are owners of a corporation that enters into a merger, consolidation, purchase or acquisition of stock, or similar business transaction with the Company.

Notwithstanding the foregoing, a transaction will not be deemed a Change in Control unless the transaction qualifies as a change in control event within the meaning of Section 409A.

Further and for the avoidance of doubt, a transaction will not constitute a Change in Control if: (i) its sole purpose is to change the jurisdiction of the Company's incorporation, or (ii) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held the Company's securities immediately before such transaction.

(c) Change in Control Period. "*Change in Control Period*" means the period beginning upon the occurrence of a Change in Control through the date twelve (12) months following a Change in Control.

(d) Disability. "*Disability*" means Executive is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment that can be expected to result in death or can be expected to last for a continuous period of not less than twelve (12) months.

(e) Good Reason. "*Good Reason*" means Executive's termination of his or her employment with the Company within thirty (30) days following the expiration of any cure period (discussed below) following the occurrence of one or more of the following, without Executive's express written consent: (i) a material reduction of Executive's duties, authority, or responsibilities, relative to Employee's duties, authority, or responsibilities as in effect immediately prior to such reduction; *provided, however,* that a reduction in duties, authority, or responsibilities solely by virtue of the Company being acquired and made part of a larger entity (for example, where Executive retains essentially the same responsibility and duties of the subsidiary, business unit or division substantially containing the Company's business following a Change in Control) shall not constitute "Good Reason"; (ii) a material reduction by the Company in Executive's annualized base pay as in effect immediately prior to such reduction (in other words, a reduction of more than ten percent (10%) of Executive's annualized base compensation in any one year, other than a reduction applicable to executives generally that does not adversely affect Executive to a greater extent than other similarly situated executives); (iii) the relocation of Executive's principal place of performing his or her duties as an employee of the Company by more than fifty (50) miles; or (iv) the failure of the Company to obtain the assumption of this Agreement by a successor. In order for an event to

qualify as Good Reason, Executive must not terminate employment with the Company without first providing the Company with written notice of the acts or omissions constituting the grounds for "Good Reason" within ninety (90) days of the initial existence of the grounds for "Good Reason" and a reasonable cure period of not less than thirty (30) days following the date of such notice. To the extent Executive's primary work location is not the Company's corporate offices due to a shelter-in-place order, quarantine order, or similar work-from-home requirement that applies to Executive, Executive's primary office location, from which a change in location under the foregoing clause (iii) will be measured, will be considered the Company's office location where Executive's employment with the Company primarily was based immediately prior to the commencement of such shelter-in-place order, quarantine order, or similar work-from-home requirement.

(f) Qualifying Termination. "*Qualifying Termination*" means either (i) the Company terminates Executive's employment with the Company for a reason other than (A) Cause, (B) Executive's death, or (C) Executive's Disability or (ii) Executive resigns for Good Reason.

(g) Salary. "*Salary*" means Executive's base salary as in effect immediately prior to the termination of Executive's employment (unless such termination occurs as a result of clause (ii) of the definition of "Good Reason" under Section 6(e), in which case the amount will be equal to Executive's base salary as in effect immediately prior to such reduction) or, if greater in the case of a Qualifying Termination during the Change in Control Period, as in effect immediately prior to the Change in Control.

11. Successors.

(a) The Company's Successors. Any successor to the Company (whether direct or indirect and whether by purchase, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets will assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. For all purposes under this Agreement, the term "Company" will include any successor to the Company's business and/or assets which executes and delivers the assumption agreement described in this Section 7(a) or which becomes bound by the terms of this Agreement by operation of law.

(b) Executive's Successors. The terms of this Agreement and all rights of Executive hereunder will inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees. Notwithstanding the foregoing, none of the rights of Executive to receive any form of compensation payable pursuant to this Agreement may be assigned or transferred except by will or the laws of descent and distribution. Any other attempted assignment, transfer, conveyance, or other disposition of Executive's right to compensation or other benefits will be null and void.

12. Notice.

(a) General. Notices and all other communications contemplated by this Agreement will be in writing and will be deemed to have been duly given (a) upon actual delivery to the party to be notified, (b) twenty-four (24) hours after confirmed facsimile transmission, (c) one (1) business day after deposit with a recognized overnight courier, or (d) three (3) business days after deposit with the U.S. Postal Service by first class certified or registered mail, return receipt requested, postage prepaid, addressed: (i) if to Executive, at the address Executive will have most recently furnished to the Company in writing, or (ii) if to the Company, to its corporate headquarters and all notices will be directed to the General Counsel of the Company.

(b) Notice of Termination. Any termination of Executive's employment by the Company for Cause or by Executive for Good Reason or as a result of a voluntary resignation will be communicated by a notice of termination to the other party hereto given in accordance with Section 8(a) of this Agreement. Such notice will indicate the specific termination provision in this Agreement relied upon, will set forth in reasonable detail the facts and circumstances claimed to provide a basis for termination under the provision so indicated, and will specify the termination date (which will be not more than thirty (30) days after the giving of such notice or in the case of Executive's resignation for Good Reason, in accordance with the requirements under Section 6(e)). The failure by Executive to include in the notice any fact or circumstance which contributes to a showing of Good Reason will not waive any right of Executive hereunder or preclude Executive from asserting such fact or circumstance in enforcing Executive's rights hereunder.

(c) Resignation. The termination of Executive's employment for any reason also will constitute, without any further required action by Executive, Executive's voluntary resignation from all officer and/or director positions held at the Company or any of its subsidiaries or affiliates, and at the Board's request, Executive will execute any documents reasonably necessary to reflect the resignations.

13. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive will not be required to mitigate the amount of any payment contemplated by this Agreement, nor will any such payment be reduced by any earnings that Executive may receive from any other source except as specified in Sections 3(e), 4(d) and 5.

(b) Waiver. No provision of this Agreement will be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party will be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Headings. All captions and section headings used in this Agreement are for convenient reference only and do not form a part of this Agreement.

(d) Entire Agreement. This Agreement constitutes the entire agreement of the parties hereto and supersedes in their entirety all prior representations, understandings, undertakings or agreements (whether oral or written and whether expressed or implied) of the parties. No waiver, alteration, or modification of any of the provisions of this Agreement will be binding unless in writing and signed by duly authorized representatives of the parties hereto and which specifically mention this Agreement.

(e) Choice of Law. The validity, interpretation, construction, and performance of this Agreement will be governed by the laws of the State of California (with the exception of its conflict of laws provisions). Any claims or legal actions by one party against the other arising out of the relationship between the parties contemplated herein (whether or not arising under this Agreement) will be commenced or maintained in any state or federal court located in San Mateo County, California, and Executive and the Company hereby submit to the jurisdiction and venue of any such court.

(f) Severability. The invalidity, illegality, or unenforceability of any provision or provisions of this Agreement will not affect the validity, legality or enforceability of any other provision hereof, which will remain in full force and effect, and this Agreement will be construed and enforced as if the invalid, illegal, or unenforceable provision had not been included.

(g) Withholding. The Company (and any parent, subsidiary or other affiliate of the Company, as applicable) will have the right and authority to deduct from any payments or benefits all applicable federal, state, local, and/or non-U.S. taxes or other required withholdings and payroll deductions ("*Withholdings*"). Prior to the payment of any amounts or provision of any benefits under this Agreement, the Company (and any parent, subsidiary or other affiliate of the Company, as applicable) is permitted to deduct or withhold, or require Executive to remit to the Company, an amount sufficient to satisfy any applicable Withholdings with respect to such payments and benefits. Neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to pay Executive's taxes arising from or relating to any payments or benefits under this Agreement.

(h) Counterparts. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

o O o

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the Effective Date set forth above.

COMPANY PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

By:

Name:

Title:

EXECUTIVE

By:

Name: [_____]

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.
CEO EMPLOYMENT AGREEMENT

This CEO Employment Agreement (the "***Agreement***"), effective as of September 14, 2020, by and between Pacific Biosciences of California, Inc. (the "***Company***") and Christian O. Henry ("***Executive***").

1. Duties and Scope of Employment.

(a) Positions and Duties. Executive's employment with the Company commenced on September 14, 2020 (the "***Start Date***"). As of the Start Date, Executive has served and will continue to serve as President and Chief Executive Officer of the Company ("***CEO***") and as a member of the Company's Board of Directors (the "***Board***"). Executive will render such business and professional services in the performance of Executive's duties, consistent with Executive's position within the Company, as will reasonably be assigned to Executive by the Board. The Board may modify Executive's job title and duties as it deems necessary or appropriate in light of the Company's needs and interests from time to time. The period of Executive's at-will employment under the terms of this Agreement is referred to herein as the "***Employment Term***."

(b) Board Membership. During the Employment Term, Executive will serve as a member of the Board, subject to any required Board and/or stockholder approval. Upon termination of the Employment Term, Executive will resign from the Board and agrees to take any action reasonably requested by the Company to give effect to the same.

(c) Obligations. During the Employment Term, Executive will perform his duties faithfully and to the best of his ability and will devote his full business efforts and time to the Company. For the duration of the Employment Term, Executive agrees not to actively engage in any other employment, occupation or consulting activity for any direct or indirect remuneration without the prior approval of the Board. Executive currently is a member of the Board of Directors for Ginkgo Bioworks, a private company based in Boston, and is the Chairman of Wave Lifesciences, a publicly traded company and will continue as a member of the Board of Directors of these two companies so long as it does not interfere with the performance of Executive's duties and responsibilities under this Agreement.

(d) Confidentiality Agreement. Executive agrees to enter into the Company's standard confidential information and invention assignment agreement (the "***Confidentiality Agreement***").

2. At-will Employment. The parties agree that Executive's employment with the Company will be "at-will" employment and may be terminated at any time with or without cause or notice. Executive understands and agrees that neither Executive's job performance nor promotions, commendations, bonuses or the like from the Company give rise to or in any way serve as the basis for modification, amendment, or extension, by implication or otherwise, of Executive's employment with the Company. Upon termination of Executive's employment with

the Company, Executive will be deemed to have resigned from all offices then held with the Company and any of its subsidiaries without any further action required by Executive and Executive agrees to execute any documents as may be requested by the Company to reflect such resignation.

3. Compensation.

(a) Monthly Base Salary. During the Employment Term, the Company will pay Executive an annual base salary $650,000 (the "***Base Salary***"). The Base Salary will be paid periodically in accordance with the Company's normal payroll practices and be subject to the usual, required withholdings. Executive's Base Salary will be subject to review and adjustments will be made based upon the Company's normal performance review practices.

(b) Bonus. During the Employment Term, Executive will be eligible for an annual performance bonus with a target bonus of 100% of Executive's Base Salary based upon performance criteria to be established by the Board or the Compensation Committee of the Board (the "***Committee***"). The Board or Committee will endeavor in good faith to establish the annual performance bonus criteria within the first quarter of the applicable year. For the Company's fiscal year 2020, fifty percent (50%) of the target bonus opportunity will be based on achieving the Board approved plan for fiscal 2020 and the remaining fifty percent (50%) will be based on achieving goals that have been established and agreed to between Executive and the Compensation Committee of the Board. Any bonus for 2020 will be prorated based on the amount of time during the fiscal year that Executive serves as Chief Executive Officer. For Executive to earn any bonus, he will need to remain employed under this Agreement through the date the Board or Committee determines a bonus has been earned, which will be paid (to the extent earned) as soon as practicable after the Board or Committee makes such determination, but in no event will the bonus be paid after March 15 following the calendar year in which the bonus is earned.

(c) Equity Awards.

(i) Stock Option. Effective as of September 15, 2020, the Company granted to Executive a nonstatutory stock option ("***Option***") to purchase a total of 1,500,000 shares of the Company's common stock ("***Shares***"), with an exercise price per Share equal to $7.52, which was the fair market value of a Share on the date of grant. The Option is subject to the terms and conditions of the Company's 2020 Equity Incentive Plan (the "***Plan***") and stock option agreement between Executive and the Company ("***Option Agreement***").

(ii) Restricted Stock Units. Effective as of September 15, 2020, the Company granted to Executive an award of restricted stock units covering 750,000 Shares (the "***RSUs***"). The RSUs will be subject to the terms and conditions of the Plan and restricted stock unit agreement thereunder ("***RSU Agreement***"). The RSUs are subject to the terms and conditions of the Plan and restricted stock unit agreement between Executive and the Company ("***RSU Agreement***").

(iii) Vesting of Equity Awards. Any equity awards granted to Executive due to his providing services to the Company as CEO, including the Option and RSU,

will only vest based on continued employment with the Company, except that if the equity awards are assumed, substituted for, or otherwise continued in connection with a Change in Control, then such equity awards will continue to vest based on being a "Service Provider" (as defined in the Plan). For the avoidance of doubt, any equity awards granted to Executive prior to the Start Date due to his service as a member of the Board will continue to vest during the Employment Term in accordance with, and subject to the terms and conditions of, those equity awards.

(iv) Additional Equity Awards. Executive will be eligible to receive equity awards covering Shares pursuant to any plans or arrangements the Company may have in effect from time to time, including but not limited to any focal grants. The Board or Committee will determine in its discretion whether Executive will be granted any such equity awards and the terms of any such award in accordance with the terms of any applicable plan or arrangement that may be in effect from time to time.

4. Employee Benefits. During the Employment Term, Executive will be entitled to participate in the employee benefit plans currently and hereafter maintained by the Company of general applicability to other senior executives of the Company, as in effect from time to time and subject to the terms and conditions of those arrangements. The Company reserves the right to cancel or change the benefit plans and programs it offers to its employees at any time.

5. Vacation. Executive will be entitled to paid vacation in accordance with the Company's vacation policy for senior executive officers, with the timing and duration of specific vacations mutually and reasonably agreed to by the parties hereto.

6. Expenses.

(a) General. The Company will reimburse Executive for reasonable travel, entertainment or other expenses incurred by Executive in the furtherance of or in connection with the performance of Executive's duties hereunder, in accordance with the Company's expense reimbursement policy as in effect from time to time. The Company agrees and understands that as a result of the COVID-19 pandemic that Executive will initially be performing services under this Agreement from his home. Once it is determined by the Company and Executive that it is safe and appropriate to resume performing services in person (for instance, at the Company's headquarters), the Company and Executive will work in good faith to determine how best to accommodate that, which may include, for instance, temporary housing and related travel expenses.

(b) Relocation. If the Executive relocates his permanent residence to a location within 60 miles of the Company's corporate headquarters, the Company will reimburse executive for reasonable relocation expenses up to a total of $250,000, which will be made in accordance with the Company's standard reimbursement policies and further in a manner to avoid the imposition of additional taxes under Section 409A (including as set forth in Section 9). For the avoidance of doubt, relocation expenses may include items such as the movement of Executive's personal property, closing costs and commissions on the sale of Executive's primary residence, house hunting trips, and other reasonable costs associated with the relocation. If reimbursed amounts are subject to income taxes, the Company will "gross-up" the

reimbursement to include the amount of tax imposed on Executive as reasonably agreed to by the parties to this Agreement.

7. Termination of Employment. In the event Executive's employment with the Company terminates for any reason, Executive will be entitled to any (a) unpaid base pay accrued up to the effective date of termination; (b) pay for accrued but unused vacation; (c) benefits or compensation as provided under the terms of any employee benefit and compensation agreements or plans applicable to Executive, and (d) unreimbursed business expenses required to be reimbursed to Executive.

8. Change in Control and Severance Agreement. Executive and the Company have entered into the Change in Control and Severance Agreement of even date herewith (the "***Change in Control and Severance Agreement***").

9. Section 409A. All payments and benefits provided under this Agreement are intended to comply with, or be exempt from, the requirements of Section 409A so that none of the payments and benefits will be subject to the additional tax imposed under Section 409A, and any ambiguities and ambiguous terms herein will be interpreted to so comply or be exempt. Executive and the Company agree to work together in good faith to consider amendments to the Agreement and to take such reasonable actions which are necessary, appropriate or desirable to avoid imposition of any additional tax or income recognition prior to actual payment to Executive under Section 409A. All reimbursements will be paid as soon as administratively practicable, but, except as otherwise expressly provided herein, no later than the last day of the taxable year following the taxable year in which the expense was incurred. The amount of in-kind benefits provided or reimbursable expenses incurred in one taxable year shall not affect the in-kind benefits to be provided or the expenses eligible for reimbursement in any other taxable year (except for any lifetime or other aggregate limitation applicable to medical expenses). Such right to reimbursement or in-kind benefits is not subject to liquidation or exchange for another benefit. To the extent that any provision of this Agreement is ambiguous as to its compliance with Section 409A, the provision shall be read in such a manner so that all payments hereunder comply with Section 409A. Payments pursuant to this Agreement are intended to constitute separate payments for purposes of Section 1.409A-2(b)(2) of the Treasury Regulations. In no event will the Company have any responsibility, liability or obligation to reimburse, indemnify or hold harmless Executive for any taxes imposed, or other costs incurred, as result of Section 409A.

10. Definition of Certain Terms. The following terms referred to in this Agreement will have the following meanings:

(a) Code. For purposes of this Agreement, "***Code***" means the Internal Revenue Code of 1986, as amended.

(b) Section 409A. "***Section 409A***" means Code Section 409A and the Treasury Regulations and guidance thereunder, and any applicable state law equivalent, as each may be promulgated, amended or modified from time to time.

11. Assignment. This Agreement will be binding upon and inure to the benefit of (a) the heirs, executors and legal representatives of Executive upon Executive's death and (b) any successor of the Company. Any such successor of the Company will be deemed substituted for the Company under the terms of this Agreement for all purposes. For this purpose, "successor" means any person, firm, corporation or other business entity which at any time, whether by purchase, merger or otherwise, directly or indirectly acquires all or substantially all of the assets or business of the Company. None of the rights of Executive to receive any form of compensation payable pursuant to this Agreement may be assigned or transferred except by will or the laws of descent and distribution. Any other attempted assignment, transfer, conveyance or other disposition of Executive's right to compensation or other benefits will be null and void.

12. Notices. All notices, requests, demands and other communications called for hereunder shall be in writing and shall be deemed given (a) on the date of delivery if delivered personally, (b) one (1) day after being sent by a well-established commercial overnight service, or (c) four (4) days after being mailed by registered or certified mail, return receipt requested, prepaid and addressed to the parties or their successors at the following addresses, or at such other addresses as the parties may later designate in writing:

If to the Company:
Pacific Biosciences of California, Inc.
1305 O'Brien Drive
Menlo Park, CA 94025
Attn: General Counsel

If to Executive:

at the last residential address known by the Company.

13. Severability. In the event that any provision hereof becomes or is declared by a court of competent jurisdiction to be illegal, unenforceable or void, this Agreement will continue in full force and effect without said provision.

14. Integration. This Agreement, together with the Plan, Option Agreement, RSU Agreement, the Confidentiality Agreement, and the Change in Control and Severance Agreement represents the entire agreement and understanding between the parties as to the subject matter herein and supersedes all prior or contemporaneous agreements whether written or oral. This Agreement may be modified only by agreement of the parties by a written instrument executed by the parties that is designated as an amendment to this Agreement.

15. Taxes. All payments made pursuant to this Agreement will be subject to any applicable withholdings and other deductions required by applicable law. The Company is authorized to withhold from any payments or benefits any federal, state, and local taxes required to be withheld from the payments or benefits and make any other required payroll deductions. Executive agrees that the Company does not have a duty to design its compensation policies in a manner that minimizes Executive's tax liabilities arising from Executive's compensation. The Company will not have any responsibility, obligation or liability to pay Executive's taxes arising from or relating to any payments or benefits under this Agreement.

16. Choice of Law. The validity, interpretation, construction, and performance of this Agreement will be governed by the laws of the State of California (with the exception of its conflict of laws provisions). Any claims or legal actions by one party against the other arising out of the relationship between the parties contemplated herein (whether or not arising under this Agreement) will be commenced or maintained in any state or federal court located in San Mateo County, California, and Executive and the Company hereby submit to the jurisdiction and venue of any such court.

17. Acknowledgment. Executive acknowledges that he has had the opportunity to discuss this matter with and obtain advice from his private attorney, has had sufficient time to, and has carefully read and fully understands all the provisions of this Agreement, and is knowingly and voluntarily entering into this Agreement.

18. Headings. All captions and section headings used in this Agreement are for convenient reference only and do not form a part of this Agreement.

19. Counterparts. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

[Signature Page to Follow]

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the date and year first written above.

COMPANY:
PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

By: /s/ William Ericson
Name: William Ericson
Title: Compensation Committee Chair
of the Board of Directors

EXECUTIVE:

/s/ Christian O. Henry
Christian O. Henry

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

CHANGE IN CONTROL AND SEVERANCE AGREEMENT

This Change in Control and Severance Agreement (the "***Agreement***") is made and entered into by and between Christian O. Henry ("***Executive***") and Pacific Biosciences of California, Inc., a Delaware corporation (the "***Company***"), effective as of September 14, 2020 (the "***Effective Date***").

RECITALS

1. It is expected that the Company from time to time will consider the possibility of an acquisition by another company or other change in control. The Board of Directors of the Company (the "***Board***") recognizes that such considerations can be a distraction to Executive and can cause Executive to consider alternative employment opportunities. The Board has determined that it is in the best interests of the Company and its stockholders to assure that the Company will have the continued dedication and objectivity of Executive, notwithstanding the possibility, threat or occurrence of such a termination of employment or the occurrence of a Change in Control (as defined herein) of the Company.

2. The Board believes that it is in the best interests of the Company and its stockholders to provide Executive with an incentive to continue Executive's employment and to motivate Executive to maximize the value of the Company for the benefit of its stockholders.

3. The Board believes that it is imperative to provide Executive with certain severance benefits upon Executive's termination of employment in connection with a Change in Control. These benefits will provide Executive with enhanced financial security, incentive and encouragement to remain with the Company.

4. Certain capitalized terms used in the Agreement are defined in Section 6 below.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties hereto agree as follows:

5. Term of Agreement. This Agreement will have an initial term of three (3) years commencing on the Effective Date (the "***Initial Term***"). On the third anniversary of the Effective Date, this Agreement will renew automatically for additional one (1) year terms (each an "***Additional Term***"), unless either party provides the other party with written notice of non-renewal at least sixty (60) days prior to the date of automatic renewal. Notwithstanding the foregoing provisions of this paragraph, if a Change in Control occurs when there are fewer than twelve (12) months remaining during the Initial Term or an Additional Term, the term of this Agreement will extend automatically through the date that is twelve (12) months following the effective date of the Change in Control. If Executive becomes entitled to benefits under Section

3(a) or Section 3(b) during the term of this Agreement, the Agreement will not terminate until all of the obligations of the parties hereto with respect to this Agreement have been satisfied.

6. At-Will Employment. The Company and Executive acknowledge that Executive's employment is and will continue to be at-will, as defined under applicable law. No payments, benefits, or provisions under this Agreement will confer upon Executive any right to continue Executive's employment with the Company, nor will they interfere with or limit in any way the right of the Company or Executive to terminate such relationship at any time, with or without cause, to the extent permitted by applicable laws.

7. Severance Benefits.

(a) Termination without Cause or Other than Death or Disability or Resignation for Good Reason Either Other than During the Change in Control Period. If a Qualifying Termination occurs other than during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

Base Salary Severance. Executive will receive a lump sum cash payment equal to eighteen (18) months of Executive's Salary (unless such termination occurs as a result of clause (ii) of the definition of Good Reason, in which case the amount will be equal to eighteen (18) months of Executive's Salary as in effect immediately prior to such Salary reduction).

Continued Employee Benefits. If Executive elects continuation coverage pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended ("***COBRA***") for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, Executive will receive Company-paid group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, at the coverage levels in effect immediately prior to the termination of Executive's employment (the "***COBRA Severance***") until the earliest of: (A) a period of eighteen (18) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

Vesting Acceleration of Equity Awards. Each of Executive's then-outstanding equity awards (the "***Equity Awards***") that are, as of the date of termination of employment with the Company, to vest solely based on continued service to the Company, will immediately vest as to the number of shares of Common Stock subject to each such Equity Award that otherwise would have vested had Executive remained an employee of the Company through the six (6) month anniversary of the Qualifying Termination.

(b) Termination without Cause or Other than Death or Disability or Resignation for Good Reason On or Within Twelve Months Following a Change in Control. If a Qualifying Termination occurs during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

(i) Base Salary Severance. Executive will receive a lump sum cash payment equal to eighteen (18) months months of Executive's Salary (unless such termination occurs as a result of clause (ii) of the definition of Good Reason, in which case the amount will

be equal to eighteen (18) months of Executive's Salary as in effect immediately prior to such Salary reduction).

(ii) Continued Employee Benefits. If Executive elects continuation coverage pursuant to COBRA for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, the Company will provide the COBRA Severance until the earliest of: (A) a period of eighteen (18) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

(iii) Equity. One hundred percent (100%) of the unvested portion of the Executive's then-outstanding Equity Awards will immediately vest and, to the extent applicable, become exercisable, as of the date of such termination. To the extent that an Equity Award is subject to performance-based vesting at the time of such termination, such performance goals will be deemed achieved at one hundred percent (100%) of target levels and all other terms and conditions met, unless specifically provided otherwise under the applicable Equity Award agreement. The Equity Awards will remain exercisable, to the extent applicable, following Executive's termination for the period prescribed in the applicable equity plan and agreement for each Equity Award.

(c) Other Termination. If Executive's employment with the Company terminates other than as set forth in Section 3(a) or 3(b) above, then (i) all vesting will terminate immediately with respect to Executive's outstanding Equity Awards, (ii) all payments of compensation by the Company to Executive hereunder will terminate immediately (except as to amounts already earned), and (iii) Executive will only be eligible for severance benefits in accordance with the Company's established policies, if any, as then in effect.

(d) Accrued Amounts. On any termination of Executive's employment with the Company, Executive will be entitled to receive all accrued but unpaid vacation, expense reimbursements, wages, and other benefits due to Executive under any Company-provided plans, policies, and arrangements.

(e) Non-duplication of Payment or Benefits. Notwithstanding any provision of this Agreement to the contrary, if Executive is entitled to any cash severance, continued health coverage severance benefits, vesting acceleration of any Equity Awards, or other severance or separation benefits similar to those provided under this Agreement, by operation of applicable law or under a plan, policy, contract, or arrangement sponsored by or to which the Company is a party other than this Agreement ("***Other Benefits***"), then the corresponding severance payments and benefits under this Agreement will be reduced by the amount of Other Benefits paid or provided to Executive.

8. Conditions to Receipt of Severance.

(a) Release of Claims Agreement. The receipt of any severance payments or benefits pursuant to this Agreement is subject to Executive signing and not revoking a separation

agreement and release of claims in a form acceptable to the Company (the "***Release***"), which must become effective and irrevocable no later than the sixtieth (60th) day following Executive's termination of employment (the "***Release Deadline Date***"). If the Release does not become effective and irrevocable by the Release Deadline Date, Executive will forfeit any right to severance payments or benefits under this Agreement. No severance payments and benefits under Section 3(a) or 3(b) of this Agreement will be paid or provided until the Release becomes effective and irrevocable, and any such severance payments and benefits otherwise payable between the date of Executive's termination of employment and the date the Release becomes effective and irrevocable (including, if applicable, the lump sum cash payment under Section 4(c) below) will be paid, subject to the requirements of Section 4(d) below, on the Company's first regularly scheduled payroll date on or following the date the Release becomes effective and irrevocable. Any restricted stock units, performance units, performance shares, and/or similar full value awards that accelerate vesting under this Agreement ("***Full Value Awards***") will be settled (subject to Section 4(d) below and the terms of any award agreement or other Company plan, policy, or arrangement governing the settlement timing of such award to the extent such terms specifically require different payment timing in order to comply with the requirements of Section 409A, as applicable (the "***Full Value Settlement Provisions***"), on a date within ten (10) days following the date the Release becomes effective and irrevocable.

(b) Confidential Information and Invention Assignment Agreements. Executive's receipt of any payments or benefits under Sections 3(a) and 3(b) will be subject to Executive continuing to comply with the terms of any confidential information and invention assignment agreement executed by Executive in favor of the Company and the provisions of this Agreement.

(c) COBRA Severance Limitations. Notwithstanding the provisions of Sections 3(a)(ii) and 3(b)(ii), if the Company determines in its sole discretion that it cannot provide the COBRA Severance without potentially violating applicable laws (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), then in lieu of such COBRA Severance, and subject to any delay required by this Section 4, the Company will provide to Executive a taxable lump sum cash payment in an amount equal to the product of (x) the number of months of Salary severance specified in Section 3(a)(i) or 3(b)(i), as applicable, multiplied by (y) the monthly COBRA premium that Executive otherwise would be required to pay to continue the group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, as in effect on the date of termination of Executive's employment (which amount will be based on the premium for the first month of COBRA coverage for Executive and Executive's eligible dependents), which payment will be made regardless of whether Executive elects COBRA continuation coverage (the "***Taxable Payment***"). For the avoidance of doubt, the Taxable Payment may be used for any purpose, including, but not limited to continuation coverage under COBRA, and will be subject to all applicable tax withholdings. Notwithstanding anything to the contrary under this Agreement, if the Company determines in its sole discretion at any time that it cannot provide the COBRA Severance or the Taxable Payment without violating applicable law (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), Executive will not receive any COBRA Severance or Taxable Amount under this Agreement.

(d) Section 409A.

(i) Notwithstanding anything to the contrary in this Agreement, no severance payments or benefits payable to Executive, if any, pursuant to this Agreement that, when considered together with any other severance payments or separation benefits, is considered deferred compensation under Internal Revenue Code Section 409A (together, the "***Deferred Payments***") will be payable until Executive has a "separation from service" within the meaning of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***"), and the Treasury Regulations and guidance thereunder, and any applicable state law equivalent, as each may be promulgated, amended or modified from time to time ("***Section 409A***"). Similarly, no severance payable to Executive, if any, pursuant to this Agreement that otherwise would be exempt from Section 409A pursuant to Treasury Regulations Section 1.409A-1(b)(9) will be payable until Executive has a "separation from service" within the meaning of Section 409A. To the extent required to be exempt from or comply with Section 409A, references to the termination of Executive's employment or similar phrases used in this Agreement will mean Executive's "separation from service" within the meaning of Section 409A.

(ii) Any severance payments or benefits under this Agreement that would be considered Deferred Payments will be paid on, or, in the case of installments, will not commence until, the sixtieth (60th) day following Executive's separation from service, or, if later, such time as required by Section 4(d)(iii) (or with respect to Full Value Awards, such time or times as required by any applicable Full Value Settlement Provisions). Except as required by Section 4(d)(iii) and any applicable Full Value Settlement Provisions, any Deferred Payments payable in installments that would have been made to Executive during the sixty (60) day period immediately following Executive's separation from service but for the preceding sentence will be paid to Executive on the sixtieth (60th) day following Executive's separation from service and the remaining payments shall be made as provided in this Agreement.

(iii) Further, if Executive is a "specified employee" within the meaning of Section 409A at the time of Executive's separation from service (other than due to death), any Deferred Payments that otherwise are payable within the first six (6) months following Executive's separation from service will become payable on the first payroll date that occurs on or after the date six (6) months and one (1) day following the date of Executive's separation from service. All subsequent Deferred Payments, if any, will be payable in accordance with the payment schedule applicable to each payment or benefit. Notwithstanding anything herein to the contrary, in the event of Executive's death following Executive's separation from service but prior to the six (6) month anniversary of Executive's separation from service (or any later delay date), then any payments delayed in accordance with this paragraph will be payable in a lump sum as soon as administratively practicable after the date of Executive's death and all other Deferred Payments will be payable in accordance with the payment schedule applicable to each payment or benefit. Each payment and benefit payable under the Agreement is intended to constitute a separate payment for purposes of Section 1.409A-2(b)(2) of the Treasury Regulations.

(iv) Any amount paid under this Agreement that satisfies the requirements of the "short-term deferral" rule set forth in Section 1.409A-1(b)(4) of the Treasury Regulations will not constitute Deferred Payments for purposes of clause (i) above. Any amount

paid under this Agreement that qualifies as a payment made as a result of an involuntary separation from service pursuant to Section 1.409A-1(b)(9)(iii) of the Treasury Regulations that is within the limit set forth thereunder will not constitute Deferred Payments for purposes of clause (i) above.

(v) The foregoing provisions are intended to comply with, or be exempt from, the requirements of Section 409A so that none of the severance payments and benefits to be provided under the Agreement will be subject to the additional tax imposed under Section 409A, and any ambiguities and ambiguous terms herein will be interpreted to so comply or be exempt. Executive and the Company agree to work together in good faith to consider amendments to the Agreement and to take such reasonable actions which are necessary, appropriate or desirable to avoid imposition of any additional tax or income recognition prior to actual payment to Executive under Section 409A. In no event will the Company or any of its subsidiaries or other affiliates have any obligation, responsibility or liability to reimburse, indemnify or hold harmless Executive for any taxes imposed, or other costs incurred, as result of Section 409A.

9. Limitation on Payments. In the event that the severance and other benefits provided for in this Agreement or otherwise that Executive would receive from the Company or any other party whether in connection with the provisions of this Agreement or otherwise (the "***Payments***") would (i) constitute "parachute payments" within the meaning of Section 280G of the Code and (ii) but for this Section 5, would be subject to the excise tax imposed by Section 4999 of the Code, then the Payments will be either:

(a) delivered in full, or

(b) delivered as to such lesser extent which would result in no portion of such Payments being subject to excise tax under Section 4999 of the Code,

whichever of the foregoing amounts, taking into account the applicable federal, state and local income taxes and the excise tax imposed by Section 4999, results in the receipt by Executive on an after-tax basis, of the greatest amount of Payments, notwithstanding that all or some portion of such Payments may be taxable under Section 4999 of the Code. If a reduction in severance and other benefits constituting "parachute payments" is necessary so that benefits are delivered to a lesser extent, reduction will occur in the following order: (i) reduction of cash payments in reverse chronological order (that is, the cash payment owed on the latest date following the occurrence of the event triggering the excise tax under Code Section 4999 will be the first cash payment to be reduced); (ii) cancellation of equity awards granted "contingent on a change in ownership or control" (within the meaning of Code Section 280G) in the reverse order of date of grant of the equity awards (that is, the most recently granted equity awards will be cancelled first), (iii) reduction of accelerated vesting of equity awards in the reverse order of date of grant of the equity awards (that is, the vesting of the most recently granted equity awards will be cancelled first); (iv) reduction of employee benefits in reverse chronological order (that is, the benefit owed on the latest date following the occurrence of the event triggering such excise tax will be the first benefit to be reduced). In no event will Executive have any discretion with respect to the ordering of Payment reductions. Executive will be solely responsible for the payment of all personal tax liability that is incurred as a result of the payments and benefits

received under this Agreement, and neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to reimburse, indemnify or hold harmless Executive for any of those payments of personal tax liability.

Unless the Company and Executive otherwise agree in writing, any determination required under this Section 5 will be made in writing by a nationally recognized accounting or valuation firm (the "***Firm***") selected by the Company, whose determination will be conclusive and binding upon Executive and the Company for all purposes. For purposes of making the calculations required by this Section 5, the Firm may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and Executive will furnish to the Firm such information and documents as the Firm may reasonably request in order to make a determination under this Section. The Company will bear all costs and make all payments required to be made to the Firm for the Firm's services that are rendered in connection with any calculations contemplated by this Section 5. The Company will have no liability to Executive for the determinations of the Firm.

10. Definition of Terms. For purposes of this Agreement, the following terms referred to in this Agreement will have the following meanings:

(a) Cause. "***Cause***" means (i) conviction of any felony; (ii) conviction of any crime involving moral turpitude or dishonesty that causes, or is likely to cause, material harm to the Company; (iii) participation in a fraud or willful act of dishonesty against the Company that causes, or is likely to cause, material harm to the Company; (iv) intentional and material damage to the Company's property; or (v) material breach of the Company's Proprietary Information and Inventions Agreement.

(b) Change in Control. "***Change in Control***" means the first occurrence of any of the following on or after the Effective Date:

(i) A change in the ownership of the Company which occurs on the date that any one person, or more than one person acting as a group ("***Person***"), acquires ownership of the stock of the Company that, together with the stock held by such Person, constitutes more than 50% of the total voting power of the stock of the Company; provided, however, that for purposes of this subsection (i), the acquisition of additional stock by any one Person, who is considered to own more than 50% of the total voting power of the stock of the Company will not be considered a Change in Control. Further, if the stockholders of the Company immediately before such change in ownership continue to retain immediately after the change in ownership, in substantially the same proportions as their ownership of shares of the Company's voting stock immediately prior to the change in ownership, direct or indirect beneficial ownership of fifty percent (50%) or more of the total voting power of the stock of the Company or of the ultimate parent entity of the Company, such event will not be considered a Change in Control under this subsection (i). For this purpose, indirect beneficial ownership will include, without limitation, an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own the Company, as the case may be, either directly or through one or more subsidiary corporations or other business entities; or

(ii) A change in the effective control of the Company which occurs on the date that a majority of members of the Board (each, a "***Director***") is replaced during any twelve (12) month period by Directors whose appointment or election is not endorsed by a majority of the members of the Board prior to the date of the appointment or election. For purposes of this subsection (ii), if any Person is considered to be in effective control of the Company, the acquisition of additional control of the Company by the same Person will not be considered a Change in Control; or

(iii) A change in the ownership of a substantial portion of the Company's assets which occurs on the date that any Person acquires (or has acquired during the twelve (12) month period ending on the date of the most recent acquisition by such Person) assets from the Company that have a total gross fair market value equal to or more than 50% of the total gross fair market value of all of the assets of the Company immediately prior to such acquisition or acquisitions; provided, however, that for purposes of this subsection (iii), the following will not constitute a change in the ownership of a substantial portion of the Company's assets: (A) a transfer to an entity that is controlled by the Company's stockholders immediately after the transfer, or (B) a transfer of assets by the Company to: (1) a stockholder of the Company (immediately before the asset transfer) in exchange for or with respect to the Company's stock, (2) an entity, 50% or more of the total value or voting power of which is owned, directly or indirectly, by the Company, (3) a Person, that owns, directly or indirectly, 50% or more of the total value or voting power of all the outstanding stock of the Company, or (4) an entity, at least 50% of the total value or voting power of which is owned, directly or indirectly, by a Person described in this subsection (iii)(B)(3). For purposes of this subsection (iii), gross fair market value means the value of the assets of the Company, or the value of the assets being disposed of, determined without regard to any liabilities associated with such assets.

For purposes of this definition of Change in Control, persons will be considered to be acting as a group if they are owners of a corporation that enters into a merger, consolidation, purchase or acquisition of stock, or similar business transaction with the Company.

Notwithstanding the foregoing, a transaction will not be deemed a Change in Control unless the transaction qualifies as a change in control event within the meaning of Section 409A.

Further and for the avoidance of doubt, a transaction will not constitute a Change in Control if: (i) its sole purpose is to change the jurisdiction of the Company's incorporation, or (ii) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held the Company's securities immediately before such transaction.

(c) Change in Control Period. "***Change in Control Period***" means the period beginning upon the occurrence of a Change in Control through the date twelve (12) months following a Change in Control.

(d) Disability. "***Disability***" means Executive is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment that can be expected to result in death or can be expected to last for a continuous period of not less than twelve (12) months.

(e) Good Reason. "***Good Reason***" means Executive's termination of his or her employment with the Company within thirty (30) days following the expiration of any cure period (discussed below) following the occurrence of one or more of the following, without Executive's express written consent: (i) a material reduction of Executive's duties, authority, or responsibilities, relative to Employee's duties, authority, or responsibilities as in effect immediately prior to such reduction; (ii) a material reduction by the Company in Executive's annualized base pay as in effect immediately prior to such reduction (in other words, a reduction of more than ten percent (10%) of Executive's annualized base compensation in any one year; (iii) the relocation of Executive's principal place of performing his or her duties as an employee of the Company by more than fifty (50) miles; or (iv) the failure of the Company to obtain the assumption of this Agreement by a successor. In order for an event to qualify as Good Reason, Executive must not terminate employment with the Company without first providing the Company with written notice of the acts or omissions constituting the grounds for "Good Reason" within ninety (90) days of the initial existence of the grounds for "Good Reason" and a reasonable cure period of not less than thirty (30) days following the date of such notice. To the extent Executive's primary work location is not the Company's corporate offices due to a shelter-in-place order, quarantine order, or similar work-from-home requirement that applies to Executive, Executive's primary office location, from which a change in location under the foregoing clause (iii) will be measured, will be considered the Company's office location where Executive's employment with the Company primarily was based immediately prior to the commencement of such shelter-in-place order, quarantine order, or similar work-from-home requirement.

(f) Qualifying Termination. "***Qualifying Termination***" means either (i) the Company terminates Executive's employment with the Company for a reason other than (A) Cause, (B) Executive's death, or (C) Executive's Disability or (ii) Executive resigns for Good Reason.

(g) Salary. "***Salary***" means Executive's base salary as in effect immediately prior to the termination of Executive's employment (unless such termination occurs as a result of clause (ii) of the definition of "Good Reason" under Section 6(e), in which case the amount will be equal to Executive's base salary as in effect immediately prior to such reduction) or, if greater in the case of a Qualifying Termination during the Change in Control Period, as in effect immediately prior to the Change in Control.

11. Successors.

(a) The Company's Successors. Any successor to the Company (whether direct or indirect and whether by purchase, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets will assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. For all purposes under this Agreement, the term "Company" will include any successor to the Company's business and/or assets which executes and delivers the assumption agreement described in this Section 7(a) or which becomes bound by the terms of this Agreement by operation of law.

(b) Executive's Successors. The terms of this Agreement and all rights of Executive hereunder will inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees. Notwithstanding the foregoing, none of the rights of Executive to receive any form of compensation payable pursuant to this Agreement may be assigned or transferred except by will or the laws of descent and distribution. Any other attempted assignment, transfer, conveyance, or other disposition of Executive's right to compensation or other benefits will be null and void.

12. Notice.

(a) General. Notices and all other communications contemplated by this Agreement will be in writing and will be deemed to have been duly given (a) upon actual delivery to the party to be notified, (b) twenty-four (24) hours after confirmed facsimile transmission, (c) one (1) business day after deposit with a recognized overnight courier, or (d) three (3) business days after deposit with the U.S. Postal Service by first class certified or registered mail, return receipt requested, postage prepaid, addressed: (i) if to Executive, at the address Executive will have most recently furnished to the Company in writing, or (ii) if to the Company, to its corporate headquarters and all notices will be directed to the General Counsel of the Company.

(b) Notice of Termination. Any termination of Executive's employment by the Company for Cause or by Executive for Good Reason or as a result of a voluntary resignation will be communicated by a notice of termination to the other party hereto given in accordance with Section 8(a) of this Agreement. Such notice will indicate the specific termination provision in this Agreement relied upon, will set forth in reasonable detail the facts and circumstances claimed to provide a basis for termination under the provision so indicated, and will specify the termination date (which will be not more than thirty (30) days after the giving of such notice or in the case of Executive's resignation for Good Reason, in accordance with the requirements under Section 6(e)). The failure by Executive to include in the notice any fact or circumstance which contributes to a showing of Good Reason will not waive any right of Executive hereunder or preclude Executive from asserting such fact or circumstance in enforcing Executive's rights hereunder.

(c) Resignation. The termination of Executive's employment for any reason also will constitute, without any further required action by Executive, Executive's voluntary resignation from all officer and/or director positions held at the Company or any of its subsidiaries or affiliates, and at the Board's request, Executive will execute any documents reasonably necessary to reflect the resignations.

13. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive will not be required to mitigate the amount of any payment contemplated by this Agreement, nor will any such payment be reduced by any earnings that Executive may receive from any other source except as specified in Sections 3(e), 4(d) and 5.

(b) Waiver. No provision of this Agreement will be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party will be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Headings. All captions and section headings used in this Agreement are for convenient reference only and do not form a part of this Agreement.

(d) Entire Agreement. This Agreement constitutes the entire agreement of the parties hereto and supersedes in their entirety all prior representations, understandings, undertakings or agreements (whether oral or written and whether expressed or implied) of the parties. No waiver, alteration, or modification of any of the provisions of this Agreement will be binding unless in writing and signed by duly authorized representatives of the parties hereto and which specifically mention this Agreement.

(e) Choice of Law. The validity, interpretation, construction, and performance of this Agreement will be governed by the laws of the State of California (with the exception of its conflict of laws provisions). Any claims or legal actions by one party against the other arising out of the relationship between the parties contemplated herein (whether or not arising under this Agreement) will be commenced or maintained in any state or federal court located in San Mateo County, California, and Executive and the Company hereby submit to the jurisdiction and venue of any such court.

(f) Severability. The invalidity, illegality, or unenforceability of any provision or provisions of this Agreement will not affect the validity, legality or enforceability of any other provision hereof, which will remain in full force and effect, and this Agreement will be construed and enforced as if the invalid, illegal, or unenforceable provision had not been included.

(g) Withholding. The Company (and any parent, subsidiary or other affiliate of the Company, as applicable) will have the right and authority to deduct from any payments or benefits all applicable federal, state, local, and/or non-U.S. taxes or other required withholdings and payroll deductions ("***Withholdings***"). Prior to the payment of any amounts or provision of any benefits under this Agreement, the Company (and any parent, subsidiary or other affiliate of the Company, as applicable) is permitted to deduct or withhold, or require Executive to remit to the Company, an amount sufficient to satisfy any applicable Withholdings with respect to such payments and benefits. Neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to pay Executive's taxes arising from or relating to any payments or benefits under this Agreement.

(h) Counterparts. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

o O o

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the day and year set forth below.

COMPANY PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

By: /s/ Bill Ericson

Name: William Ericson
Title: Compensation Committee Chair
of the Board of Directors

EXECUTIVE CHRISTIAN O. HENRY

/s/ Christian O. Henry

Title: President and Chief Executive Officer

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

CHANGE IN CONTROL AND SEVERANCE AGREEMENT

This Change in Control and Severance Agreement (the "***Agreement***") is made and entered into by and between Christian O. Henry ("***Executive***") and Pacific Biosciences of California, Inc., a Delaware corporation (the "***Company***"), effective as of February 3, 2021 (the "***Effective Date***").

RECITALS

1. It is expected that the Company from time to time will consider the possibility of an acquisition by another company or other change in control. The Board of Directors of the Company (the "***Board***") recognizes that such considerations can be a distraction to Executive and can cause Executive to consider alternative employment opportunities. The Board has determined that it is in the best interests of the Company and its stockholders to assure that the Company will have the continued dedication and objectivity of Executive, notwithstanding the possibility, threat or occurrence of such a termination of employment or the occurrence of a Change in Control (as defined herein) of the Company.

2. The Board believes that it is in the best interests of the Company and its stockholders to provide Executive with an incentive to continue Executive's employment and to motivate Executive to maximize the value of the Company for the benefit of its stockholders.

3. The Board believes that it is imperative to provide Executive with certain severance benefits upon Executive's termination of employment in connection with a Change in Control. These benefits will provide Executive with enhanced financial security, incentive and encouragement to remain with the Company.

4. Certain capitalized terms used in the Agreement are defined in Section 6 below.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties hereto agree as follows:

5. Term of Agreement. This Agreement will have an initial term of three (3) years commencing on the Effective Date (the "***Initial Term***"). On the third anniversary of the Effective Date, this Agreement will renew automatically for additional one (1) year terms (each an "***Additional Term***"), unless either party provides the other party with written notice of non-renewal at least sixty (60) days prior to the date of automatic renewal. Notwithstanding the foregoing provisions of this paragraph, if a Change in Control occurs when there are fewer than twelve (12) months remaining during the Initial Term or an Additional Term, the term of this Agreement will extend automatically through the date that is twelve (12) months following the effective date of the Change in Control. If Executive becomes entitled to benefits under Section

3(a) or Section 3(b) during the term of this Agreement, the Agreement will not terminate until all of the obligations of the parties hereto with respect to this Agreement have been satisfied.

6. At-Will Employment. The Company and Executive acknowledge that Executive's employment is and will continue to be at-will, as defined under applicable law. No payments, benefits, or provisions under this Agreement will confer upon Executive any right to continue Executive's employment with the Company, nor will they interfere with or limit in any way the right of the Company or Executive to terminate such relationship at any time, with or without cause, to the extent permitted by applicable laws.

7. Severance Benefits.

(a) Termination without Cause or Other than Death or Disability or Resignation for Good Reason Either Other than During the Change in Control Period. If a Qualifying Termination occurs other than during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

Base Salary Severance. Executive will receive a lump sum cash payment equal to eighteen (18) months of Executive's Salary (unless such termination occurs as a result of clause (ii) of the definition of Good Reason, in which case the amount will be equal to eighteen (18) months of Executive's Salary as in effect immediately prior to such Salary reduction).

Continued Employee Benefits. If Executive elects continuation coverage pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended ("***COBRA***") for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, Executive will receive Company-paid group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, at the coverage levels in effect immediately prior to the termination of Executive's employment (the "***COBRA Severance***") until the earliest of: (A) a period of eighteen (18) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

Vesting Acceleration of Equity Awards. Each of Executive's then-outstanding equity awards (the "***Equity Awards***") that are, as of the date of termination of employment with the Company, to vest solely based on continued service to the Company, will immediately vest as to the number of shares of Common Stock subject to each such Equity Award that otherwise would have vested had Executive remained an employee of the Company through the six (6) month anniversary of the Qualifying Termination.

(b) Termination without Cause or Other than Death or Disability or Resignation for Good Reason On or Within Twelve Months Following a Change in Control. If a Qualifying Termination occurs during the Change in Control Period, then subject to Section 4, Executive will receive the following severance from the Company:

(i) Base Salary Severance. Executive will receive a lump sum cash payment equal to eighteen (18) months months of Executive's Salary (unless such termination occurs as a result of clause (ii) of the definition of Good Reason, in which case the amount will

be equal to eighteen (18) months of Executive's Salary as in effect immediately prior to such Salary reduction).

(ii) Prorated Target Bonus Severance. Executive will receive a lump sum cash payment equal to Executive's annualized target bonus in effect for the year in which the Qualifying Termination occurs, provided that such amount will be prorated based on a fraction, the numerator of which is the number of days during which Executive was employed with the Company (or its successor) in the year that the Qualifying Termination occurs, and the denominator of which is the total number of days in such year (the "***Prorated Bonus Severance***")

(iii) Continued Employee Benefits. If Executive elects continuation coverage pursuant to COBRA for Executive and Executive's eligible dependents (as applicable), within the time period prescribed pursuant to COBRA, the Company will provide the COBRA Severance until the earliest of: (A) a period of eighteen (18) months from the last date of employment of the Executive with the Company, (B) the date upon which Executive and/or Executive's eligible dependents becomes covered under similar plans, or (C) the expiration of Executive's and Executive's eligible dependents' (as applicable) eligibility for continuation coverage under COBRA.

(iv) Equity. One hundred percent (100%) of the unvested portion of the Executive's then-outstanding Equity Awards will immediately vest and, to the extent applicable, become exercisable, as of the date of such termination. To the extent that an Equity Award is subject to performance-based vesting at the time of such termination, such performance goals will be deemed achieved at one hundred percent (100%) of target levels and all other terms and conditions met, unless specifically provided otherwise under the applicable Equity Award agreement. The Equity Awards will remain exercisable, to the extent applicable, following Executive's termination for the period prescribed in the applicable equity plan and agreement for each Equity Award.

(c) Other Termination. If Executive's employment with the Company terminates other than as set forth in Section 3(a) or 3(b) above, then (i) all vesting will terminate immediately with respect to Executive's outstanding Equity Awards, (ii) all payments of compensation by the Company to Executive hereunder will terminate immediately (except as to amounts already earned), and (iii) Executive will only be eligible for severance benefits in accordance with the Company's established policies, if any, as then in effect.

(d) Accrued Amounts. On any termination of Executive's employment with the Company, Executive will be entitled to receive all accrued but unpaid vacation, expense reimbursements, wages, and other benefits due to Executive under any Company-provided plans, policies, and arrangements.

(e) Non-duplication of Payment or Benefits. Notwithstanding any provision of this Agreement to the contrary, if Executive is entitled to any cash severance, continued health coverage severance benefits, vesting acceleration of any Equity Awards, or other severance or separation benefits similar to those provided under this Agreement, by operation of applicable law or under a plan, policy, contract, or arrangement sponsored by or to which the Company is a

party other than this Agreement ("***Other Benefits***"), then the corresponding severance payments and benefits under this Agreement will be reduced by the amount of Other Benefits paid or provided to Executive.

8. Conditions to Receipt of Severance.

(a) Release of Claims Agreement. The receipt of any severance payments or benefits pursuant to this Agreement is subject to Executive signing and not revoking a separation agreement and release of claims in a form acceptable to the Company (the "***Release***"), which must become effective and irrevocable no later than the sixtieth (60^{th}) day following Executive's termination of employment (the "***Release Deadline Date***"). If the Release does not become effective and irrevocable by the Release Deadline Date, Executive will forfeit any right to severance payments or benefits under this Agreement. No severance payments and benefits under Section 3(a) or 3(b) of this Agreement will be paid or provided until the Release becomes effective and irrevocable, and any such severance payments and benefits otherwise payable between the date of Executive's termination of employment and the date the Release becomes effective and irrevocable (including, if applicable, the lump sum cash payment under Section 4(c) below) will be paid, subject to the requirements of Section 4(d) below, on the Company's first regularly scheduled payroll date on or following the date the Release becomes effective and irrevocable. Any restricted stock units, performance units, performance shares, and/or similar full value awards that accelerate vesting under this Agreement ("***Full Value Awards***") will be settled (subject to Section 4(d) below and the terms of any award agreement or other Company plan, policy, or arrangement governing the settlement timing of such award to the extent such terms specifically require different payment timing in order to comply with the requirements of Section 409A, as applicable (the "***Full Value Settlement Provisions***"), on a date within ten (10) days following the date the Release becomes effective and irrevocable.

(b) Confidential Information and Invention Assignment Agreements. Executive's receipt of any payments or benefits under Sections 3(a) and 3(b) will be subject to Executive continuing to comply with the terms of any confidential information and invention assignment agreement executed by Executive in favor of the Company and the provisions of this Agreement.

(c) COBRA Severance Limitations. Notwithstanding the provisions of Sections 3(a)(ii) and 3(b)(ii), if the Company determines in its sole discretion that it cannot provide the COBRA Severance without potentially violating applicable laws (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), then in lieu of such COBRA Severance, and subject to any delay required by this Section 4, the Company will provide to Executive a taxable lump sum cash payment in an amount equal to the product of (x) the number of months of Salary severance specified in Section 3(a)(i) or 3(b)(i), as applicable, multiplied by (y) the monthly COBRA premium that Executive otherwise would be required to pay to continue the group health, dental and vision coverage for Executive and Executive's eligible dependents, as applicable, as in effect on the date of termination of Executive's employment (which amount will be based on the premium for the first month of COBRA coverage for Executive and Executive's eligible dependents), which payment will be made regardless of whether Executive elects COBRA continuation coverage (the "***Taxable Payment***"). For the avoidance of doubt, the Taxable Payment may be used for any purpose, including, but not limited to continuation coverage under

COBRA, and will be subject to all applicable tax withholdings. Notwithstanding anything to the contrary under this Agreement, if the Company determines in its sole discretion at any time that it cannot provide the COBRA Severance or the Taxable Payment without violating applicable law (including, without limitation, Section 2716 of the Public Health Service Act and the Employee Retirement Income Security Act of 1974, as amended), Executive will not receive any COBRA Severance or Taxable Amount under this Agreement.

(d) Section 409A.

(i) Notwithstanding anything to the contrary in this Agreement, no severance payments or benefits payable to Executive, if any, pursuant to this Agreement that, when considered together with any other severance payments or separation benefits, is considered deferred compensation under Internal Revenue Code Section 409A (together, the "***Deferred Payments***") will be payable until Executive has a "separation from service" within the meaning of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***"), and the Treasury Regulations and guidance thereunder, and any applicable state law equivalent, as each may be promulgated, amended or modified from time to time ("***Section 409A***"). Similarly, no severance payable to Executive, if any, pursuant to this Agreement that otherwise would be exempt from Section 409A pursuant to Treasury Regulations Section 1.409A-1(b)(9) will be payable until Executive has a "separation from service" within the meaning of Section 409A. To the extent required to be exempt from or comply with Section 409A, references to the termination of Executive's employment or similar phrases used in this Agreement will mean Executive's "separation from service" within the meaning of Section 409A.

(ii) Any severance payments or benefits under this Agreement that would be considered Deferred Payments will be paid on, or, in the case of installments, will not commence until, the sixtieth (60th) day following Executive's separation from service, or, if later, such time as required by Section 4(d)(iii) (or with respect to Full Value Awards, such time or times as required by any applicable Full Value Settlement Provisions). Except as required by Section 4(d)(iii) and any applicable Full Value Settlement Provisions, any Deferred Payments payable in installments that would have been made to Executive during the sixty (60) day period immediately following Executive's separation from service but for the preceding sentence will be paid to Executive on the sixtieth (60th) day following Executive's separation from service and the remaining payments shall be made as provided in this Agreement.

(iii) Further, if Executive is a "specified employee" within the meaning of Section 409A at the time of Executive's separation from service (other than due to death), any Deferred Payments that otherwise are payable within the first six (6) months following Executive's separation from service will become payable on the first payroll date that occurs on or after the date six (6) months and one (1) day following the date of Executive's separation from service. All subsequent Deferred Payments, if any, will be payable in accordance with the payment schedule applicable to each payment or benefit. Notwithstanding anything herein to the contrary, in the event of Executive's death following Executive's separation from service but prior to the six (6) month anniversary of Executive's separation from service (or any later delay date), then any payments delayed in accordance with this paragraph will be payable in a lump sum as soon as administratively practicable after the date of Executive's death and all other Deferred Payments will be payable in accordance with the payment schedule applicable to each

payment or benefit. Each payment and benefit payable under the Agreement is intended to constitute a separate payment for purposes of Section 1.409A-2(b)(2) of the Treasury Regulations.

(iv) Any amount paid under this Agreement that satisfies the requirements of the "short-term deferral" rule set forth in Section 1.409A-1(b)(4) of the Treasury Regulations will not constitute Deferred Payments for purposes of clause (i) above. Any amount paid under this Agreement that qualifies as a payment made as a result of an involuntary separation from service pursuant to Section 1.409A-1(b)(9)(iii) of the Treasury Regulations that is within the limit set forth thereunder will not constitute Deferred Payments for purposes of clause (i) above.

(v) The foregoing provisions are intended to comply with, or be exempt from, the requirements of Section 409A so that none of the severance payments and benefits to be provided under the Agreement will be subject to the additional tax imposed under Section 409A, and any ambiguities and ambiguous terms herein will be interpreted to so comply or be exempt. Executive and the Company agree to work together in good faith to consider amendments to the Agreement and to take such reasonable actions which are necessary, appropriate or desirable to avoid imposition of any additional tax or income recognition prior to actual payment to Executive under Section 409A. In no event will the Company or any of its subsidiaries or other affiliates have any obligation, responsibility or liability to reimburse, indemnify or hold harmless Executive for any taxes imposed, or other costs incurred, as result of Section 409A.

9. Limitation on Payments. In the event that the severance and other benefits provided for in this Agreement or otherwise that Executive would receive from the Company or any other party whether in connection with the provisions of this Agreement or otherwise (the "***Payments***") would (i) constitute "parachute payments" within the meaning of Section 280G of the Code and (ii) but for this Section 5, would be subject to the excise tax imposed by Section 4999 of the Code, then the Payments will be either:

(a) delivered in full, or

(b) delivered as to such lesser extent which would result in no portion of such Payments being subject to excise tax under Section 4999 of the Code,

whichever of the foregoing amounts, taking into account the applicable federal, state and local income taxes and the excise tax imposed by Section 4999, results in the receipt by Executive on an after-tax basis, of the greatest amount of Payments, notwithstanding that all or some portion of such Payments may be taxable under Section 4999 of the Code. If a reduction in severance and other benefits constituting "parachute payments" is necessary so that benefits are delivered to a lesser extent, reduction will occur in the following order: (i) reduction of cash payments in reverse chronological order (that is, the cash payment owed on the latest date following the occurrence of the event triggering the excise tax under Code Section 4999 will be the first cash payment to be reduced); (ii) cancellation of equity awards granted "contingent on a change in ownership or control" (within the meaning of Code Section 280G) in the reverse order of date of grant of the equity awards (that is, the most recently granted equity awards will be cancelled

first), (iii) reduction of accelerated vesting of equity awards in the reverse order of date of grant of the equity awards (that is, the vesting of the most recently granted equity awards will be cancelled first); (iv) reduction of employee benefits in reverse chronological order (that is, the benefit owed on the latest date following the occurrence of the event triggering such excise tax will be the first benefit to be reduced). In no event will Executive have any discretion with respect to the ordering of Payment reductions. Executive will be solely responsible for the payment of all personal tax liability that is incurred as a result of the payments and benefits received under this Agreement, and neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to reimburse, indemnify or hold harmless Executive for any of those payments of personal tax liability.

Unless the Company and Executive otherwise agree in writing, any determination required under this Section 5 will be made in writing by a nationally recognized accounting or valuation firm (the "***Firm***") selected by the Company, whose determination will be conclusive and binding upon Executive and the Company for all purposes. For purposes of making the calculations required by this Section 5, the Firm may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and Executive will furnish to the Firm such information and documents as the Firm may reasonably request in order to make a determination under this Section. The Company will bear all costs and make all payments required to be made to the Firm for the Firm's services that are rendered in connection with any calculations contemplated by this Section 5. The Company will have no liability to Executive for the determinations of the Firm.

10. Definition of Terms. For purposes of this Agreement, the following terms referred to in this Agreement will have the following meanings:

(a) Cause. "***Cause***" means (i) conviction of any felony; (ii) conviction of any crime involving moral turpitude or dishonesty that causes, or is likely to cause, material harm to the Company; (iii) participation in a fraud or willful act of dishonesty against the Company that causes, or is likely to cause, material harm to the Company; (iv) intentional and material damage to the Company's property; or (v) material breach of the Company's Proprietary Information and Inventions Agreement.

(b) Change in Control. "***Change in Control***" means the first occurrence of any of the following on or after the Effective Date:

(i) A change in the ownership of the Company which occurs on the date that any one person, or more than one person acting as a group ("***Person***"), acquires ownership of the stock of the Company that, together with the stock held by such Person, constitutes more than 50% of the total voting power of the stock of the Company; provided, however, that for purposes of this subsection (i), the acquisition of additional stock by any one Person, who is considered to own more than 50% of the total voting power of the stock of the Company will not be considered a Change in Control. Further, if the stockholders of the Company immediately before such change in ownership continue to retain immediately after the change in ownership, in substantially the same proportions as their ownership of shares of the Company's voting stock immediately prior to the change in ownership, direct or indirect

beneficial ownership of fifty percent (50%) or more of the total voting power of the stock of the Company or of the ultimate parent entity of the Company, such event will not be considered a Change in Control under this subsection (i). For this purpose, indirect beneficial ownership will include, without limitation, an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own the Company, as the case may be, either directly or through one or more subsidiary corporations or other business entities; or

(ii) A change in the effective control of the Company which occurs on the date that a majority of members of the Board (each, a "***Director***") is replaced during any twelve (12) month period by Directors whose appointment or election is not endorsed by a majority of the members of the Board prior to the date of the appointment or election. For purposes of this subsection (ii), if any Person is considered to be in effective control of the Company, the acquisition of additional control of the Company by the same Person will not be considered a Change in Control; or

(iii) A change in the ownership of a substantial portion of the Company's assets which occurs on the date that any Person acquires (or has acquired during the twelve (12) month period ending on the date of the most recent acquisition by such Person) assets from the Company that have a total gross fair market value equal to or more than 50% of the total gross fair market value of all of the assets of the Company immediately prior to such acquisition or acquisitions; provided, however, that for purposes of this subsection (iii), the following will not constitute a change in the ownership of a substantial portion of the Company's assets: (A) a transfer to an entity that is controlled by the Company's stockholders immediately after the transfer, or (B) a transfer of assets by the Company to: (1) a stockholder of the Company (immediately before the asset transfer) in exchange for or with respect to the Company's stock, (2) an entity, 50% or more of the total value or voting power of which is owned, directly or indirectly, by the Company, (3) a Person, that owns, directly or indirectly, 50% or more of the total value or voting power of all the outstanding stock of the Company, or (4) an entity, at least 50% of the total value or voting power of which is owned, directly or indirectly, by a Person described in this subsection (iii)(B)(3). For purposes of this subsection (iii), gross fair market value means the value of the assets of the Company, or the value of the assets being disposed of, determined without regard to any liabilities associated with such assets.

For purposes of this definition of Change in Control, persons will be considered to be acting as a group if they are owners of a corporation that enters into a merger, consolidation, purchase or acquisition of stock, or similar business transaction with the Company.

Notwithstanding the foregoing, a transaction will not be deemed a Change in Control unless the transaction qualifies as a change in control event within the meaning of Section 409A.

Further and for the avoidance of doubt, a transaction will not constitute a Change in Control if: (i) its sole purpose is to change the jurisdiction of the Company's incorporation, or (ii) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held the Company's securities immediately before such transaction.

(c) Change in Control Period. "***Change in Control Period***" means the period beginning upon the occurrence of a Change in Control through the date twelve (12) months following a Change in Control.

(d) Disability. "***Disability***" means Executive is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment that can be expected to result in death or can be expected to last for a continuous period of not less than twelve (12) months.

(e) Good Reason. "***Good Reason***" means Executive's termination of his or her employment with the Company within thirty (30) days following the expiration of any cure period (discussed below) following the occurrence of one or more of the following, without Executive's express written consent: (i) a material reduction of Executive's duties, authority, or responsibilities, relative to Employee's duties, authority, or responsibilities as in effect immediately prior to such reduction; (ii) a material reduction by the Company in Executive's annualized base pay as in effect immediately prior to such reduction (in other words, a reduction of more than ten percent (10%) of Executive's annualized base compensation in any one year; (iii) the relocation of Executive's principal place of performing his or her duties as an employee of the Company by more than fifty (50) miles; or (iv) the failure of the Company to obtain the assumption of this Agreement by a successor. In order for an event to qualify as Good Reason, Executive must not terminate employment with the Company without first providing the Company with written notice of the acts or omissions constituting the grounds for "Good Reason" within ninety (90) days of the initial existence of the grounds for "Good Reason" and a reasonable cure period of not less than thirty (30) days following the date of such notice. To the extent Executive's primary work location is not the Company's corporate offices due to a shelter-in-place order, quarantine order, or similar work-from-home requirement that applies to Executive, Executive's primary office location, from which a change in location under the foregoing clause (iii) will be measured, will be considered the Company's office location where Executive's employment with the Company primarily was based immediately prior to the commencement of such shelter-in-place order, quarantine order, or similar work-from-home requirement.

(f) Qualifying Termination. "***Qualifying Termination***" means either (i) the Company terminates Executive's employment with the Company for a reason other than (A) Cause, (B) Executive's death, or (C) Executive's Disability or (ii) Executive resigns for Good Reason.

(g) Salary. "***Salary***" means Executive's base salary as in effect immediately prior to the termination of Executive's employment (unless such termination occurs as a result of clause (ii) of the definition of "Good Reason" under Section 6(e), in which case the amount will be equal to Executive's base salary as in effect immediately prior to such reduction) or, if greater in the case of a Qualifying Termination during the Change in Control Period, as in effect immediately prior to the Change in Control.

11. Successors.

(a) The Company's Successors. Any successor to the Company (whether direct or indirect and whether by purchase, merger, consolidation, liquidation or otherwise) to all or substantially all of the Company's business and/or assets will assume the obligations under this Agreement and agree expressly to perform the obligations under this Agreement in the same manner and to the same extent as the Company would be required to perform such obligations in the absence of a succession. For all purposes under this Agreement, the term "Company" will include any successor to the Company's business and/or assets which executes and delivers the assumption agreement described in this Section 7(a) or which becomes bound by the terms of this Agreement by operation of law.

(b) Executive's Successors. The terms of this Agreement and all rights of Executive hereunder will inure to the benefit of, and be enforceable by, Executive's personal or legal representatives, executors, administrators, successors, heirs, distributees, devisees and legatees. Notwithstanding the foregoing, none of the rights of Executive to receive any form of compensation payable pursuant to this Agreement may be assigned or transferred except by will or the laws of descent and distribution. Any other attempted assignment, transfer, conveyance, or other disposition of Executive's right to compensation or other benefits will be null and void.

12. Notice.

(a) General. Notices and all other communications contemplated by this Agreement will be in writing and will be deemed to have been duly given (a) upon actual delivery to the party to be notified, (b) twenty-four (24) hours after confirmed facsimile transmission, (c) one (1) business day after deposit with a recognized overnight courier, or (d) three (3) business days after deposit with the U.S. Postal Service by first class certified or registered mail, return receipt requested, postage prepaid, addressed: (i) if to Executive, at the address Executive will have most recently furnished to the Company in writing, or (ii) if to the Company, to its corporate headquarters and all notices will be directed to the General Counsel of the Company.

(b) Notice of Termination. Any termination of Executive's employment by the Company for Cause or by Executive for Good Reason or as a result of a voluntary resignation will be communicated by a notice of termination to the other party hereto given in accordance with Section 8(a) of this Agreement. Such notice will indicate the specific termination provision in this Agreement relied upon, will set forth in reasonable detail the facts and circumstances claimed to provide a basis for termination under the provision so indicated, and will specify the termination date (which will be not more than thirty (30) days after the giving of such notice or in the case of Executive's resignation for Good Reason, in accordance with the requirements under Section 6(e)). The failure by Executive to include in the notice any fact or circumstance which contributes to a showing of Good Reason will not waive any right of Executive hereunder or preclude Executive from asserting such fact or circumstance in enforcing Executive's rights hereunder.

(c) Resignation. The termination of Executive's employment for any reason also will constitute, without any further required action by Executive, Executive's voluntary

resignation from all officer and/or director positions held at the Company or any of its subsidiaries or affiliates, and at the Board's request, Executive will execute any documents reasonably necessary to reflect the resignations.

13. Miscellaneous Provisions.

(a) No Duty to Mitigate. Executive will not be required to mitigate the amount of any payment contemplated by this Agreement, nor will any such payment be reduced by any earnings that Executive may receive from any other source except as specified in Sections 3(e), 4(d) and 5.

(b) Waiver. No provision of this Agreement will be modified, waived or discharged unless the modification, waiver or discharge is agreed to in writing and signed by Executive and by an authorized officer of the Company (other than Executive). No waiver by either party of any breach of, or of compliance with, any condition or provision of this Agreement by the other party will be considered a waiver of any other condition or provision or of the same condition or provision at another time.

(c) Headings. All captions and section headings used in this Agreement are for convenient reference only and do not form a part of this Agreement.

(d) Entire Agreement. This Agreement constitutes the entire agreement of the parties hereto and supersedes in their entirety all prior representations, understandings, undertakings or agreements (whether oral or written and whether expressed or implied) of the parties. No waiver, alteration, or modification of any of the provisions of this Agreement will be binding unless in writing and signed by duly authorized representatives of the parties hereto and which specifically mention this Agreement.

(e) Choice of Law. The validity, interpretation, construction, and performance of this Agreement will be governed by the laws of the State of California (with the exception of its conflict of laws provisions). Any claims or legal actions by one party against the other arising out of the relationship between the parties contemplated herein (whether or not arising under this Agreement) will be commenced or maintained in any state or federal court located in San Mateo County, California, and Executive and the Company hereby submit to the jurisdiction and venue of any such court.

(f) Severability. The invalidity, illegality, or unenforceability of any provision or provisions of this Agreement will not affect the validity, legality or enforceability of any other provision hereof, which will remain in full force and effect, and this Agreement will be construed and enforced as if the invalid, illegal, or unenforceable provision had not been included.

(g) Withholding. The Company (and any parent, subsidiary or other affiliate of the Company, as applicable) will have the right and authority to deduct from any payments or benefits all applicable federal, state, local, and/or non-U.S. taxes or other required withholdings and payroll deductions ("***Withholdings***"). Prior to the payment of any amounts or provision of any benefits under this Agreement, the Company (and any parent, subsidiary or other affiliate of the Company, as applicable) is permitted to deduct or withhold, or require Executive to remit to

the Company, an amount sufficient to satisfy any applicable Withholdings with respect to such payments and benefits. Neither the Company nor any parent, subsidiary or other affiliate of the Company will have any responsibility, liability or obligation to pay Executive's taxes arising from or relating to any payments or benefits under this Agreement.

(h) Counterparts. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

o O o

IN WITNESS WHEREOF, each of the parties has executed this Agreement, in the case of the Company by its duly authorized officer, as of the day and year set forth below.

COMPANY PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

By: /s/ Bill Ericson

Name: William Ericson
Title: Compensation Committee Chair
of the Board of Directors

EXECUTIVE CHRISTIAN O. HENRY

/s/ Christian O. Henry

Title: President and Chief Executive Officer

December 9, 2020

Mark Van Oene
4763 Sun Valley Rd
Del Mar, CA 92014

Dear Mark,

On behalf of Pacific Biosciences of California, Inc. (or "the Company"), I am pleased to offer you a position at the Company as Chief Operating Officer. You will be reporting to Christian Henry.

You will receive a salary of $550,000 annually, paid twice monthly according to the Company's payroll schedule.

You will also be eligible to participate in The Employee Incentive Bonus Plan (the "Bonus Plan") with a target of 60% of your base salary (subject to the Company's achievement of certain corporate goals and objectives). The details of the Bonus Plan are set forth in the Employee Handbook.

You will be eligible for a one-time signing bonus of $200,000 (the "Sign-On Bonus"), to be paid in your first full payroll cycle paycheck, subject to payroll deductions and in accordance with the Company's customary payroll procedures (the "Sign-On Bonus"). If you resign from your employment with the Company for any reason prior to completing 12 months of continuous employment, you hereby agree to repay a pro-rata portion of the gross Sign-On Bonus (based on a 365 day year less the number of days you were employed by the Company) within 10 days after your employment termination date.

We have also agreed to provide you with relocation assistance if, within 18 months of your Start Date, you relocate your permanent residence to a location within 60 miles of the Company's corporate headquarters in Menlo Park, California. The terms and conditions of our relocation program will be provided to you in a separate agreement. Your relocation package will be subject to and administered in accordance with the terms of the Company's relocation policy.

Subject to approval by the Company's Board of Directors (the "**Board**") and as otherwise described below, you will be granted (i) a nonstatutory stock option (the "**Option**") to purchase a total of 750,000 shares of the Company's common stock (each a "**Share**" and, collectively, the "**Shares**"), having an exercise price per Share equal to the fair market value of a Share on the date of grant, and (ii) an award of restricted stock units covering 335,000 Shares (the "**RSUs**").

The effectiveness of the Option will be subject to your being employed by the Company on the date of grant. The specific terms of the Option will be determined by the Board and will be subject to the terms and conditions of the Company's then-current Equity Incentive Plan (the "**Plan**") and related agreements thereunder. The Option will be scheduled to vest as to one-fourth ($1/4^{th}$) of the Shares subject at grant to the Option on the one-year anniversary of your start date with the Company (the "**Start Date**") and as to one forty-eighth ($1/48^{th}$) of the Shares subject at grant to the Option each month thereafter on the same day of the month as the Start Date, provided that you remain employed with the Company through the applicable vesting date. Any portion of the Option that has not vested as of the date of cessation of your continuous status as an employee of the Company will terminate as of the date of such cessation.

The RSU award will be subject to your being employed by the Company on the date of grant. The specific terms of the RSU award will be determined when granted by the Board and will be subject to the Plan and the related agreements thereunder. The RSUs will be scheduled to vest as to one fourth (1/4th) of the Shares on each of the one (1), two (2), three (3) and four (4) year anniversaries of the Start Date, provided that you remain employed with the Company through the applicable vesting date. Any portion of the award of RSUs that has not vested as of the date of cessation of your continuous status as an employee of the Company will terminate as of the date of such cessation.

You will be eligible to receive equity awards covering Shares pursuant to any plans or arrangements the Company may have in effect from time to time, including but not limited to any focal grants. The Board will determine in its discretion whether you will be granted any such equity awards and the terms of any such award in accordance with the terms of any applicable plan or arrangement that may be in effect from time to time.

You will also be offered our standard executive Change in Control Severance Agreement, subject to approval by the Compensation Committee of the Board, and our standard director/officer Indemnification Agreement, copies of which are attached.

We will be offering you our standard benefits package. You will also be eligible for up to 15 days of vacation and 10 days of sick time per year, and you will receive designated Company holidays. The terms of our time off with pay policies are outlined in our employee handbook. The Company reserves the right to modify or terminate the benefit plans and programs it offers to its employees at any time.

All forms of compensation referred to in this letter agreement are subject to reduction to reflect applicable withholding and payroll taxes and other deductions required by law.

Your employment with the Company is for no specified period of time. Your employment with the Company will be “at will,” meaning that either you or the Company may terminate your employment at any time and for any reason, with or without cause. Any contrary representations that may have been made to you are superseded by this letter agreement. This is the full and complete agreement between you and the Company on this term. Although your job duties, title, compensation and benefits, as well as the Company’s personnel policies and procedures, may change from time to time, the “at will” nature of your employment may only be changed in an express written agreement signed by you and a duly authorized officer of the Company (other than you).

You represent that the performance of your duties in the position described above will not violate the terms of any agreements you may have with others, including your former employer. You also understand that you are not to bring to or use at the Company any confidential information of your prior employers.

Your employment is also conditioned upon your agreement and execution of the attached Pacific Biosciences At Will Employment, Confidential Information, Invention Assignment, and Arbitration Agreement.

Upon your acceptance of this offer (as evidenced by your return of a signed copy of this letter and the attached agreement to the company), this letter agreement, the Pacific Biosciences At Will Employment, Confidential Information, Invention Assignment, and Arbitration Agreement, the Change in Control Severance Agreement (if signed by you) and the Indemnification Agreement (if signed by you) together constitute the complete agreement between you and the Company, contain all of the terms of your employment with the Company and supersede any prior agreements, representations or understandings (whether written, oral or implied) between you and the Company.

As required by law, your employment with the Company is contingent upon your providing legal proof of identity and authorization to work within the United States on your first day of employment. In addition, to the extent permitted by applicable law, the Company may require current or new employees to submit to, and pass, a background check. Additionally, any employee authorized to drive a Company vehicle, or who is receiving a vehicle allowance, must provide a valid and current driver's license and consent to a DMV check.

To accept our offer, please sign and date this letter in the space provided below. If you accept our offer, your first day of employment will be January 8, 2021.

This offer of employment will terminate if it is not accepted, signed, and returned by midnight Pacific Time, December 12, 2020.

The Company is committed to hiring employees like you that have the courage, creativity, and experience to develop new ideas for new markets.

We look forward to your joining us!

/s/ Christian Henry

Pacific Biosciences By: Christian O. Henry, President & Chief Executive Officer

I have read and accept this employment offer:

/s/ Mark Van Oene 12/11/2020

Mark Van Oene **Date**

December 7, 2020

Peter Fromen
18 Stukeley St., Flat 5
London
WC2B 5LR
United Kingdom

Dear Peter,

On behalf of Pacific Biosciences of California, Inc. (the "Company"), I am pleased to offer you a position at the Company as Chief Commercial Officer. You will report to the Chief Executive Officer. You will be based in the United Kingdom (the "UK") for an initial period of up to 12 months, following which you will relocate to work at the Company's offices in the United States (the "US") in Menlo Park, California.

The Company is still considering the structure of your employment in the first 12 months (either being employed directly by Pacific Biosciences UK, Limited ("PacBio UK") or being employed by the Company and seconded to work on assignment with PacBio UK. We will be in touch shortly to confirm the approach to you, but in the meantime I am writing to confirm the key terms of the offer.

You will receive a salary of $425,000 annually, paid twice monthly while in the US, and monthly in arrears while in the UK, in each case less appropriate deductions.

You will be eligible for a one-time signing bonus of $125,000 (the "Sign-On Bonus"), to be paid in your first full payroll cycle paycheck, less appropriate deductions and in accordance with the Company's customary payroll procedures (the "Sign-On Bonus"). If you resign from your employment with the Company for any reason prior to completing 12 months of continuous employment, you hereby agree to repay a pro-rata portion of the gross Sign-On Bonus (based on a 365 day year less the number of days you were employed by the Company) within 10 days after your employment termination date. We may deduct any Sign-On Bonus you are required to re-pay from any monies owed by the Company to you.

You will also be eligible to participate in The Employee Incentive Bonus Plan (the "Bonus Plan") with a target of 50% of your base salary (subject to the Company's achievement of certain corporate goals and objectives). The details of the Bonus Plan are set forth in the Employee Handbook. Any bonus payment you are awarded will be paid less appropriate deductions.

On repatriation to the US at the end of your assignment you will be eligible for repatriation benefits up to a total of $100,000 subject to deductions and the terms of, and in accordance with, the Company's Executive International Relocation Agreement, which will be provided to you in a separate agreement.

Subject to approval by the Company's Board of Directors (the "**Board**") and as otherwise described below, you will be granted (i) a nonstatutory stock option (the "**Option**") to purchase a total of 320,000 shares of the Company's common stock (each a "**Share**" and, collectively, the "**Shares**"), having an exercise price per Share equal to the fair market value of a Share on the date of grant, and (ii) an award of restricted stock units covering 160,000 Shares (the "**RSUs**").

The effectiveness of the Option will be subject to your being employed by the Company on the date of grant. The specific terms of the Option will be determined by the Board and will be subject to the terms and conditions of the Company's then-current Equity Incentive Plan (the "**Plan**") and related agreements thereunder. The Option will be scheduled to vest as to one-fourth (1/4th) of the Shares subject at grant to the Option on the one-year anniversary of your start date with the Company (the "**Start Date**") and as to one forty-eighth (1/48th) of the Shares subject at grant to the Option each month thereafter on the same day of the month as the Start Date, provided that you remain employed with the Company through the applicable vesting date. Any portion of the Option that has not vested as of the date of cessation of your continuous status as an employee of the Company will terminate as of the date of such cessation.

The RSU award will be subject to your being employed by the Company or a group company on the date of grant. The specific terms of the RSU award will be determined when granted by the Board and will be subject to the Plan and the related agreements thereunder. The RSUs will be scheduled to vest as to one fourth (1/4th) of the Shares on each of the one (1), two (2), three (3) and four (4) year anniversaries of the date of grant, provided that you remain employed with the Company through the applicable vesting date. Any portion of the award of RSUs that has not vested as of the date of cessation of your continuous status as an employee of the Company or a group company will terminate as of the date of such cessation.

You will be eligible to receive equity awards covering Shares pursuant to any plans or arrangements the Company may have in effect from time to time, including but not limited to any focal grants. The Board will determine in its discretion whether you will be granted any such equity awards and the terms of any such award in accordance with the terms of any applicable plan or arrangement that may be in effect from time to time.

You will be subject to tax equalization in accordance with the Company's Tax Equalization Policy while based in the UK. Further details of your tax equalization are explained in the Company's Tax Equalization Policy.

Your normal place of work while based in the UK will be your home address in the UK from time to time, or such other place in the UK as the Company or PacBio UK may advise you and as the needs of the business or the proper performance of your duties may require.

Your employment while in the UK will be on the terms of any contract of employment or alternatively assignment letter, that we provide. Where there is any dispute between the terms of this letter and that document, the provisions of that document shall take precedence.

You will also be offered our standard executive Change in Control Severance Agreement, subject to approval by the Compensation Committee of the Board, and our standard director/officer Indemnification Agreement, copies of which are attached.

We will be offering you a benefits package while you are based in the UK, which we can discuss separately in an additional assignment letter, and our standard benefits package available to employees in the US when you relocate to the US. When you relocate to the United States you will be eligible for up to 15 days of vacation and 10 days of sick time per year, and you will receive designated Company holidays. The terms of our time off with pay policies are outlined in our employee handbook. The Company reserves the right to modify or terminate the benefit plans and programs it offers to its employees at any time. During the first 12 months when you are working in the UK you will be eligible for 25 days' holiday plus the normal bank and public holidays applicable in the UK.

All forms of compensation referred to in this letter agreement are subject to reduction to reflect applicable withholding and payroll taxes and other deductions required by law.

Your employment with the Company is for no specified period of time. When you relocate to the United States your employment with the Company will be “at will,” meaning that either you or the Company may terminate your employment at any time and for any reason, with or without cause. Any contrary representations that may have been made to you are superseded by this letter agreement. This is the full and complete agreement between you and the Company on this term. Although your job duties, title, compensation and benefits, as well as the Company’s personnel policies and procedures, may change from time to time, the “at will” nature of your employment may only be changed in an express written agreement signed by you and a duly authorized officer of the Company (other than you).

You represent that the performance of your duties in the position described above will not violate the terms of any agreements you may have with others, including your former employer. You also understand that you are not to bring to or use at the Company any confidential information of your prior employers.

Your employment is also conditioned upon your agreement and execution of the attached Pacific Biosciences At Will Employment, Confidential Information, Invention Assignment, and Arbitration Agreement.

Upon your acceptance of this offer (as evidenced by your return of a signed copy of this letter and the attached agreement to the Company), this letter agreement, the Pacific Biosciences At Will Employment, Confidential Information, Invention Assignment, and Arbitration Agreement, the Change in Control Severance Agreement (if signed by you) and the Indemnification Agreement (if signed by you) together will constitute the complete agreement between you and the Company in respect of your employment when you are based in the United States, and it contains all of the terms of your employment with the Company in relation to that period of your employment, and supersedes any prior agreements, representations or understandings (whether written, oral or implied) between you and the Company.

To the extent permitted by applicable law, the Company may require current or new employees to submit to, and pass, a background check. Additionally, any employee authorized to drive a Company vehicle, or who is receiving a vehicle allowance, must provide a valid and current driver’s license and consent to a DMV, or international equivalent, check.

This offer outlines key terms applicable to our offer. It is subject to and conditioned upon the Company obtaining immigration approvals enabling you to work in the UK. It is also subject to the terms of the employment contract or if applicable, the assignment letter in respect of your period of employment when you are based in the UK, the Executive International Relocation Agreement and the Tax Equalization Policy. As you have not yet seen these documents yet, I'm asking that you confirm if you accept the offer in principle; we can then finalize the terms once we have provided you with the additional documentation.

To accept our offer, please sign and date this letter in the space provided below. If you accept our offer, your first day of employment will be January 8, 2021, subject to obtaining appropriate immigration approvals for you to work in the UK.

This offer of employment will terminate if it is not accepted, signed, and returned by midnight Pacific Time, December 14, 2020.

The Company is committed to hiring employees like you that have the courage, creativity, and experience to develop new ideas for new markets.

We look forward to your joining us!

/s/ Christian O. Henry

Pacific Biosciences By: Christian O. Henry, President & Chief Executive Officer

I have read and accept this employment offer:

/s/ Peter Fromen December 9, 2020

Peter Fromen **Date**

CERTAIN CONFIDENTIAL INFORMATION CONTAINED IN THIS DOCUMENT, MARKED BY BRACKETS ([***]), HAS BEEN OMITTED BECAUSE
THE INFORMATION (I) IS NOT MATERIAL AND
(II) WOULD BE COMPETITIVELY HARMFUL IF PUBLICLY DISCLOSED.

DEVELOPMENT AND COMMERCIALIZATION AGREEMENT

This DEVELOPMENT AND COMMERCIALIZATION AGREEMENT (the "**Agreement**"), effective as of January 12, 2021 (the "**Effective Date**"), is made by and between Pacific Biosciences of California, Inc., a Delaware corporation, having a place of business at 1305 O'Brien Dr., Menlo Park, CA 94025 ("**PacBio**") and Invitae Corporation, a Delaware corporation, having a place of business at 1400 16th St., San Francisco, CA 94103 ("**Invitae**" and, together with PacBio, the "**Parties**" and each, a "**Party**").

BACKGROUND

A. Invitae is working to bring comprehensive genetic information into mainstream medicine to improve healthcare.

B. PacBio is a leading provider of high-quality sequencing of genomes, transcriptomes and epigenomes employing SMRT Sequencing Technology to generate HiFi genomes.

C. PacBio and Invitae desire to collaborate to develop next generation instruments utilizing PacBio's technology capable of scalable, comprehensive whole genome sequencing, all on the terms and conditions set forth below.

NOW, THEREFORE, for and in consideration of the covenants, conditions and undertakings hereinafter set forth, it is agreed by and between the Parties as follows:

1.
DEFINITIONS

As used herein, the following terms will have the meanings set forth below:

(a) "**[***]Product**" means, individually and collectively, (i) the "**[***]System**" described on Exhibit A, inclusive of the Specifications for the [***]System set forth on Exhibit A and as they may be modified from time to time by the Joint Steering Committee, and (ii) any [***] (as defined below) for use with the [***]System.

(b) "**[***]Product**" means, individually and collectively, (i) the "**[***]System**" described on Exhibit A, inclusive of the Specifications for the [***]System set forth on Exhibit A and as they may be modified from time to time by the Joint Steering Committee, and (ii) any [***] for use with the [***]System.

(c) "**Affiliate**" means, with respect to an entity, any other entity that controls, is controlled by, or is under common control with the first entity. For the purpose of this definition, "control" shall mean direct or indirect ownership of fifty percent (50%) or more of the shares of stock entitled to vote for the election of directors, in the case of a corporation, or fifty percent (50%) or more of the equity interest, in the case of any type of legal entity other than a corporation, status as a general partner in any partnership, or any other arrangement whereby the entity or person controls or has the right to control the board of directors or equivalent governing body of a corporation or other entity, or the ability to cause the direction of the management or policies of a corporation or other entity. In the case of entities organized under the laws of certain countries, the Parties acknowledge that the maximum percentage ownership permitted by law for a foreign investor may be less than fifty percent (50%) and, in such case, such lower percentage shall be substituted in the preceding sentence; provided, that such foreign investor has the power to direct the management and policies of such entity.

(d) "**Business Day"** means a day other than a Saturday, Sunday, or other day on which commercial banks in San Francisco, CA are authorized or required by law to be closed for business.

(e) "**Change in Control**" means the occurrence of any of the following events:

(i) A change in the ownership of PacBio which occurs on the date that one person or entity or more than one person or entity acting as a group (in any event, a "**Person**") acquires ownership of the stock of PacBio that, together with any other stock of PacBio held by such Person, constitutes more than fifty percent (50%) of the total voting power of the stock of PacBio; provided, however, that if the stockholders of PacBio immediately before such change in ownership continue to retain immediately after the change in ownership, in substantially the same proportions as their ownership of shares of PacBio's voting stock immediately prior to the change in ownership, direct or indirect beneficial ownership of fifty percent (50%) or more of the total voting power of the stock of PacBio or of the ultimate parent entity of PacBio, such event will not be considered a Change in Control under this Section 1.5.1. For this purpose, indirect beneficial ownership will include an interest resulting from ownership of the voting securities of one or more corporations or other business entities which own PacBio, as the case may be, either directly or through one or more subsidiary corporations or other business entities; or

(ii) The acquisition or the attainment of control by any Person of a material amount (other than the supply to Third Parties of any [***]Products or any [***] in the ordinary course of business) or any necessary item of PacBio's business or assets relating to this Agreement; provided, however, that for purposes of this Section 1.5.2, the following will not constitute a Change in Control under this Section 1.5.2: (A) a transfer to a Person that is controlled by PacBio's stockholders immediately after the transfer (with such control distributed among such stockholders in substantially the same proportions as their ownership of shares of PacBio's voting stock); or (B) a transfer to a Person fifty percent (50%) or more of the total value or voting power of which is owned, directly or indirectly, by PacBio.

Further and for the avoidance of doubt, a transaction will not constitute a Change in Control if: (x) its sole purpose is to change the jurisdiction of PacBio's incorporation; or (y) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held PacBio's securities immediately before such transaction.

(f) "**[***] and [***]**" means the [***] and [***] for the [***] in effect from time to time, as established in accordance with Article 3.

(g) "**[***]**" shall include the activities conducted in connection with the development of [***]Products as described in Article 4.

(h) "**Field**" means services which consist, [***], including [***] supporting the delivery of [***]. For clarity, (a) other services are [***] so long as the services provided consist primarily of [***] and (b) any material amount of [***] is not permitted within this definition if the primary purpose is to [***].

(i) "**[***]**" means a [***], or in the case of [***] a full-time dedicated person, a full-time equivalent person year, based upon the total of [***] hours per year of work.

(j) "**[***] Cost**" means, for any period, the total of the products of (a) the [***] (and/or portion thereof) engaged in executing the [***] (as adjusted to reflect the portion of a year represented by the period at issue), and (b) the respective [***]s for such [***].

(k) "**[***]**" means the rate that is applicable to [***] within [***] or categories, as set forth in the [***] and [***], with such [***]to be determined by the Joint Steering Committee from time to time as representing the actual direct cash costs to the employer plus an allocation of the employer's overhead which is appropriate in respect of the scope and undertaking represented by the [***].

(l) "**[***]**" means [***], and [***] incurred by [***] in respect of the [***], but solely in accordance with [***].

(m) "**[***]**" means, collectively, all [***] and all [***].

(n) "**[***]Product**" means, individually and collectively, (i) the "**[***]System**," (ii) the "**[***]System**," and (iii) all [***] available from [***] labelled or otherwise intended for use with [***]System[***]System (any, a "**[***]**").

(o) "**[***]Product System**" means, individually and collectively, (i) the [***]System and (ii) the [***]System.

(p) "**Specifications**" means, with respect to a particular [***]Product, the written specifications therefor initially set forth on Exhibit A and thereafter updated, if applicable, by the Joint Steering Committee.

(q) "**Third Party**" means any person or entity other than Invitae, PacBio or each's applicable Affiliates.

(r) Additional Definitions. Each of the following definitions shall have the meanings defined in the corresponding sections of this Agreement indicated below:

Defined Term	Section
[***]Credit Amount	**9.14(a)**
[***]Period	**9.12(a)**
[***]Period	**9.14(a)**
[***]	**9.14(b)**
[***]System	**1.14**
[***]Period	**9.12(b)**
[***]Period	**9.14(c)**
[***]	**9.14(d)**
[***]System	**1.14**
Alliance Manager	**2.7**
Claim	**14.3**
Co-Chair	**2.3**
COGS	**9.14(e)**
Confidential Information	**12.1**
[***]	**1.14**
[***]	**6.1**
Development [***]	**3.3.1; 3.3.2**
Development Term	**3.1**

Disclosing Party	**12.1**
Dispute	**16.2**
Escalation to Mediation Date	**16.2.1**
Extended [***]Period	**9.1.3**
Force Majeure	**16.3**
Force Majeure Delay	**3.3.3**
Indemnitee	**14.3**
Indemnitor	**14.3**
Initial [***] and [***]	**3.2.1**
Invitae Claim	**14.1**
Invitae Indemnitee	**14.1**
Invitae Licensed Sole or Joint Inventions	**11.2**
IP Notice	**14.5**
Joint Steering Committee	**2.1**
Notice of Dispute	**16.2**
Other Technology	**11.1**
PacBio Claim	**14.2**
PacBio Indemnitee	**14.2**
[***]Period	**9.1(f)**
Prior CDA	**12.7**
[***]	**9.1**
[***]	**6.1.3**
[***]	**3.2.2**
Receiving Party	**12.1**
[***]	**15.8.1(b)**
[***]	**8.1**

(s) Interpretation. The captions and headings to this Agreement are for convenience only, and are to be of no force or effect in construing or interpreting any of the provisions of this Agreement. Unless specified to the contrary, references to Articles, Sections, Attachments or Exhibits mean the particular Articles, Sections, Attachments or Exhibits to this Agreement and references to this Agreement include all Attachments and Exhibits hereto. Unless the context otherwise clearly requires, whenever used in this Agreement: (a) the words “include” or “including” shall be construed as incorporating, also, “but not limited to” or “without limitation;” (b) the word “day” or “year” means a calendar day or year unless otherwise specified; (c) the word “notice” means notice in writing (whether or not specifically stated) and shall include notices, consents, approvals and other communications contemplated under this Agreement; (d) the words “hereof,” “herein,” “hereby” and derivative or similar words refer to this Agreement (including any Attachments); (e) the word “or” shall be construed as the inclusive meaning identified with the phrase “and/or;”(f) provisions that require that a Party, or the Parties hereunder “agree,” “consent” or “approve” or the like shall require that such agreement, consent or approval be specific and in writing, whether by written agreement, letter or otherwise; (g) words of any gender include the other gender; (h) words using the singular or plural number also include the plural or singular number, respectively; (i) references to any specific law, rule or regulation, or article, section or other division thereof, shall be deemed to include the then-current amendments thereto or any replacement law, rule or regulation thereof;

and (j) neither Party or its Affiliates shall be deemed to be acting "on behalf of" or "under authority of" the other Party.

2. GOVERNANCE

(a) Joint Steering Committee; Establishment. Promptly after the Effective Date, PacBio and Invitae shall establish a joint, co-chaired joint steering committee (the "**Joint Steering Committee**") to [***] of the Parties under this Agreement, including the [***].

(b) Responsibilities. The Joint Steering Committee shall be responsible for:

(i) Providing [***] to each Party's activities under the [***];

(ii) Overseeing, reviewing and monitoring such [***]including reviewing [***] and [***], and the [***] related thereto;

(iii) Reviewing and revising the [***]on a [***] basis (as provided in the definition for [***]);

(iv) Reviewing the [***] for each [***]Product then being [***] and the estimated [***] for each [***]Product then in [***] no less frequently than [***] per [***]Period, with a schedule providing detail for the determination of [***] to be [***] and [***] by the [***] (i) as [***] (or, at the election of the Joint Steering Committee, [***]) determining the [***] as contemplated by [***] and (ii) [***] than [***] per [***]Period thereafter;

(v) Managing the [***] and [***] of the [***] with [***] to [***]Products as contemplated by this Agreement;

(vi) Facilitating access to and the exchange of [***] between the Parties related to the [***] and the [***]Products;

(vii) Establishing [***] as it deems appropriate to manage [***] under the [***] and [***], [***] and [***] of such [***];

(viii) Reviewing and, as applicable, approving [***] to the [***] and [***] or [***] for the Parties to [***] the [***] of this Agreement;

(ix) Comparing [***] as part of the [***] against the applicable [***]; and

(x) Undertaking or approving such other [***] as are specifically provided for the [***] under this Agreement.

Without limiting the foregoing, the Joint Steering Committee shall (i) discuss matters relating to the [***], including modifications to the [***] and [***] and the Specifications; (ii) establish sub-committees, with representation from each Party, to assess [***] impacts of technical and design changes to the [***]Products; (iii) discuss and resolve matters concerning ongoing [***] of the [***]Products, including applicable [***] initiatives and [***] changes and similar matters; and (iv) discuss and resolve, if possible, any disputes referred to the Joint Steering Committee.

(c) Membership. The Joint Steering Committee shall be comprised of [***]number [***] from [***] and unless otherwise agreed such number shall be [***] employees from [***]. Either Party may replace its respective Joint Steering Committee members at any time with prior notice to the other Party, provided that such replacement is of comparable authority and scope of functional responsibility within that Party's organization as the person he or she is replacing. Unless otherwise agreed by the Parties, the Joint Steering Committee shall have at least one member who is a senior executive with relevant decision-making authority from each Party such that the Joint Steering Committee is able to effectuate all of its decisions within the scope of its responsibilities. Without limiting the foregoing, each Party shall appoint one of its members to the Joint Steering Committee to co-chair the meetings for the Joint Steering Committee (each, a "**Co-Chair**"). The Co-Chairs for the Joint Steering Committee shall (i) coordinate and prepare the agenda and ensure the orderly conduct of the Joint Steering Committee's meetings, (ii) attend (subject to below) each meeting of the Joint Steering Committee, and (iii) prepare and issue minutes of each meeting [***]after accurately reflecting the discussions and decisions of the Joint Steering Committee. Such minutes from each Joint Steering Committee meeting shall not be finalized until the applicable Co-Chair from each Party has reviewed and confirmed the accuracy of such minutes in writing. The Co-Chairs shall solicit agenda items from the other Joint Steering Committee members and provide an agenda along with appropriate information for such agenda reasonably in advance (to the extent possible) of any meeting. In the event the Co-Chair or another member of the Joint Steering Committee from either Party is unable to attend or participate in any meeting of the Joint Steering Committee, the Party who designated such Co-Chair or member may designate a substitute Co-Chair or other member for the meeting.

(d) Meetings. Unless otherwise agreed by the Parties, the Joint Steering Committee will meet at least [***] during the Development Term in connection with the review and approval of the [***]. In addition to regularly scheduled meetings of the Joint Steering Committee, either Party may call a special meeting of the Joint Steering Committee on at least [***] notice to the other Party to discuss one or more matters deemed material by such first Party and identified in the notice of such first Party calling such meeting. Each Party shall be responsible for its own expenses relating to such meetings. As appropriate, other employee representatives of the Parties may attend Joint Steering Committee meetings as nonvoting observers, but no [***] may attend unless otherwise agreed by the Parties. Each Party may also call for special meetings to resolve particular matters requested by such Party.

(e) Decision Making. A [***] Joint Steering Committee members shall be present in person or by other means (e.g., teleconference) in order to [***] at any meeting. In the event that a [***] is not present or ceases to be present at any meeting of the Joint Steering Committee, such meeting shall be [***] a [***] can be [***]. Each Joint Steering Committee member shall have [***] in any matter requiring the Joint Steering Committee's action or approval, and all decisions shall be [***]. If the Joint Steering Committee cannot reach a [***] at a Joint Steering Committee meeting or within twenty (20) Business Days thereafter, the matter shall be resolved in accordance with [***].

(f) Day-to-Day Responsibilities. Each Party shall: (i) be responsible for day-to-day implementation and operation of the activities hereunder for which it has or is otherwise assigned responsibility under this Agreement, provided that such implementation is not inconsistent with (A) the express terms of this Agreement and the decisions of the Joint Steering Committee within the scope of their authority specified herein and (B) the [***] and [***] with respect to activities under the [***]; and (ii) keep the other Party informed as to the progress of such activities as determined by the Joint Steering Committee.

(g) Alliance Managers. Promptly after the Effective Date, each Party shall appoint an individual to act as alliance manager for that Party (each, an "**Alliance Manager**"). Each Party's Alliance Manager shall be a voting member of the Joint Steering Committee. The Alliance Managers shall be the primary point of contact for the Parties with respect to the activities to be conducted under this Agreement. The name and contact information for the Alliance Managers, as well as any replacement(s), which may be chosen by either Party in their sole discretion from time to time, shall be promptly provided to the other Party in writing.

3.
[***]S AND [***]S

(a) Development Term. During the period for conduct of the [***] (the "**Development Term**"), PacBio shall prepare in consultation with Invitae and provide to the Joint Steering Committee for approval a reasonably detailed [***] and [***] for the performance of the [***] as set forth in Section 3.2. The [***] and [***] shall specify the [***] and [***] of the [***], together with a [***] of [***] ([***]) of PacBio [***] to be [***] to the [***] and any other [***] (as defined below). Beginning [***] prior to the estimated time of launch of a

[***]Product, the [***] and [***] shall also set forth the [***] (as defined in Section 9.1) of such [***]Product.

(b) [***] and [***].

(i) Initial [***] and [***]. Within thirty (30) days after the Effective Date, PacBio shall submit to the Joint Steering Committee the proposed [***] and [***] for the period from the Effective Date through June 30, 2022 (the "**Initial [***] and [***]**"), which Initial [***] and [***] shall be consistent with the general plan attached hereto as Exhibit B. After submission of the Initial [***] and [***] by PacBio, the Joint Steering Committee shall meet and review such proposal as soon as possible and shall establish and approve (as applicable) the Initial [***] and [***], with such changes as the Joint Steering Committee may agree to the plan and [***] proposed by PacBio.

(ii) Other. In advance of the first Business Day on or after [***] in advance of the first Business Day of each of [***] and [***] thereafter during the Development Term, PacBio shall submit to the Joint Steering Committee an update to the [***] and [***] for the following [***]Period commencing immediately after the end of the [***] (e.g., [***] to [***] for the first such update) (each, a "**[***]**"). The Joint Steering Committee shall review and approve (as applicable) the [***] for the next succeeding [***]Period, with such changes as the Joint Steering Committee may agree to the updated plan and [***] proposed by PacBio; and upon the approval of the [***], the same shall be the [***] and [***] for the corresponding period. Upon the reasonable request of Invitae, and in any event no less frequently than [***], PacBio will provide the Joint Steering Committee with a detailed schedule of (i) PacBio's calculation of the [***] for each [***]Product then being [***] and (ii) a good faith estimate of the [***] for each [***]Product then in [***].

(c) Development Status Review.

(i) [***]Product Status Review. At the Joint Steering Committee meeting occurring immediately after the date that is [***] following the Effective Date, the Parties shall discuss the progress of the [***]Product. If it is determined (or if it otherwise turns out to be) that the [***]Product development (a) [***] on or prior to the end of the [***] following the Effective Date, then there shall be [***] on the terms of this Agreement, or (b) [***] [***] on or prior to the end of the [***] following the Effective Date, then Invitae shall not be [***] any [***] by PacBio following the end of such [***] month with respect to the [***]Product, but Invitae shall remain obligated to [***] [***] following the end of such [***] pursuant to the [***] and [***]. In addition to, and not in lieu of, the foregoing, if at such Joint Steering Committee meeting it is determined (or if it otherwise turns out to be) that the [***]Product development will [***] on or prior to the end of the [***] following the Effective Date, a "**Development [***]**" shall be deemed [***] [***].

(ii) [***]Product Status Review. At the Joint Steering Committee meeting occurring immediately after the date that is [***] following the Effective Date, the Parties shall discuss the progress of the [***]Product. If it is determined (or if it otherwise turns out to be) that the [***]Product development (a) [***] [***] on or prior to the end of the [***] following the Effective Date, then there shall be [***] on the terms of this Agreement, or (b) [***] on or prior to the end of the [***] following the Effective Date (whether due to a [***] or otherwise), then Invitae shall not be responsible for any [***] by PacBio following the end of such [***] with respect to the [***]Product, but Invitae shall remain obligated to [***] following the end of such [***] pursuant to the [***] and [***]. In addition to, and not in lieu of, the foregoing, if at such Joint Steering Committee meeting it is determined (or if it otherwise turns out to be) that the [***]Product development will [***] on or prior to the end of the [***] following the Effective Date (whether due to a [***] or otherwise), a [***]**Development [***]** shall be deemed [***].

(iii) [***]. If a [***] occurs and, as a result, the [***] in respect of either the [***]Product or the [***]Product is [***] (a "**[***]**"), (i) PacBio shall promptly notify Invitae and (ii) the date on which a [***] would otherwise be deemed [***] for the [***]Product or the [***]Product, as applicable, will be [***] by an amount of [***] to the [***] of the [***] as determined by the Joint Steering Committee.

4.
[***]

(a) [***]. PacBio shall be responsible for and shall consistently use no less than [***] and [***] in conducting, directly or through its Affiliates, the development and validation

program for the [***]Products in accordance with the [***] and [***] then in effect, including the development objectives, timelines, [***] and [***] set forth therein (the "**[***]**"). PacBio agrees to keep the Joint Steering Committee reasonably informed at Joint Steering Committee meetings and to be reasonably responsive to inquiries from Invitae's members of the Joint Steering Committee concerning the progress of the [***] between meetings of the Joint Steering Committee. Invitae shall provide reasonable assistance to PacBio regarding the [***] as specified by the Joint Steering Committee. Invitae shall be consulted and informed with respect to the [***] through its representatives on the Joint Steering Committee.

(b) [***] Funding. PacBio shall apply all amounts paid by Invitae in accordance with Article 6 toward the [***] in accordance with the [***] and [***] then in effect.

5.
RECORD KEEPING

(a) Reports and Records.

(i) Records. PacBio shall maintain current records of the [***] (or cause such records to be maintained) in [***] and in [***] as will properly reflect the [***] and [***] in the performance of the [***].

(ii) Reports. With each update to the [***] and [***] submitted to the Joint Steering Committee by PacBio as contemplated by Section 3.2.2, PacBio shall provide the Joint Steering Committee with a written report summarizing the progress of the [***] performed by it with respect to [***]Product during the preceding [***]. Coincident with such reports, PacBio will provide Invitae an accounting of [***] incurred during the corresponding [***] as required in Section 6.1.3.

6.
[***] FUNDING

(a) [***] and [***]Product Development Payments.

(i) General. Invitae will reimburse PacBio as set forth in this Section 6.1 for those [***] and [***] (collectively "**[***]**") reflected in the Initial [***] and [***] (until superseded by the first [***]) or any then current [***] as approved by the Joint Steering Committee in accordance with Section 3.2, with such Initial [***] and [***] or [***] to include the estimated number of [***], the functional categories of such [***], the applicable [***]s, the resulting estimated [***] and the estimated [***] expected to be incurred in each [***] (or portion thereof) in the following [***]Period. Together with each update to the [***] and [***] submitted to the Joint Steering Committee by PacBio as contemplated by Section 3.2.2, PacBio shall provide Invitae with (i) an accounting of the [***] for the prior [***] and (ii) an invoice for

the [***] incurred during such period. The Parties acknowledge and agree that the actual costs incurred in connection with the [***] may exceed, or may be lower than, the [***]ed amounts therefor.

(ii) [***] – Initial Payment. No later than thirty (30) days following the approval of the Initial [***] and [***] by the Joint Steering Committee, Invitae shall pay to PacBio an amount equal to the estimated [***] for the period from the Effective Date to June 30, 2021, as set forth in the approved Initial [***] and [***].

(iii) [***] – [***]. No later than thirty (30) days from the Joint Steering Committee's approval of each [***] (each a "**[***]**"), Invitae shall pay PacBio an amount equal to the [***] for the following [***], *i.e.*, the first [***] of the then just-approved [***], as set forth in such [***].

(iv) Carry Forward. For clarity, if the actual [***] incurred by PacBio in a [***] (or the initial period set forth in Section 6.1.2) are less than the amounts advanced by Invitae for such [***] (or initial period), then any amount in excess of such [***] will be carried forward and applied to Invitae's funding obligations for the subsequent quarter (or in the event of the last quarter, refunded to Invitae).

(v) [***] Payment. No later than each [***], Invitae shall reimburse PacBio for [***] invoiced for the previous [***] (and, in the instance of the first [***], any additional period following the Effective Date and prior to the commencement of the previous [***]).

(vi) Cost [***]. In each [***], if PacBio determines that the [***] for an activity reflected in the Initial [***] and [***] (until superseded by the first [***]) or any then current [***] as approved by the Joint Steering Committee in accordance with Section 3.2 is likely to be [***] or is [***] by at least [***], PacBio shall: (i) promptly inform the Joint Steering Committee of the expected or actual [***]; and (ii) provide the Joint Steering Committee with a detailed, written explanation for the [***] for that activity, and complete and accurate records substantiating the expected or actual [***]. At its next regularly scheduled meeting, the Joint Steering Committee shall determine whether, and to what extent, any [***] shall be [***] by [***] (to the extent the [***] at issue [***] reasonably [***] the power of PacBio to [***] for or [***]), [***] by [***] (to the extent the [***] at issue [***] reasonably within the power of PacBio to [***] for or [***]), or [***] in some [***] [***] the Parties (as applicable). If the Joint Steering Committee determines that any aspect of the [***] should be [***] by Invitae, then such [***] will be [***] and applied to Invitae's [***] for the subsequent [***].

7.
MARKETING RIGHTS

Without limiting PacBio's obligations and Invitae's rights in Article 8, Article 9 and the [***], and except as otherwise expressly set forth herein, PacBio shall, as between the Parties, have the exclusive worldwide right to market, sell, distribute and otherwise commercialize [***]Products (itself or through others) for all applications on terms and conditions as PacBio may determine from time to time and retain all income therefrom. For clarity, and notwithstanding any provision herein to the contrary, Invitae and its Affiliates shall have the right to use the [***]Products purchased by Invitae and its Affiliates and to commercialize the data generated from such use, in each case without any further payment or obligation to PacBio.

8.
MANUFACTURE AND SUPPLY

(a) Terms and Conditions. No later than [***] months prior to the Joint Steering Committee's good faith estimate of the [***] of the first [***]Product, the Parties will negotiate in good faith and enter into a [***] for [***]Products associated with the applicable system (the "**[***]**").

(b) [***] Terms. In addition to the terms and conditions set forth in Article 9 and such other terms and conditions as are reasonable and customary in the biotech tools industry, the [***] will include the following features:

(i) On a [***] basis Invitae will provide PacBio with a [***] of Invitae's expected purchases of [***]Products, with (i) Invitae thereafter maintaining the ability to [***] such forecasted amounts albeit within [***] for the [***], (ii) the most current forecasted [***] distilling, within a limited range around the [***] as finally determined by Invitae, into purchase orders which PacBio will be obligated to accept assuming such purchase orders are otherwise in compliance with the terms and conditions of the [***], and (iii) PacBio agreeing to exercise [***] to accept purchase order from Invitae, if tendered, for [***] such [***] around the [***]; provided, however, the Parties acknowledge that the manufacturing lead-time for certain [***]Products is expected to be up to [***], and therefore PacBio may require Invitae to place non-cancelable purchase orders for such items in advance in order to secure enough supply to satisfy a [***], and that PacBio's ability to satisfy requested [***] in the [***] may be limited as a result of s[***];

(ii) Representations, warranties and covenants from PacBio comparable to the features of Article 13 and indemnification by PacBio of the Invitae Indemnitees (as defined below) comparable to the features of Article 14 (other than the proviso in Section 14.5), but with the addition of representations, warranties and covenants from PacBio to the effect that (i) it has obtained and shall continue to maintain all licenses, authorizations, approvals, consents, or permits required by applicable law to conduct its business generally and to perform its obligations under the [***], (ii) it has and shall continue to maintain the full right,

power and authority (by ownership, license, or otherwise) to use all patents, copyrights, trademarks, or other intellectual property embodied in the [***]Products, (iii) the [***]Products do not and will not infringe or misappropriate the intellectual property rights of any Third Party; and (iv) the [***]Products will (A) conform, at a minimum, to ordinary standards of care, (B) be of at least the same grade, quality, and value as [***] sold under similar circumstances, and (C) be fit for the purposes for which the [***]Products are intended to be used;

(iii) If PacBio is (or if PacBio reasonably determines that it will be) unable to supply Invitae with any [***]Product forecasted and ordered by Invitae in accordance with the [***] and its other customers' [***] and [***] of such [***]Product, then PacBio shall notify Invitae as soon as practicable of such situation. Without limiting Section 8.2.5, in such circumstances, PacBio shall [***] to (i) [***] the [***] of such [***]Product that PacBio has [***] and that it is able to [***], so that Invitae receives at least [***] (relative to [***] PacBio customer) of available [***]Product from [***] and [***] as determined based on such forecasted and ordered amounts from Invitae and each such other customer of PacBio for such [***]Product and (ii) in all events deliver at least [***] of such [***]Product to Invitae no later than [***] the delivery to such other customers;

(iv) The [***] shall include an assignment provision on terms substantially identical to Section 16.7; and

(v) In the event that PacBio [***] or notifies Invitae (which PacBio shall be obligated to do in good faith if applicable) that it is likely to [***] (other than as a result of [***]) to supply Invitae with any [***]Product forecasted and ordered by Invitae in accordance with the [***] which causes or threatens to cause a [***] in Invitae's business for [***], PacBio agrees to [***] Invitae a [***], [***], without right to [***] or [***], as necessary for Invitae (itself or through an Affiliate, or a Third Party [***] (to which PacBio has [***])) to [***]such [***]Product on [***] of and [***] to Invitae such [***]Product and for [***] and provide PacBio with customary [***]to confirm the same.

(1) If Invitae uses a [***], then such [***] shall enter into an agreement [***] on standard and customary terms for the bio-tools industry to prevent the misuse of [***] and acknowledging and agreeing to the [***].

(2) All [***]Product [***] by Invitae pursuant to this Section 8.2.5 shall be subject to the [***] and other [***], if any, to be set forth in the [***].

9. The [***] described in Section 8.2.5 above shall [***] only until such time as PacBio has [***] that it is [***] of the applicable [***]Product forecasted and ordered by Invitae during such period (accordingly, Invitae shall continue to provide PacBio with copies of its forecasts). It is understood that at such time as PacBio has so [***] its [***] to [***] such [***]Product,

PacBio will have the right to [***] of such [***]Product with such [***] to be made over the course of a [***]Period in which [***] by PacBio is [***] with a [***] by Invitae, its Affiliate or its [***] over a period [***] to [***] [***]S

(a) [***]Products. The "**[***]**" for each of the applicable [***]Products and the [***]Products shall depend upon whether the applicable [***]Period for such products is in effect as set forth below:

(i) For each [***]Product during the [***]Period, and for each [***]Product during the [***]Period, in each instance where the intended use of the [***]Product during the applicable [***]Period is within the [***], the [***] for each applicable [***]Product shall be [***] to [***] for such [***]Product.

(ii) After the [***]Period for the applicable [***]Product, the [***] shall be mutually agreed upon between the Parties and set forth in the [***]; provided, however, that the [***] for Invitae shall be [***] the following:

(1) for the shorter of (i) [***] after the [***]Period or (ii) following any [***]Period during which Invitae does not purchase a sufficient number of [***] comprising the [***]Products to [***] at least [***] under the [***] after the [***]Period (the "**[***]Period**"):

a) for [***]Systems, an [***] to [***]; and

b) for [***] comprising [***]Products, an [***] to the [***] of (i) [***] or (ii) [***] of [***] necessary to [***] using a [***]System including necessary [***]; provided, however, if [***] for such [***] of [***] is [***] than [***], then the [***] of (x) [***] and (y) [***]; and

(2) for the [***] of (i) [***] after the [***]Period or (ii) following any [***]Period during which Invitae does not purchase a sufficient number of [***] comprising the [***]Products to [***] at least [***] under the [***] after the [***]Period (the "**[***]Period**"):

a) for [***]Systems, an [***] to [***]; and

(3) for [***] comprising [***]Products, an [***] to the [***] of (i) [***] or (ii) [***] of [***] necessary to [***] using a [***]System including necessary [***]; provided, however, if [***] for such quantity of [***] is [***] than [***], then the [***] of (x) [***] and (y) [***].

(iii) From the Effective Date through the end of the [***]Period, with respect to [***]Products, and from the Effective Date through the end of the [***]Period, with respect to [***]Products (each an "**[***] [***]Period**"), if the [***] paid to PacBio or any Affiliate by any [***] of a [***]Product or a [***] (as defined below) (with such [***] evaluated on an aggregate basis for a [***]System or an [***]System, as applicable, plus the [***] for such system) is [***] any [***] [***] by Invitae for the applicable [***]Product (whether or not the intended use of the [***]Product by Invitae is within the [***]), then (A) the [***] deemed [***] (for the portion of the applicable [***]Period commencing with the effectiveness of such [***]) calculated from each instance where [***] [***] was [***] than such [***] by such [***] shall be promptly [***] to [***] and (B) such [***] shall thereafter be a [***] on the [***] for Invitae for so long as the [***] is [***] to the [***]. Notwithstanding the foregoing, the following [***] shall be excluded from the coverage of this Section 9.1.3: (x) [***] purchases of [***]Products where use thereof (including end use of information) is [***] to [***] or [***] or [***] outside of [***] and [***]; and (y) [***] purchases resulting directly from [***] which are [***] in [***] and [***] solely to allow [***] to evaluate [***]Products.

(iv) For purposes of this Section 9.1:

(1) "**[***]Period**" means the period beginning upon the Effective Date and ending upon the earliest of (i) the [***] of the date of delivery of the first [***]Product (inclusive of the [***]System) by PacBio to Invitae, (ii) the date upon which Invitae has [***] using [***]Products and (iii) the date upon which the [***] under the [***] equals the lesser of the following (the "**[***]**"): (A) [***] of the [***] paid or payable by Invitae to PacBio as of the end of the [***] in which the [***] of a [***]System is [***] to Invitae; or (B) [***] determined by [***] and set forth in [***] to PacBio;

(2) "**[***]**" is the cumulative amount equal to the excess of (i) [***] for [***]Products delivered to Invitae from and after the date of delivery of the first [***]Product (inclusive of the [***]System) by PacBio to Invitae over (ii) the [***] by [***] for such [***]Products;

(3) "**[***]Period**" means the period beginning upon the Effective Date and ending upon the earlier of (i) the [***] of the [***] of [***] of the first [***]Product (inclusive of the [***]System) by PacBio to Invitae, (ii) the date upon which Invitae has [***] using the [***]Products or (iii) the date upon which the [***] under the [***] equals the sum of (A) [***] of the [***] or [***] by [***] to [***] less (B) the [***] Amount;

(4) "**[***]**" is the cumulative amount equal to the excess of (i) [***] of [***] for [***]Products delivered to Invitae from and after the date of delivery of the

first [***]Product (inclusive of the [***]System) by PacBio to Invitae over (ii) the [***] by [***] for such [***]Products;

(5) "**[***]**" means, with respect to a [***]Product, the [***] for such [***]Product calculated using the [***] by agreement of the Joint Steering Committee (such agreement not to be unreasonably withheld or delayed); provided that PacBio's obligation to [***] shall be subject to such [***] or, in the absence of such [***], resolution pursuant to the [***] set forth in Section [***] (as contemplated by the [***]). The Parties shall determine (through the Joint Steering Committee) the [***] for the calculation of [***] within [***] of execution of this Agreement; for clarity, any failure to [***] shall be subject to the [***] set forth in Section [***].

(6) "**[***]Period**" means, individually and collectively, (i) the [***]Period, and (ii) the [***]Period.

(b) [***]Adjustments to [***]s. Subject to the provisions of Section 9.1, upon written notice by PacBio or upon the written request of Invitae the [***] set forth in this Article 9 may be [***] no more than [***] to reflect the [***] in [***] in respect of each applicable [***]Product.

10.
PAYMENTS; BOOKS AND RECORDS

(a) Payment Method. All payments under this Agreement shall be made by check or bank wire transfer in immediately available funds to an account designated by the receiving Party. All amounts specified or referenced in this Agreement, and all payments made hereunder, are and shall be made in U.S. dollars. Any undisputed payments due under this Agreement which are not paid by the date such payments are due under this Agreement shall bear interest in the lesser amount of (a) the U.S. prime rate per annum quoted in the "Money Rates" column of The Wall Street Journal (U.S., Internet Edition) on the date such payment is due plus 300 basis points, or (b) the highest rate allowed by applicable law, calculated on the number of days such payment is delinquent. This Section 10.1 shall in no way limit any other remedies available to either Party.

(b) Taxes. Each Party shall be solely responsible for the payment of all taxes imposed on such Party arising directly or indirectly from the payments and activities of the Parties under this Agreement. The Parties agree to cooperate with one another and use reasonable efforts to reduce or eliminate tax obligations in respect of the reimbursement payments and other payments made under this Agreement or to obtain tax credits that may be available to either Party with respect to the activities contemplated by this Agreement.

(c) Records; Inspection. PacBio shall keep (or cause to be kept) complete, true and accurate books of accounts and records for the purpose of determining the amounts payable pursuant to this Agreement. Such books and records shall be kept at the principal place of business of PacBio for at least [***] following the end of the [***] to which they pertain; provided, however, that complete records with respect to all [***] shall be kept for at least [***] following the end of the [***]Period. Such records will be open for inspection during such [***] period (or the longer period noted for [***]) by an independent auditor chosen by [***] and reasonably acceptable to [***] for the purpose of verifying the amounts payable or calculable hereunder. Such inspections may be made no more than once in any [***] period, at reasonable times and on reasonable notice. Inspections conducted under this Section 10.3 shall be at the expense of Invitae, unless variations or errors producing an overpayment, an underpayment or an incorrect calculation, as applicable, in an amount exceeding [***] for the period covered by the inspection is established in the course of any such inspection, whereupon all costs relating to the inspection for such period shall be paid by PacBio and any unpaid amounts or incorrect calculations shall be promptly rectified (together with interest on any amounts payable by PacBio at the rate set forth in Section 10.1). The Parties will endeavor to minimize disruption of PacBio's normal business activities to the extent reasonably practicable.

11. INTELLECTUAL PROPERTY

(a) Ownership of Inventions. As between the Parties, all right, title and interest to inventions (i) made or created by or on behalf of [***] under the [***] in connection with its activities with respect to the [***]Products, (ii) made or created by or on behalf of [***] as a direct result of the [***], to the extent such invention comprises a [***] or [***] used with the [***]Products [***] by [***], or (iii) resulting from any joint activities within the foregoing clauses (i) and (ii), and in the case of each of the foregoing clauses (i), (ii) and (iii) all intellectual property rights, including patent rights, therein (collectively, such inventions and rights, the "**[***]**"), shall be solely owned by [***]. Accordingly, [***] hereby assigns to [***] all right, title and interest of [***] in and to the [***] as and when such [***] is defined. [***] shall take all reasonable actions and execute all documents necessary to effect the intent of the preceding sentence. For clarity and notwithstanding any provision herein to the contrary: all inventions made or created by or on behalf of [***]e, either (A) through use of any [***]Product [***] by [***] under the [***] or, prior to [***], any [***]Product [***] to [***] by [***], (except for inventions described in clause (ii) of this Section 11.1, which are owned by [***]) or (B) in connection with the development of [***]Products as contemplated under this Agreement to the extent any such invention is useful or applicable to [***] or [***] other than those of [***], shall be solely owned by [***] and [***] from [***] (the subject matter and intellectual property described in clause (B), to the extent incorporated into any [***]Products [***] by [***], individually and collectively, the "**[***]**").

(b) License Grants.

(i) To [***].

(1) (i) During the term of this Agreement and subject to the terms of this Agreement and notwithstanding any rights acquired pursuant to the [***] of any [***]Products, [***] grants to [***] and [***] a non-exclusive, fully-paid, royalty-free, worldwide license to practice the [***] for [***] and [***]. The license in this Section 11.2.1(a)(i) includes the [***] solely to [***] or more [***] or [***] to [***] such [***] for [***] and [***] solely for purposes of [***] such [***]. (ii) Subject to the terms of this Agreement, [***] grants to [***] and [***] a non-exclusive, perpetual, irrevocable, fully-paid, royalty-free, worldwide license, with the right to grant sublicenses, to [***] and [***] the [***] conceived and reduced to practice solely by [***] or jointly by the Parties ("**[***]**") for any purpose, including to research, develop, manufacture, have manufactured, use, sell, offer for sale, create derivative works, distribute, import, export or otherwise commercialize such [***].

(2) In the event this Agreement is terminated in accordance with [***] (other than by [***] pursuant to Section [***] or [***] pursuant to Section [***]), [***] shall, and hereby does, grant to [***] and [***] a non-exclusive, perpetual, irrevocable, fully-paid, royalty-free, worldwide license, with the right to grant sublicenses (subject to the limitations below), to practice and exploit the [***] made or created as a direct result of the [***] to research, develop, manufacture, have manufactured and use the [***] in the [***] of [***]. The license in this Section 11.2.1(b) includes the right to [***] to [***] one or more [***] or [***] to perform such research, development and manufacture of products comprising [***] for [***] and [***]. [***] shall notify [***] of any [***] in respect of the [***]. For the avoidance of doubt, the license in this Section 11.2.1(b) (i) excludes the right to [***] or [***] any [***] comprising [***] owned by [***] (pursuant to Section [***]) to or on behalf of [***], and (ii) does not cover inventions made or created by or on behalf of [***] prior to the Effective Date or acquired, created or invented by [***] outside of the [***] or any intellectual property with respect thereto.

(ii) To [***]. During the term of this Agreement and subject to the terms of this Agreement, [***] grants to [***] a non-exclusive, fully-paid, royalty-free, worldwide license to use inventions made or created by [***] in [***] of the [***] (to the extent ownership is retained by [***] under Section [***]), solely to the extent necessary for [***] to [***] under the [***]. Further, [***] hereby grants to [***] a non-exclusive, perpetual, irrevocable, fully-paid, royalty-free, worldwide license, with the right to grant sublicenses, to practice and exploit the [***] for any purpose, including to research, develop, manufacture, have manufactured, use, sell, offer for sale, create derivative works, distribute, import, export or otherwise commercialize the [***].

(c) No Implied License. Other than as expressly provided herein, neither Party grants the other Party any other rights or licenses under this Agreement, whether by implication, estoppel or otherwise.

12.
CONFIDENTIALITY, PUBLIC ANNOUNCEMENTS

(a) Confidential Information. Except as expressly provided herein, the Parties agree that, for the term of this Agreement and five (5) years thereafter, the Receiving Party (as defined below) shall keep confidential and not publish or otherwise disclose and shall not use for any purpose Confidential Information of the Disclosing Party except in connection with the obligations and the rights of the Receiving Party under this Agreement or otherwise as expressly permitted hereunder or with the prior written consent of the Disclosing Party. Each Receiving Party agrees to treat the applicable Disclosing Party's Confidential Information with the same degree of care such Receiving Party uses to protect such Receiving Party's own confidential information, but in no event with less than a reasonable degree of care. "**Confidential Information**" means all confidential or proprietary information disclosed by the disclosing Party or any of its Affiliates (the "**Disclosing Party**") to the receiving Party or any of its Affiliates ("**Receiving Party**"), whether made available orally, in writing, or in electronic form, including information comprising or relating to concepts, discoveries, inventions, know how, data, designs, formulae, financial information, product roadmaps, operational information, specifications, processes, techniques, sequences, or models.

(b) Exclusions. Notwithstanding the foregoing, Confidential Information shall not include information that, in each case as demonstrated by written documentation:

(i) was already known to the Receiving Party, other than under an obligation of confidentiality to the Disclosing Party, at the time of disclosure;

(ii) was generally available to the public or otherwise part of the public domain at the time of its disclosure to the Receiving Party;

(iii) became generally available to the public or otherwise part of the public domain after its disclosure and other than through any act or omission of the Receiving Party in breach of this Agreement;

(iv) was subsequently lawfully disclosed to the Receiving Party by a Third Party; or

(v) was developed by the Receiving Party without reference to any information or materials disclosed by the Disclosing Party.

(c) Permitted Disclosures. Notwithstanding the provisions of Section 12.1, each Party hereto may disclose the other Party's Confidential Information to the extent such disclosure is reasonably necessary to exercise its rights or fulfill its obligations under this Agreement, prosecuting or maintaining patent and other intellectual property rights owned by such Party hereunder, prosecuting or defending litigation, complying with applicable

governmental regulations, or submitting information to tax or other governmental authorities, provided that if a Party is required to make any such disclosure of the other Party's Confidential Information, to the extent it may legally do so, it will give reasonable advance notice to such other Party of such disclosure and, save to the extent inappropriate or unavailable, will use its reasonable efforts to secure confidential treatment of such information prior to its disclosure (whether through protective orders or otherwise).

(d) Ownership. The Receiving Party hereby acknowledges that, as between the Parties, the Disclosing Party is the owner or licensee of its Confidential Information, including originals and copies of all notes, reports and other documents prepared by the Receiving Party to the extent including such Confidential Information. Confidential Information shall not be reproduced by the Receiving Party in any form except as required to perform the obligations or to exercise the rights of the Receiving Party under this Agreement. Any reproduction of any Confidential Information shall remain the property of the Disclosing Party and shall contain any and all confidential or proprietary notices or legends which appear on the original, unless otherwise authorized in writing by the Disclosing Party. The Receiving Party does not and will not acquire by implication or otherwise any right in, title to or license in respect of the Confidential Information disclosed to it by the Disclosing Party, except as otherwise expressly set forth in this Agreement.

(e) Return of Confidential Information. Upon receipt of a written request from the Disclosing Party following the expiration or termination of this Agreement, the Receiving Party will, at the election of the Disclosing Party, either destroy (with written confirmation thereof delivered to the Disclosing Party) or deliver to the Disclosing Party all documents and other materials provided by the Disclosing Party to the Receiving Party (or any reproductions thereof) constituting the Disclosing Party's Confidential Information.

(f) Independent Development and Residuals. Notwithstanding any provision in this Agreement to the contrary: (a) this Agreement and the terms of confidentiality and nonuse hereunder shall not be construed to limit Invitae's right to independently develop or acquire products or technology, including products or technology that are similar to, or that compete with, any of the [***]Products; and (b) the Receiving Party shall be free to use for any purpose the residuals resulting from access to or work with the Disclosing Party's Confidential Information. The term "residuals" means information in non-tangible form that may be retained in the unaided memories of individuals who have had rightful access to Confidential Information under this Agreement, including ideas, concepts, know-how or techniques contained therein. No Party shall have any obligation to limit or restrict the assignment or reassignment of such individuals or to pay royalties for any work resulting from the use of residuals. However, the provisions of this Section 12.6 shall not be deemed to grant to any Party a license under the other Party's copyrights or patents.

(g) Prior CDA. This Agreement supersedes the Confidentiality Agreement between the Parties dated as of February 18, 2020 (the "**Prior CDA**") with respect to

information disclosed thereunder. All information or materials disclosed or provided by a Party or its Affiliates to the other Party (or its representatives) under the Prior CDA shall be deemed Confidential Information of such Party (subject to the exceptions set forth herein).

(h) Public Announcements; Confidential Terms.

(i) The Parties have agreed upon a joint press release to announce the execution of this Agreement, which is attached as Exhibit C; the release of which the Parties shall coordinate in order to accomplish such release promptly following execution of this Agreement.

(ii) Neither Party shall disclose to any Third Party, or issue any other public announcement, press release, advertisement, promotion or other public disclosure regarding the terms of this Agreement or use the other Party's name or the name of any Affiliate of the other Party, without the other Party's prior written consent, except any such disclosure that is required by applicable law or the rules of any securities exchange on which the securities of the disclosing Party are listed. In the event a Party determines in good faith that it is required by applicable law or the rules of any securities exchange on which its securities are listed to make a public disclosure regarding the terms of this Agreement, such Party shall submit the proposed disclosure in writing (including, as applicable, the proposed redacted form of this Agreement) to the other Party as far in advance as reasonably practicable (and in no event less than five (5) Business Days prior to the anticipated date of disclosure) so as to provide a reasonable opportunity for the other Party to comment thereon. The Party making such disclosure shall use good faith efforts to incorporate the reviewing Party's reasonable comments and, as applicable, seek confidential treatment for the redacted terms of this Agreement to the extent such confidential treatment is applicable and reasonably available. Each Party shall be responsible for its own legal and other external costs in connection with any such disclosure. Neither Party shall be required to seek the permission of the other Party to repeat any information regarding the terms of this Agreement or any amendment hereto that has already been publicly disclosed by such Party, or by the other Party, in accordance with this Section 12.8, provided that such information remains accurate as of such time and provided the frequency and form of such disclosure are reasonable.

13. REPRESENTATIONS AND WARRANTIES

(a) Mutual Warranties. Each Party represents, warrants and covenants to the other Party that:

(i) it has and shall continue to maintain the full right and authority to enter into and perform this Agreement; and

(ii) it is not and shall not be party to any agreement that conflicts with its representations, warranties, or obligations under this Agreement.

(b) PacBio Warranties. PacBio represents, warrants and covenants to Invitae that:

(i) it has obtained and shall continue to maintain all licenses, authorizations, approvals, consents, or permits required by applicable law to conduct its business generally and to perform its obligations under this Agreement; and

(ii) the [***]Products will (i) conform, at a minimum, to ordinary standards of care, and (ii) be of at least the same grade, quality, and value as [***] sold under similar circumstances.

14.
INDEMNIFICATION, LIMITATION OF LIABILITY

(a) Indemnification of [***]. [***] shall defend each of [***] and its trustees, directors, officers, and employees and the successors and assigns of any of the foregoing (each an "**[***] Indemnitee**"), and indemnify and hold harmless each [***] Indemnitee from and against any and all claims, actions, proceedings, liabilities, damages, settlements, penalties, fines, costs or expenses (including, without limitation, reasonable attorneys' fees and other expenses of litigation) in each case brought by a Third Party against any [***] Indemnitee arising out of the following (each an "**[***] Claim**"): (i) any breach by [***] of any of its representations, warranties or covenants under this Agreement; (ii) any negligence, recklessness or misconduct of [***] or any of its Affiliates or designees (including any of the employees, agents, or consultants of [***] or any of its Affiliates or designees) in performing the obligations of [***] under this Agreement; (iii) any failure of [***] or any of its Affiliates or designees (including any of the employees, agents, or consultants of [***] or any of its Affiliates or designees) to comply with any applicable federal, state, local or foreign laws, regulations, or codes in the performance of the obligations of [***] under this Agreement; or (iv) any allegation of infringement or misappropriation of a Third Party's intellectual property rights by a [***]Product or in the performance of the obligations of [***] under this Agreement, including any direct or indirect infringement of Third Party patents and any infringement or misappropriation related to the development, manufacture, use, offer for sale, sale or import of any [***]Product. [***] shall have no obligation to any [***] Indemnitee under this Section 14.1 to the extent an [***] Claim results from the breach of this Agreement, gross negligence or knowing and willful misconduct of the [***] Indemnitee.

(b) Indemnification of [***]. [***] shall defend each of [***] and its trustees, directors, officers, and employees and the successors and assigns of any of the foregoing (each a "**[***] Indemnitee**"), and indemnify and hold harmless each [***] Indemnitee from and against any and all claims, actions, proceedings, liabilities, damages, settlements, penalties, fines, costs

or expenses (including, without limitation, reasonable attorneys' fees and other expenses of litigation) in each case brought by a Third Party against any [***] Indemnitee arising out of the following (each a "**[***] Claim**"): (i) any breach by [***] of any of its representations, warranties or covenants under this Agreement; (ii) any negligence, recklessness or misconduct of [***] or any of its Affiliates or designees (including any of the employees, agents, or consultants of [***] or any of its Affiliates or designees) in performing the obligations of [***] under this Agreement; or (iii) any failure of [***] or any of its Affiliates or designees (including any of the employees, agents, or consultants of [***] or any of its Affiliates or designees) to comply with any applicable federal, state, local or foreign laws, regulations, or codes in the performance of the obligations of [***] under this Agreement. [***] shall have no obligation to any [***] Indemnitee under this Section 14.2 to the extent a [***] Claim results from the breach of this Agreement, gross negligence or knowing and willful misconduct of the [***] Indemnitee.

(c) Procedure. A party (the "**Indemnitee**") that intends to require indemnification under this Article 14 shall promptly notify the other party (the "**Indemnitor**") in writing of any [***] Claim or [***] Claim (any, a "**Claim**") in respect of which the Indemnitee intends to require such indemnification in accordance with Article 14; provided, however, that the failure to give such notice shall not relive the Indemnitor of its obligations hereunder except to the extent that such Indemnitor is materially prejudiced by such failure. The Indemnitor will have the sole right to defend, negotiate, and settle such claims. The Indemnitee will be entitled to participate in the defense of such matter and to employ counsel at its expense to assist in such defense; provided, however, that the Indemnitor will have final decision-making authority regarding all aspects of the defense of the claim. The Indemnitee will provide the Indemnitor with such information and assistance as the Indemnitor may reasonably request, at the expense of the Indemnitor. Neither party will be responsible nor bound by any settlement of any claim or suit made without its prior written consent; provided, however, that the Indemnitee will not unreasonably withhold or delay such consent. It is understood that only [***] may claim indemnity under this Article 14 (on its own behalf or on behalf of an [***] Indemnitee), and other [***] Indemnitees may not directly claim indemnity hereunder. Likewise, it is understood that only [***] may claim indemnity under this Article 14 (on its own behalf or on behalf of a [***] Indemnitee), and other [***] Indemnitees may not directly claim indemnity hereunder.

(d) Mitigation of Loss; Reliance. Each Indemnitee will take, and will procure that its Affiliates take, all such reasonable steps and action as are necessary (or, as the Indemnitor may reasonably require, at the Indemnitor's expense) in order to mitigate any Claims (or potential losses or damages) under this Article 14. Nothing in this Agreement shall or shall be deemed to relieve any Party of any common law or other duty to mitigate any losses incurred by it. The right of an Indemnitee to indemnification or to assert or recover on any Claim shall not be affected by any investigation conducted with respect to matters relating thereto, or any knowledge acquired or capable of being acquired, at any time, whether before or after the execution and delivery of this Agreement, including with respect to the accuracy of or compliance with any of the representations, warranties, covenants, or agreements set forth in this Agreement. The waiver of any condition based on the accuracy of any representation or warranty, or on the performance of or compliance with any covenant or agreement, shall not

affect the right to indemnification or other remedy based on such representation, warranty, covenant or agreement.

(e) Mitigation of an Infringement Claim. If either Party receives or otherwise learns of any [***] or [***] alleging that [***], or any [***] or [***], of any [***]Product violates a Third Party's intellectual property rights (each an "**IP Notice**"), such Party shall promptly notify the other Party in writing. At the request of either Party, the Joint Steering Committee shall thereafter promptly consider the matter (taking into consideration all relevant factors including the likely scope and enforceability of the applicable intellectual property rights and availability of necessary right to such intellectual property on commercially reasonable terms) and, if [***] and [***] to [***] of any [***]Product by the Joint Steering Committee, [***] at its own expense shall promptly take at least one the following actions: (a) secure for [***] the right to continue using such [***]Product; or (b) replace or modify any aspect of the [***]Product to make it non-infringing, provided such modification or replacement does not materially degrade any functionality of such [***]Product; provided, however, that if, upon [***] request, the Joint Steering Committee makes a determination that both of the foregoing clauses (a) and (b) are [***], then (x) [***] shall not be obligated to take at least one of such clause (a) or clause (b) actions and the Parties may continue with the [***], or (y) [***] may [***] this Agreement at any time following the [***] of the Effective Date. If the Joint Steering Committee does not [***] whether an IP Notice reflects a matter [***] to [***] of any [***]Product, the matter may be [***] to [***] pursuant to Section [***]. The remedies set forth in this Section 14.5 are in addition to, and not in lieu of, all other remedies that may be available to [***] under this Agreement or otherwise, including [***]'s right to be indemnified pursuant to Section 14.1.

(f) Special, Indirect, and Other Losses. NEITHER PARTY NOR ANY OF ITS AFFILIATES SHALL BE LIABLE IN CONTRACT, TORT, NEGLIGENCE, BREACH OF STATUTORY DUTY, OR OTHERWISE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES OR FOR ANY LOSS OF PROFITS SUFFERED BY THE OTHER PARTY. NOTWITHSTANDING THE FOREGOING, NOTHING IN THIS SECTION 14.6 IS INTENDED TO OR SHALL LIMIT OR RESTRICT: (A) THE INDEMNIFICATION RIGHTS OR OBLIGATIONS OF ANY PARTY UNDER SECTION 14.1 OR SECTION 14.2, AS APPLICABLE; OR (B) ANY DAMAGES AVAILABLE FOR A PARTY'S BREACH OF ITS CONFIDENTIALITY OBLIGATIONS IN ARTICLE 12.

15. TERM AND TERMINATION

(a) Term. Unless otherwise agreed in writing or terminated in accordance with this Article 15, the term of this Agreement shall commence on the Effective Date and shall continue in full force and effect until the expiration of the last to expire of the [***]Periods and [***]Periods.

(b) Termination for Cause. Subject to the requirements of this Section 15.2, either Party may terminate this Agreement in the event the other Party is in material breach of any material obligation hereunder. In the event of a material breach, the non-breaching Party shall give written notice to the breaching Party specifying the claimed particulars of such breach and, in the event such material breach is not cured within ninety (90) days after the breaching Party's receipt of such notice, the non-breaching Party shall have the right thereafter to terminate this Agreement immediately by giving written notice referencing this Section 15.2 to the breaching Party to such effect; provided, that if such breach is reasonably capable of being cured but cannot be cured within such ninety (90)-day period and the breaching Party initiates actions to cure such breach within such period and thereafter diligently pursues such actions, the breaching Party shall have such additional period as is reasonable in the circumstances to cure such breach. In the event that dispute resolution procedures have commenced in accordance with Section 16.2 with respect to any alleged breach hereunder, no purported termination of this Agreement pursuant to this Section 15.2 shall take effect until the resolution of such procedure. Any termination by any Party under this Section 15.2 and the effects of termination provided herein shall be without prejudice to any damages or other legal or equitable remedies to which it may be entitled.

(c) Termination Without Cause. Invitae may terminate this Agreement without cause by providing PacBio with one hundred eighty (180) days written notice; provided, however, that such notice may not be delivered prior to the date which is twelve (12) months after the Effective Date.

(d) Termination Due to [***]. If a Development [***] occurs or [***] notifies [***] in writing of [***]'s good faith determination that the occurrence of a Development [***] in respect of the [***]Product (i.e., a Development [***] pursuant to Section 3.3.2) is reasonably probable, [***] may unilaterally terminate this Agreement upon written notice to [***].

(e) Termination Due to Impracticality or Infeasibility. [***] may terminate this Agreement upon written notice to [***] if [***] determines in good faith (after consultation with [***] through the Joint Steering Committee) that, after taking commercially reasonable and diligent efforts, the development of the [***]Products is technically or commercially infeasible or impracticable; provided, however, that such notice may not be delivered prior to the date which is [***] after the Effective Date.

(f) IP Infringement. [***] may terminate this Agreement as set forth in Section [***] or following entry of a [***] or [***] or [***] by a court of competent jurisdiction with respect to the manufacture or use of any [***]Product or any [***] or [***].

(g) Change in Control. [***] shall promptly notify [***] in writing of any Change in Control and shall provide [***] with the name of any Persons involved in the Change

in Control. [***] shall have a period beginning on the date of consummation of the Change in Control and ending on the date that is ninety (90) days after the date of consummation of the Change in Control (or, if later, ninety (90) days after the date [***] notifies [***] in writing of the consummation of the Change in Control) to terminate this Agreement, unless prior to the Change in Control [***] notifies [***] in writing of the planned Change in Control and provides [***] with the name of any Persons involved in the planned Change in Control and [***] thereafter consents in writing not to exercise its right of termination in respect of such Change in Control pursuant to this Section 15.7. [***] agrees that it will not unreasonably withhold or delay such consent assuming that any information and assurances reasonably requested by [***] with respect to the planned Change in Control as well as from any Persons involved in the planned Change in Control are promptly provided to [***].

(h) Effect of Termination.

(i) Effect of Termination by [***].

(1) Upon termination of this Agreement by [***] (as non-breaching party) under Section [***], [***] shall, within thirty (30) days following the effective date of such termination, pay [***] the amount of any [***] reflected in the approved [***] in effect as of the date of notice of termination to the extent the incurrence by [***] of such [***] is unavoidable or any previous [***] incurred are not recoverable with commercially reasonable effort.

(2) Upon termination of this Agreement by [***] under Section [***], (i) [***] shall promptly wind down the [***] and (ii) [***] shall not be obligated to [***] to [***] following the date of such termination notice. (A) If the Joint Steering Committee agrees with [***] position related to [***] (such agreement not to be unreasonably withheld), then if [***] subsequently restarts the development or commercialization of the [***]System or [***]System or any [***], [***] will promptly notify [***]. Further, in the event of any commercialization of any [***]Product or any [***] based on a [***], [***], together with [***] intended for [***] (each, a "**[***]**") after a termination pursuant to Section [***], [***] shall pay a fee to [***] for each such [***] and [***] sold or licensed to a Third Party by [***] or its Affiliates, or any licensee, transferee, successor or assign of any of the assets thereof, in the amount of [***] of the [***] from such [***] and [***]; provided, however, that the aggregate fee payable to [***] shall be capped at an amount equal to [***] of the [***] paid by [***] to [***]. (B) Alternatively, if the Joint Steering Committee does not agree with [***] position, then [***] shall immediately [***] to [***] in [***] (*i.e.*, [***]) paid by [***] to [***] between the Effective Date and the date of such termination notice. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of such termination notice. Further, in the event of any commercialization of any [***]Product or any [***], [***] shall pay a fee to [***] for each such [***] and [***] sold or licensed to a Third Party by [***]

or its Affiliates, or any licensee, transferee, successor or assign of any of the assets thereof, in the amount of [***] of the [***] from such [***] and [***]; provided, however, that the aggregate fee payable to [***] shall be capped at an amount equal to [***] of the [***] paid by [***] to [***] less [***] of the aggregate [***] as of the date of termination

(ii) Effect of Termination by [***].

(1) Upon termination of this Agreement by [***] under Section [***] (as non-breaching party), [***] shall immediately refund to [***] in full all amounts (*i.e.*, [***]) paid by [***] to [***] between the Effective Date and the date of such termination notice. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of such termination notice. Further, in the event of any commercialization of any [***]Product or any [***], [***] shall pay a fee to [***] for each such [***] and [***] sold or licensed to a Third Party by [***] or its Affiliates, or any licensee, transferee, successor or assign of any of the assets thereof, in the amount of [***] of the [***] from such [***] and [***]; provided, however, that the aggregate fee payable to [***] shall be capped at an amount equal to [***] of the [***] paid by [***] to [***] less [***] of the aggregate [***] as of the date of termination.

(2) Upon termination of the Agreement by [***] under Section [***], [***] shall, within thirty (30) days following the effective date of such termination, pay [***] the amount of any [***] for the three month period following the date of termination reflected in the approved [***] in effect as of the date of notice of termination to the extent the incurrence by [***] of such [***] is unavoidable or any previous [***] incurred are not recoverable with commercially reasonable effort. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of such termination notice.

(3) Upon termination of this Agreement by [***] under Section [***]:

a) If the Development [***] is in respect of the [***]Product, [***] shall not have any immediate reimbursement obligation to [***]; provided, however, that in the event of any subsequent commercialization of any [***]Product or any [***], [***] shall refund to [***] an amount equal to the [***] paid by [***] to [***] within sixty (60) days of the first commercial sale thereof. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of the termination notice.

b) If the Development [***] is in respect of the [***]Product, [***] shall, within thirty (30) days following the effective date of such termination, [***] to [***] in [***] the sum of [***] of all [***] paid by [***] to [***] between

the date of delivery of the first [***]Product and the date of such termination notice. For the avoidance of doubt, [***] shall not be obligated to [***] to [***] following the date of such termination notice. Further, in the event of any commercialization of any [***]System or any ultra-high throughput [***], [***] shall [***] a [***] to [***] for each such [***] and [***] [***] or [***] to a Third Party by [***] or its Affiliates, or any licensee, transferee, successor or assign of any of the assets thereof, in the amount of [***] of the [***] from such [***] and [***]; provided, however, that the aggregate fee payable to [***] shall be capped at an amount equal to [***] of the [***] paid by [***] to [***] following the date of delivery of the first [***]Product.

(4) Upon termination of this Agreement by [***] under Section [***], [***] shall, within thirty (30) days following the effective date of such termination, refund to [***] in full the sum of (i) all [***] paid by [***] to [***] between the Effective Date and the date of such termination notice less (ii) [***] of the aggregate [***] as of the date of termination. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of such termination notice.

(5) Upon termination of this Agreement by [***] under Section [***], [***] shall, within thirty (30) days following the effective date of such termination, refund to [***] in full the sum of (i) all [***] paid by [***] to [***] between the Effective Date and the date of such termination notice less (ii) [***] of the aggregate [***] as of the date of termination. For the avoidance of doubt, [***] shall not be obligated to make any further payments to [***] following the date of such termination notice. Further, in the event of any commercialization of any [***]Product or any [***], [***] shall pay a fee to [***] for each such [***] and [***] sold or licensed to a Third Party by [***] or its Affiliates, or any licensee, transferee, successor or assign of any of the assets thereof, in the amount of [***] of the [***] from such [***] and [***]; provided, however, that the aggregate fee payable to [***] shall be capped at an amount equal to [***] of the [***] paid by [***] to [***] less [***] of the aggregate [***] as of the date of termination.

Notwithstanding anything in the contrary in this Section 15.8, [***]'s obligation to share any [***] from [***]Products or [***] shall terminate if [***] notifies [***] that it has abandoned (without the intent to restart) the development or commercialization of any [***]Product or [***]; provided that if [***] or any Affiliate, or any licensee, transferee, successor or assign of any of the assets thereof, ever restarts such development or commercialization [***] shall promptly notify [***] and such obligation shall be restored.

(i) Accrued Liability. Except as expressly set forth herein, termination or expiration of this Agreement for any reason shall not release either Party hereto from any liability which at the time of such termination or expiration has already accrued to the other Party prior to such time. Such termination or expiration will not relieve a Party from accrued payment

obligations or from other obligations which are expressly indicated in this Agreement to survive termination or expiration of this Agreement.

(j) Survival. The following provisions shall survive the expiration or termination of this Agreement for any reason: Articles 1 and [***] through [***] (inclusive).

(k) Termination Not Sole Remedy. Termination is not the sole remedy under this Agreement and, whether or not termination is effected and notwithstanding anything contained in this Agreement to the contrary, all other remedies will remain available except as agreed to otherwise herein.

16.
MISCELLANEOUS

(a) Governing Law. This Agreement and any dispute arising from the performance or breach hereof shall be governed by and construed and enforced in accordance with, the laws of the State of California, United States, without reference to conflicts of laws principles and without regard to the 1980 Convention on the International Sale of Goods.

(b) Dispute Resolution. The Parties recognize that disputes may arise that might not be resolved by the Joint Steering Committee. It is the Parties' objective to establish procedures to facilitate the resolution of all disputes or controversies arising out of, in relation to, or in connection with this Agreement, or the validity, enforceability, construction, performance or breach hereof (each a "**Dispute**"), in an expedient manner by mutual cooperation and without resort to arbitration. Unless otherwise expressly provided in this Agreement, all Disputes will be subject to this Section 16.2. Either Party may initiate the dispute resolution procedure of this Section 16.2 by giving the other Party written notice of any Dispute in accordance with the terms of Section 16.6 (a "**Notice of Dispute**"). For clarity and without limitation, in any instance where the agreement, decision, determination or other action of the Joint Steering Committee is called for or otherwise required and the Joint Steering Committee cannot reach a unanimous decision at a Joint Steering Committee meeting or within twenty (20) Business Days thereafter, the matter shall be deemed a Dispute and resolved in accordance with this Section 16.2 and the resolution of such matter pursuant to this Section 16.2 shall be deemed to be the unanimous decision of the Joint Steering Committee for purposes of this Agreement.

(i) Senior Executives. If the Parties are unable to resolve any Dispute between them, either Party may, by delivery of a Notice of Dispute to the other, have such Dispute referred to the Chief Executive Officers of the Parties for attempted resolution by good faith negotiations for a period of fifteen (15) Business Days after such Notice of Dispute is received. Unless otherwise mutually agreed, within five (5) Business Days of delivery of the Notice of Dispute, the Chief Executive Officers of the Parties shall meet in person, or by

teleconference, at a mutually agreeable time and place, and thereafter as often as they reasonably deem necessary, to attempt in good faith to resolve the Dispute. If the Parties are unable to resolve such Dispute in accordance with the aforementioned procedure or within such fifteen (15) Business Day period (the last day of such time period, the "**Escalation to Mediation Date**"), either Party may initiate mediation under Section 16.2.2.

(ii) Mediation. Subject to Section 16.2.1, the Parties may, at any time after the Escalation to Mediation Date, submit the Dispute at issue to any mutually agreed upon mediation service for mediation by providing to the mediation service a joint, written request for mediation, setting forth the subject of the Dispute and the relief requested. The Parties shall cooperate with one another in selecting a mediation service, and shall cooperate with the mediation service and with one another in selecting a neutral mediator and in scheduling the mediation proceedings. The Parties acknowledge and agree that they will attempt in good faith to select a mediator with experience relevant to the Dispute (including, for example, that the mediator need not be a retired judge or lawyer, but could, as applicable, be someone with relevant business, industry or professional experience). The Parties covenant that they will use commercially reasonable efforts toward engagement in the mediation. The Parties agree that the mediator's fees and expenses and the costs incidental to the mediation will be shared equally between the Parties. The Parties further agree that all offers, promises, conduct, and statements, whether oral or written, made in the course of the discussions of the Chief Executive Officers of the Parties pursuant to Section 16.2.1 or of the mediation by any of the Parties, their agents, employees, experts, and attorneys, and by the mediator and any employees of the mediation service, are confidential, privileged, and inadmissible for any purpose, including impeachment, in any litigation, arbitration or other proceeding involving the Parties, provided that evidence that is otherwise admissible or discoverable shall not be rendered inadmissible or non-discoverable as a result of its use in the mediation.

(iii) Arbitration. If the Parties cannot resolve any Dispute for any reason, including the failure of either Party to agree to enter into mediation or agree to any settlement proposed by the mediator, within twenty (20) Business Days after the Escalation to Mediation Date, either Party may commence binding arbitration in accordance with this Section 16.2.3. Subject to Section 16.2.1 and Section 16.2.2, Invitae and PacBio agree that any Dispute shall be settled by binding arbitration administered by the American Arbitration Association in San Francisco, California (or virtually as the Parties agree), under the then-current Commercial or other Arbitration Rules by a single arbitrator agreeable to both Parties. If the Parties cannot agree on an arbitrator within five (5) Business Days after the commencement of the arbitration, each Party shall select an arbitrator who is not (and has not been within the past ten (10) years) employed by or a consultant to either Party or any of its Affiliates, and the two (2) selected arbitrators shall select a third (3rd) arbitrator who is not (and has not been within the past ten (10) years) employed by or a consultant to either Party or any of its Affiliates. Any arbitrator(s) chosen hereunder shall have reasonable educational training and industry experience relevant to the particular Dispute (including, for example, that an arbitrator need not be a retired judge or lawyer, but could, as applicable, be someone with relevant business, industry or professional experience). The arbitrator(s) shall determine what discovery will be permitted, based on the principle of limiting the cost and time which the Parties must expend on discovery; provided, the

arbitrator(s) shall permit such discovery as deemed necessary to achieve an equitable resolution of the Dispute. The decision and/or award rendered by the arbitrator(s) shall be written, final and non-appealable and may be entered in any court of competent jurisdiction. The Parties agree that, any provision of applicable law notwithstanding, they will not request, and the arbitrator shall have no authority to award, punitive or exemplary damages against any Party (except to the extent of any Party's liability to a Third Party for such damages). The costs of any arbitration, including administrative fees and fees of the arbitrator(s), shall be borne by the losing Party, if identified, and otherwise shared equally between the Parties. Additionally, the losing Party, if identified, shall reimburse the other Party for its costs and expenses incurred in connection with the arbitration (including attorneys' and expert fees and expenses). The arbitral proceedings and all pleadings shall be the Confidential Information of both Parties; provided, however, the foregoing shall not change either Party's rights or obligations with respect to any information that was the Confidential Information of a Party prior to its introduction into the arbitration. Any decision by the arbitrator(s) shall not be interpreted as an admission against interest of any Party and shall not be admissible as evidence in any subsequent court action with a Third Party. Notwithstanding any provision of this Section 16.2 to the contrary, either Party may initiate and engage in court proceedings in a court of competent jurisdiction at any time: (a) for breach of the other Party's confidentiality obligations; (b) to enforce any arbitration award between the Parties; or (c) for claims for equitable relief (including any preliminary injunction or temporary restraining order).

(c) Force Majeure. In the event that either Party is prevented from performing its obligations under this Agreement as a result of any contingency beyond its reasonable control ("**Force Majeure**"), including any actions of governmental authorities or agencies, war, hostilities between nations, civil commotions, riots, national industry strikes, lockouts, sabotage, shortages in supplies, energy shortages, epidemics, pandemics, fire, floods, and acts of nature such as typhoons, hurricanes, earthquakes, or tsunamis, the Party so affected shall not be responsible to the other Party for any delay or failure of performance of its obligations hereunder for so long as Force Majeure prevents such performance. In the event of Force Majeure, the Party immediately affected thereby shall give prompt written notice to the other Party specifying the Force Majeure complained of, and shall use commercially reasonable efforts to resume performance of its obligations as promptly as possible.

(d) No Implied Obligations. Nothing in this Agreement shall be deemed to create any implied obligations of either Party. No failure on the part of PacBio or Invitae to exercise and no delay in exercising any right under this Agreement, or provided by statute or at law or in equity or otherwise, shall impair, prejudice or constitute a waiver of any such right, nor shall any partial exercise of any such right preclude any other or further exercise thereof or the exercise of any other right.

(e) Independent Contractors. The relationship between the Parties is that of independent contractors. Nothing contained in this Agreement shall be construed as creating any agency, partnership, joint venture, or other form of joint enterprise, employment, or fiduciary relationship between the Parties, and neither party shall have authority to contract for or bind the

other Party in any manner whatsoever. PacBio is responsible for, and will withhold and/or pay, any and all applicable federal, state or local taxes, payroll taxes, workers' compensation contributions, unemployment insurance contributions, or other payroll deductions from the compensation of employees, [***] and other personnel of PacBio or its Affiliates or designees and no such employees, [***] or other personnel will be entitled to any benefits applicable to or available to employees of Invitae.

(f) Notices. All notices, requests and other communications hereunder shall be in writing and shall be (i) personally delivered or (ii) sent by registered or certified mail, return receipt requested, postage prepaid, (iii) overnight courier service or (iv) or emailed, receipt confirmed, in each case to the respective address specified below, or such other address as may be specified in writing to the other Party:

Invitae: Invitae Corporation.
1400 16th Street
San Francisco, CA 94103
Attn: General Counsel
Email: [***]

PacBio: Pacific Biosciences of California, Inc.
1305 O'Brien Drive
Menlo Park, CA 94025
Attn: General Counsel

with a copy to: Wilson Sonsini Goodrich & Rosati
Professional Corporation
650 Page Mill Road
Palo Alto, California 94304-1050
Attn: Ian Edvalson
Email: iedvalson@wsgr.com

(g) Assignment. Neither Party may assign this Agreement or any of its rights or obligations hereunder without the other Party's prior written consent; provided that each Party may assign without the other Party's consent (a) its rights or obligations under this Agreement to one (1) or more of its Affiliates or (b) without limiting Invitae's right under Section 15.7 with respect to a Change in Control, this Agreement in its entirety to a successor to all or substantially all of the business or assets of such Party to which this Agreement relates whether by merger, acquisition (or stock or assets) or otherwise, provided that (x) any such successor (whether clause (a) or (b)) agrees in writing to be bound by the terms and conditions of this Agreement and (y) any assignment by PacBio under clause (b) is stipulated by the Parties to be a Change in Control for purposes of this Agreement (regardless of whether such assignment otherwise qualifies pursuant to such definition). Any permitted assignee will assume all obligations of its assignor under this Agreement. Any assignment shall not relieve the assignor of any of its obligations under this Agreement. Any attempted assignment in contravention of the foregoing will be null and void. Subject to the foregoing and the other terms of this Agreement, this

Agreement will be binding upon and inure to the benefit of the Parties and their respective successors and permitted assigns.

(h) Modification. No amendment or modification of any provision of this Agreement shall be effective unless in writing signed by both Parties. No provision of this Agreement shall be varied, contradicted or explained by any oral agreement, course of dealing or performance or any other matter not set forth in writing and signed by both Parties.

(i) Severability. If any provision hereof should be held invalid, illegal or unenforceable in any jurisdiction, the Parties shall negotiate in good faith a valid, legal and enforceable substitute provision that most nearly reflects the original intent of the Parties and all other provisions hereof shall remain in full force and effect in such jurisdiction and shall be liberally construed in order to carry out the intentions of the Parties hereto as nearly as may be possible. Such invalidity, illegality or unenforceability shall not affect the validity, legality or enforceability of such provision in any other jurisdiction.

(j) Entire Agreement. This Agreement together with the Exhibits hereto constitute the entire agreement, both written or oral, with respect to the subject matter hereof, and supersede all prior or contemporaneous understandings or agreements, whether written or oral, between PacBio and Invitae with respect to the subject matter hereof.

(k) Counterparts. This Agreement may be executed and delivered in two counterparts, each of which shall be deemed an original, and all of which together, shall constitute one and the same instrument.

[Signature page follows]

IN WITNESS WHEREOF, each Party has caused this Agreement to be duly executed and delivered in duplicate originals as of the Effective Date.

PACIFIC BIOSCIENCES OF CALIFORNIA, INC.	INVITAE CORPORATION
By:	By: _____
Name: Title:	Name: _____ Title:

Exhibit A: [***]Product Description

Exhibit B: General plan

Exhibit C: Press Release

Exhibit A

System Descriptions

[***]

[***]

[***]

[***]

Exhibit B

General Plan

[***]

[***]

Exhibit C

Press Release

Pacific Biosciences and Invitae to Develop Ultra-High-Throughput Clinical Whole Genome Sequencing Platform

New platform expected to make whole genome sequencing significantly more affordable and accessible for use in mainstream medical care

MENLO PARK, Calif. – January 12, 2021 – Pacific Biosciences of California, Inc. (Nasdaq: PACB), a leading provider of high-quality, long-read sequencing platforms, today announced a multi-year collaboration with Invitae Corporation (NYSE: NVTA), a leading medical genetics company, to begin development of a production-scale high-throughput sequencing platform leveraging the power of PacBio's highly accurate HiFi sequencing to expand Invitae's whole genome testing capabilities.

"Whole genome sequencing has the ability to significantly improve diagnosis for a wide range of diseases and guide healthcare throughout life. This collaboration is aimed at developing the technology to make it affordable and accessible to all patients who can benefit from in-depth, full genome information," said Sean George, co-founder and Chief Executive Officer of Invitae. "Our work with PacBio to date has demonstrated the increased diagnostic yield and clinical utility of using information from high-quality, long-read genomes to guide patient care. We believe this world-class sequencing technology combined with our clinical capabilities will uniquely position us to deliver those benefits cost effectively at scale. We look forward to working with the PacBio team to develop a new generation of innovative whole genome-based offerings."

Identifying the many underlying genetic influences on human health is becoming increasingly critical to overall clinical care and prognosis and whole genome sequencing offers the most comprehensive view of medically relevant variations. As whole genome sequencing continues to grow into a preferred method for genetic testing, it is expected by the Global Alliance for Genomics and Health that by 2025 as many as sixty million genomes will be sequenced. With the development of a new sequencing platform, Invitae and PacBio aim to enable a new class of cost-effective assays that could be used to accelerate the accessibility of a more comprehensive whole genome sequencing approach in areas including carrier screening, immune system response, and other heritable diseases.

"Invitae is a leader in medical genetic testing and has driven innovation in this area for more than a decade. We are excited to join forces to develop and implement this new platform which is built on our shared vision that broad access to whole genome sequencing in the clinic has the power to improve diagnosis and access to precision therapies," said Christian Henry, President

and Chief Executive Officer of Pacific Biosciences. “Building on the proven performance of our HiFi sequencing, we believe that this new system will ultimately enable us to deliver the most clinically relevant whole genome at substantially less than $1,000 which we believe is a critical price threshold needed to expand adoption in routine medical care.”

PacBio HiFi sequencing combines the high accuracy of Sanger sequencing (>99.9%) with long reads up to 25 kb. Together, the length and accuracy of HiFi reads provide excellent detection of variants from single nucleotide changes to large structural variants, even in hard-to-sequence regions of the genome.

Through the collaboration, both companies will commit significant resources to support development of a production-scale sequencing platform designed with the capacity to process clinical whole genomes at scale. Those resources are expected to include talent, technology and collaborative oversight, and Invitae will also invest capital to support development throughout the multi-year effort.

About Pacific Biosciences
Pacific Biosciences of California, Inc. (NASDAQ: PACB) is empowering life scientists with highly accurate long-read sequencing. The company’s innovative instruments are based on Single Molecule, Real-Time (SMRT®) Sequencing technology, which delivers a comprehensive view of genomes, transcriptomes, and epigenomes, enabling access to the full spectrum of genetic variation in any organism. Cited in thousands of peer-reviewed publications, PacBio® sequencing systems are in use by scientists around the world to drive discovery in human biomedical research, plant and animal sciences, and microbiology. For more information, please visit www.pacb.com and follow @PacBio.

PacBio products are provided for Research Use Only. Not for use in diagnostic procedures.

About Invitae
Invitae Corporation (NYSE: NVTA) is a leading medical genetics company whose mission is to bring comprehensive genetic information into mainstream medicine to improve healthcare for billions of people. Invitae's goal is to aggregate the world's genetic tests into a single service with higher quality, faster turnaround time, and lower prices. For more information, visit the company's website at invitae.com.

Pacific Biosciences Forward-Looking Statements
This press release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995,, including, among other things, statements relating to market leadership, uses, accuracy, quality or performance of, or benefits of using, Pacific Biosciences’ products or technologies, including HiFi technology; the expected benefits, suitability or utility of Pacific Biosciences methods, products or technologies for particular applications or projects, including for whole genome sequencing; the benefits of whole genome sequencing; market estimates; the ability to provide whole genome sequencing for less than $1,000; the resources to be committed by Pacific Biosciences to the new sequencing platform; the ability of the parties to achieve the goals and realize the expected benefits of the collaboration; and other future events. You should not place undue reliance on forward-looking statements because they involve known and unknown risks, uncertainties, changes in circumstances and other factors that are, in some cases, beyond Pacific Biosciences’ control and could cause actual results to differ materially from the information expressed or implied by forward-looking statements made in this press release. Factors that could materially affect actual results can be found in Pacific Biosciences’ most recent filings with the Securities and Exchange Commission, including Pacific Biosciences’ most recent reports on Forms

8-K, 10-K and 10-Q, and include those listed under the caption “Risk Factors.” Pacific Biosciences undertakes no obligation to revise or update information in this press release to reflect events or circumstances in the future, even if new information becomes available.

Invitae Forward-Looking Statements
This press release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, including statements relating to the quality of Pacific Biosciences’ technology; the benefits of whole genome sequencing; market estimates; the contributions of Invitae to the collaboration; and the ability of the parties to achieve the goals and realize the expected benefits of the collaboration. Forward-looking statements are subject to risks and uncertainties that could cause actual results to differ materially, and reported results should not be considered as an indication of future performance. These risks and uncertainties include, but are not limited to: Invitae’s history of losses; Invitae’s ability to compete; Invitae’s failure to manage growth effectively; Invitae’s need to scale its infrastructure in advance of demand for its tests and to increase demand for its tests; Invitae’s ability to use rapidly changing genetic data to interpret test results accurately and consistently; security breaches, loss of data and other disruptions; laws and regulations applicable to Invitae’s business; the impact of litigation on Invitae’s business; and the other risks set forth in Invitae’s filings with the Securities and Exchange Commission, including the risks set forth in Invitae’s Quarterly Report on Form 10-Q for the quarter ended September 30, 2020. These forward-looking statements speak only as of the date hereof, and Invitae Corporation disclaims any obligation to update these forward-looking statements.
Contacts:

For PacBio:
Investors: Trevin Rard 650.521.8450
ir@pacificbiosciences.com

Media: Colin Sanford 203.918.4347
colin@bioscribe.com

For Invitae:
Laura D’Angelo 628.213.3283
pr@invitae.com

CERTAIN CONFIDENTIAL INFORMATION CONTAINED IN THIS DOCUMENT, MARKED BY BRACKETS ([***]), HAS BEEN OMITTED BECAUSE
THE INFORMATION (I) IS NOT MATERIAL AND
(II) WOULD BE COMPETITIVELY HARMFUL IF PUBLICLY DISCLOSED.

EXCLUSIVE LICENSE AGREEMENT

THIS AGREEMENT is effective as of February 1, 2004 ("Effective Date") between Nanofluidics, Inc. ("LICENSEE"), a corporation of the State of Delaware, that has a principal place of business at 31 Dutch Mill Road, Ithaca, New York 14850, and Cornell Research Foundation, Inc. ("FOUNDATION"), a non-profit corporation of the State of New York, having an office at 20 Thornwood Drive, Suite 105, Ithaca, NY 14850. FOUNDATION and LICENSEE (individually "Party" and collectively, "Parties") hereby agree as follows:

ARTICLE 1: INTRODUCTION

1.1 FOUNDATION is a wholly owned subsidiary of Cornell and holds the ownership interests of patents, trademarks, copyrights, and proprietary materials made by Cornell's employees and administers licenses in a manner consistent with the policies of Cornell.

1.2 The Technology outlined in FOUNDATION dockets: [***] have been invented by employees of Cornell University ("Cornell"), assigned to FOUNDATION, and FOUNDATION has filed for patent protection on such inventions related to Technology

1.3 LICENSEE desires to obtain the right to develop and to commercialize the Technology.

1.4 The work leading to the Technology was supported in part by an agency of the United States Government, and FOUNDATION is obligated to comply with United States OMB Circular A-124 and 37 CFR Part 401. This license is subject to the applicable terms of United States Government regulations concerning Government funded inventions.

1.5 The Parties agree to the terms and conditions hereinbelow in order to develop the Technology for commercial purposes, and utilize them in the public interest.

ARTICLE 2: DEFINITIONS

2.1 "Affiliate" shall mean (1) any corporation or other noncorporate entity owning directly, or indirectly controlling, [***] of the stock normally entitled to vote for election of directors of LICENSEE; (2) any corporation owned or controlled by LICENSEE through ownership of [***] of the stock entitled to elect directors or any other entity actually controlled by LICENSEE, (3) any corporate or noncorporate entity under common control with LICENSEE.

2.2 "Applications" shall mean United States Patent Application entitled [***] serial number [***] filed [***], [***] serial number [***] filed [***], [***] filed [***] and [***] serial number [***] filed [***] and any other United States patent applications that may be filed on Technology, and any continuations, continuations-in-part, divisions of these applications, and any foreign patent applications that correspond to United States patent applications.

2.3 "Patents" shall mean United States Patent Number [***] issued [***], United States Patent Number [***] issued [***], United States Patent Number [***] issued [***], United States Patent Number [***] issued [***], any corresponding foreign patent applications, and any patent that issues on Applications, including any reissues and reexaminations.

2.4 "Exclusive" shall mean that during the term of this Agreement FOUNDATION will not grant commercial rights to Technology to any other party.

2.5 "Field-of-Use" shall mean [***].

2.6 "Licensed Territory" shall mean all territories in the world where there are pending Applications or unexpired Patents that have not been declared invalid in an unappealed decision by a court having jurisdiction

2.7 "License Year" shall mean each twelve-month period beginning on January 1 and ending on December 31. However, the first License Year (alternatively, License Year 1) shall commence on the Effective Date and end on December 31 of the same calendar year.

2.8 “Products” shall mean any product or service which is covered by claims in Applications or Patents or which are made by a process which is covered by claims in Applications or Patents and any services which is covered by claims in Applications or Patents.

2.9 “Net Sales” shall mean the gross amount received for sales and other dispositions of Products by LICENSEE, and Sublicensees, to an independent third party on an arm’s length basis less (i) all trade, quantity, and cash discounts actually allowed on Products, including discounts or rebates to governmental or managed care organizations; (ii) all credits and allowances actually granted on Products on account of rejection, returns, billing errors, and retroactive price reductions, (iii) charges for freight, insurance and other transport costs related to the delivery of the product; (iv) duties actually paid on Products; and (v) excise, sale and use taxes, and equivalent taxes or charges actually paid on Products.

2.10 “Sublicense” shall mean a rights-granting contract with an independent third party other than an Affiliate in which LICENSEE conveys rights granted to LICENSEE in 4.1 and 4.2 of this Agreement.

2.11 “Sublicensees” shall mean any entity granted a Sublicense by LICENSEE, and acceptable to FOUNDATION, under this Agreement.

2.12 “Technology” shall mean the novel methods, compositions and devices contained in the following FOUNDATION Dockets [***] which are described in United States Patent Number [***] issued [***], United States Patent Number [***] issued [***], United States Patent Application Number [***] filed [***], United States Patent Application Number [***] filed [***], United States Patent Application Number [***] filed [***], United States Provisional Patent Application Number [***] filed [***], and United States Provisional Patent Application Number [***] filed [***] and any other United States patent applications that may be filed on the listed FOUNDATION Dockets, and any other patent applications, continuations, continuations-in-part, divisions of these applications related thereto, and any foreign patent applications that correspond to United States patent applications. FOUNDATION shall use reasonable efforts to assist LICENSEE in accord with any LICENSEE funded sponsored research undertaken at Cornell and separately contracted with Cornell’s Office of Sponsored Programs

2.13 “Valid Claim” shall mean a claim in an issued, unexpired patent or in a pending patent application within the Applications and Patents that (a) has not been finally cancelled, withdrawn, abandoned or rejected by any administrative agency or other body of competent jurisdiction, (b) has not been revoked, held invalid, or declared unpatentable or unenforceable in a decision of a court or other body of competent jurisdiction that is unappealable or unappealed within the time allowed for appeal, (c) has not been rendered unenforceable through disclaimer or otherwise, and (d) is not lost through an interference proceeding.

ARTICLE 3: APPLICATIONS AND PATENTS

3.1 FOUNDATION shall hold title to all Applications and Patents.

3.2 FOUNDATION agrees to use reasonable efforts to file and prosecute Applications and maintain Patents. At any time during the term of this Agreement, LICENSEE may elect in writing to be released from its license in any of the Patents or Applications, in which event LICENSEE shall thereafter have no obligation to reimburse FOUNDATION for any future expenses relating to such Patents or Applications, and FOUNDATION shall have the option at its sole discretion and expense to file, prosecute, maintain and license to a third party such Patents or Applications.

3.3 [***] for preparation, filing, prosecution and maintenance of Applications and Patents except for those Applications and

---

Patents for which it has waived its rights, in writing, as described in Section 3.2. Such reimbursable expenses [***]. Such expenses shall be paid to FOUNDATION by LICENSEE within thirty (30) days of receipt of an invoice therefore unless FOUNDATION has otherwise agreed, in writing. LICENSEE shall [***] by LICENSEE for reimbursable expenses under this agreement.

3.4 FOUNDATION shall have final authority over selection of patent attorneys and all decisions concerning filing and prosecution of Applications and maintenance of Patents. However, FOUNDATION shall keep LICENSEE informed of its filing, prosecution and maintenance activities, such information to include without limitation copies of all documents related to the filing, prosecution and maintenance of Applications and Patents, and shall give LICENSEE the option to actively participate, including the right to co-counsel, in making major decisions concerning such activities.

ARTICLE 4: LICENSE GRANT AND COMMERCIAL EFFORTS

4.1 Subject to the terms and conditions of this Agreement and to the rights of and obligations to the United States Government as set forth in United States Office of Management & Budget Circular A-124 or 37 CFR Part 401 et seq., FOUNDATION hereby grants and LICENSEE hereby accepts an EXCLUSIVE right to make, use, sell, offer for sale, lease, import, export or otherwise dispose of Products under Applications and Patents in Field-of-Use in Licensed Territory for the term of this Agreement as specified in Section 7.1.

(i) The right of LICENSEE to make Products includes the right to have Products made by contract with third parties within the Licensed Territory. Such contractual arrangements with third parties shall be subject to and conditioned upon appropriate supervision and quality assurance and control of the third party by LICENSEE and the third party shall be bound in writing to respect all rights of FOUNDATION.

4.2 LICENSEE shall also have the right to grant Sublicenses under this Agreement, [***]. LICENSEE agrees to provide FOUNDATION a copy of any Sublicense granted pursuant to this Article 4. Sublicenses under this Agreement will be considered to be Confidential Information as specified in Section 8.2. Any such Sublicense shall contain provisions that are consistent with all the provisions of this Agreement which are protective of and beneficial to FOUNDATION. FOUNDATION shall have the right to require that said Sublicense be terminated in the event that a Sublicense materially breaches the above provision. LICENSEE shall be responsible to FOUNDATION for the [***]. LICENSEE shall [***] of any up-front Sublicense fees, or other up-front consideration, not including (i) payments made in consideration of the LICENSEE'S issuance of equity, or debt securities of the LICENSEE and (ii) payments made to LICENSEE in consideration of or as support for research and development activities. LICENSEE'S obligation to pay FOUNDATION'S share of Sublicense consideration described above shall be considered incurred as of the date on which such Sublicense consideration is received by LICENSEE.

4.3 FOUNDATION and Cornell retain an irrevocable, nonexclusive, and nontransferable right to practice for their own educational and research purposes, the inventions claimed in Applications and Patents and such purposes shall include limited, non-commercial collaboration with other non-profit research institutes as long as it does not adversely affect or compete with the business of LICENSEE as determined by an objective third party acceptable to both parties.

4.4 Nothing in this Agreement shall be construed to give LICENSEE rights in any inventions currently owned or developed in the future by FOUNDATION or Cornell other than those explicitly specified in this Agreement. Nothing in this Agreement shall be construed to give FOUNDATION rights in inventions currently owned or developed in the future by LICENSEE other than those explicitly specified in this Agreement.

4.5 The rights granted by this Agreement are to LICENSEE alone and not to any third parties or to any subsidiary or Affiliate of LICENSEE. However, LICENSEE may transfer this Agreement by way of sale of LICENSEE, through merger, sale of assets and/or sale of stock. LICENSEE shall provide written notice to FOUNDATION of any such transfer.

4.6 LICENSEE shall use reasonable commercial efforts, consistent with sound and reasonable business practices and judgment, to affect commercialization of Products as soon as practicable and to maximize sales thereof. Failure of LICENSEE to meet the diligence milestones of this Section 4.6 shall be a material breach of this Agreement.

(i) In the event that the FOUNDATION identifies any other markets for DNA sequencing in Licensed Territory and/or other Products and/or geographical area markets as significant, LICENSEE shall agree in writing to evaluate the potential for commercialization therein itself or through appropriate Sublicense in a timely manner. If LICENSEE elects not to pursue said commercialization in said market(s) or in FOUNDATION's sole judgment LICENSEE has failed to evaluate such commercialization, then LICENSEE agrees to Sublicense with reasonable commercial terms to a Sublicensee for said market(s) or terminate this LICENSEE'S rights under this Agreement only for said significant Products and/or geographical area markets

(ii) FOUNDATION may terminate this Agreement if LICENSEE has not sold Product for any period of one (1) year after the end of the [***] License Year.

4.7 Beginning with the first (1st) License Year, within sixty (60) days after the start of each License Year and until LICENSEE markets Products, LICENSEE shall make a written annual report to FOUNDATION covering the preceding License Year, regarding the progress of LICENSEE toward commercial use of Products. Such report shall include, at a minimum, information sufficient to enable FOUNDATION to satisfy reporting requirements of the United States Government and for FOUNDATION to ascertain progress by LICENSEE toward meeting the reasonable commercial efforts of this Article 4. LICENSEE shall provide these reports with the royalty report specified in Article 5. Such report will be considered to be Confidential Information as specified in Section 8.2.

4.8 LICENSEE shall not use, nor shall LICENSEE permit Sublicensee to use, the names, trademarks and indicia of FOUNDATION or of Cornell, nor the names of any employee, student or faculty member of FOUNDATION nor of Cornell without prior written approval from FOUNDATION, which will not be unreasonably withheld.

4.9 LICENSEE shall alone have the obligation to ensure that Products it makes, uses, sells, offers for sale, leases, imports, exports, or otherwise disposes of are not defective, that Products satisfy all applicable government regulations and that export of Products satisfies government export requirements.

ARTICLE 5: PAYMENTS, ROYALTIES, REPORTS AND RECORDS

5.1 As consideration for entering into this Agreement, [***], in the event that LICENSEE [***] related series of transactions with total proceeds to LICENSEE of at least [***] (a "Major Financing") and following such Major Financing, FOUNDATION'S "Equity Ownership" of LICENSEE, which includes the shares of LICENSEE'S non-voting Common Stock then held by FOUNDATION (or any shares of LICENSEE'S voting common stock issued upon conversion thereof), is less than [***] of LICENSEE'S outstanding capital stock (including all outstanding common stock, preferred stock, options or warrants to purchase common or preferred stock, and any options reserved for issuance under any equity incentive plan, hereinafter referred to as "on a fully diluted basis"); then

(a) LICENSEE shall issue to the FOUNDATION, pursuant to a common stock purchase agreement in the form attached hereto as Exhibit B, that number of shares of common stock equal to the number of shares necessary to increase FOUNDATION'S Equity Ownership to [***] of LICENSEE'S outstanding capital stock, following such Major Financing, on a fully diluted basis. If the Major Financing exceeds [***], LICENSEE will not issue any shares of common stock to provide an adjustment to FOUNDATION'S Equity Ownership for the amount of the Major Financing in excess of [***]; and

(b) LICENSEE shall grant to FOUNDATION the same registration and information rights granted to the investors in the Major Financing.

(c) LICENSEE will use its commercially reasonable efforts to cause the common stock issued pursuant to Section 5.1(a) hereof to not be subject to any lock-up periods that may be required in connection with the LICENSEE'S initial public offering.

A Major Financing shall only include the first financing of LICENSEE that meets the [***] proceeds threshold.

5.2 FOUNDATION hereby consent to any conversion of the non-voting Common Stock held by it to voting Common Stock in connection with the Major Financing.

5.3 FOUNDATION hereby agrees that all previous provisions of, rights granted and covenants made regarding the issuance of the LICENSEE'S capital stock are hereby waived, released and superseded in their entirety by the provisions of this Section 5 and shall have no further force or effect.

5.4 For the license granted hereunder, commencing on the date of the first commercial sale of Product, LICENSEE shall pay or cause to be paid to FOUNDATION a royalty of [***] on Net Sales of Products on a country by country basis [***]. In the event that Products incorporate at least one claim described in third party [***] (each such third-party [***] being defined as a "Non-Foundation Right") the royalty shall be (i) the amount of Net Sales for the Products incorporating Non-Foundation Rights, (ii) multiplied by [***], and (iii) [***]. Such stacking shall become effective on LICENSEE providing reasonable evidence to FOUNDATION that additional Applications or Patents are applicable to the Product. In the event of a disagreement as to the inclusion of any [***], the Parties agree that an independent neutral party shall be consulted to determine the appropriateness of inclusion of the [***] such royalty calculation.

5.5 Beginning with the [***] License Year and in each License Year thereafter, LICENSEE shall pay FOUNDATION a minimum annual royalty for that License Year. Payment shall be due within thirty (30) days of the first day of the License Year and [***] and the royalty reports required under Section 5.7 should reflect [***]. None of the minimum annual royalties are refundable or applicable to a succeeding License Year. Such minimum annual royalty payments shall be made according to the following schedule and [***]:

License Year	Payment Due Date	Min. Royalty Payment
[***]	[***]	[***]
[***]	[***]	[***]
[***]	[***]	[***]
[***]	[***]	[***]

5.6 Royalties shall be payable only once with respect to the same unit of Products.

5.7 LICENSEE shall provide FOUNDATION with semi-annual written reports, due June 30th and December 31st of each License Year, of all sales, leases or other dispositions of Products by LICENSEE and Sublicensees. In order to minimize LICENSEE time spent on royalty reports, a brief one-page Royalty Report Form is provided in Exhibit A that will satisfy FOUNDATION'S reporting requirements. The report shall be made within thirty (30) days of the end of each semiannual period. FOUNDATION agrees to keep the information in these reports confidential, except as may be necessary to maintain an action against LICENSEE for breach of this Agreement. Royalty payments for sales, leases, and other dispositions of the Products invoiced during a semi-annual period shall accompany the Royalty Report Form for that particular semi-annual period. The Royalty Report Form shall be submitted regardless of whether or not royalties are owed. Payments shall be made in United States dollars, Conversion from foreign currencies,

---

if any, shall be based upon the conversion rate published in The Wall Street Journal on the last day of the particular semi-annual accounting period (or on the last business day on which The Wall Street Journal is published during said semi-annual period) for which royalties are due. Royalty checks shall be made payable to Cornell Research Foundation and mailed to the address specified in section 13.4.

5.8 LICENSEE shall keep and maintain, and LICENSEE shall require that Sublicensees keep and maintain, any and all records necessary to certify compliance of LICENSEE with the terms of this agreement, including but not limited to accounting general ledgers, Sublicense and distributor agreements, price lists, catalogs, marketing materials, audited financial statements, income tax returns, sales tax returns, inventory records, and shipping documents of Products. Such records shall be open to inspection at reasonable times by a certified public accountant chosen by FOUNDATION and acceptable to LICENSEE, which shall not unreasonably withhold such acceptance. Such inspection shall be made at FOUNDATION'S expense. However, if the results of any audit reveal additional royalties owed to FOUNDATION that differ by more the [***] percent) from those royalties already paid, LICENSEE shall also reimburse FOUNDATION for the costs of the audit. FOUNDATION agrees to hold such records confidential, except as may be necessary to maintain an action against LICENSEE for breach of this Agreement. The records required by this paragraph shall be maintained and available for inspection for a period of six (6) years following the calendar quarter to which they pertain. This paragraph shall survive termination of this Agreement.

5.9 LICENSEE shall reimburse FOUNDATION for the expenses specified in Section 3.3 within thirty (30) days of written invoice from FOUNDATION. Such invoice shall specify the date the expense was incurred, the purpose of the expense (including, as applicable, a summary of patent attorney services giving rise to the expense), and the Applications or Patents to which the expense relates,

5.10 Payments due under Sections 5.1 and 5.5 shall be considered late if not received by the dates specified in Sections 5.1 and 5.5 respectively, whether invoiced or not. Payments due under Section 5.9, and any other payments due under this Agreement, other than the payments due under Sections 5.1 and 5.5 and royalty payments, shall be considered late if not received within sixty (60) days of the date of invoice. Royalty payments due under Section 5.7 of this Agreement and payment of FOUNDATION'S share of Sublicense consideration shall become late if not paid within sixty (60) days after the end of the semi-annual in which the payment obligation was incurred. Late payments [***].

5.11 LICENSEE agrees to make a written report to FOUNDATION within ninety (90) days after the expiration of this Agreement pursuant to Section 7.1. LICENSEE shall continue to make reports pursuant to the provisions of this Section 5.7 concerning royalties payable in accordance with Section 5.4 in connection with the sale of Products after expiration of the license, until such time as all such Products produced under the license have been sold or destroyed. Concurrent with the submittal of each post-termination report, LICENSEE shall pay FOUNDATION all applicable royalties.

ARTICLE 6: INFRINGEMENT

6.1 In the event that either party determines that a third party is making, using, selling, offering for sale, or importing a product that may infringe Patents, it will promptly notify the other party in writing. LICENSEE may elect, with the prior written consent of FOUNDATION, to bring suit against such alleged infringer. Such election must be made within thirty (30) days of receipt of said written consent from FOUNDATION. All recoveries in such suit shall belong to LICENSEE except that LICENSEE may elect to grant FOUNDATION the right to elect to pay up to fifty percent (50%) of the litigation costs and receive a percentage of any recovery equal to the percentage of litigation costs paid. If such suit involves claims of infringement of Non-Foundation Rights, FOUNDATION'S right of election to pay litigation costs and corresponding rights in recovery shall be limited to 50% multiplied by the fraction expressed in section 5.4 (iii). FOUNDATION must make such election within thirty (30) days of its receipt of notice that LICENSEE has elected to bring suit. FOUNDATION shall also have the right to choose to be represented by separate counsel in any such suit at its own expense. Such expense for separate counsel shall not be considered as part of "litigation costs" for purposes of determining FOUNDATION'S share of any recovery in accordance with the sentence above. If LICENSEE elects not to bring a suit against the alleged infringer, it shall promptly notify FOUNDATION of that fact and FOUNDATION shall have the right to commence such actions at its own cost and expense, in which case any recoveries shall belong to FOUNDATION. In such suits by FOUNDATION, LICENSEE shall have rights of participation and recovery that are the same as FOUNDATION rights as provided above when LICENSEE elects to sue, except in this case the fraction expressed in section 5.4 (iii) shall not be applied.

6.2 Regardless of which party controls a suit brought against an infringer, both parties shall participate in any settlement discussions and each will be a signatory to any settlement agreement.

ARTICLE 7: TERM AND TERMINATION

7.1 This Agreement shall commence on Effective Date, and shall continue as a Field-of-Use Exclusive license until the last of all Patents has either expired or been invalidated in an unappealed decision by a court having jurisdiction so long as LICENSEE'S covenants under the Agreement are being performed and the LICENSEE is in good standing, and provided this Agreement is not earlier terminated as provided for herein.

7.2 FOUNDATION may terminate this Agreement if LICENSEE:

(i) is in default in payment of license fees, royalties or cost reimbursements or in providing reports;
(ii) is in material breach of any provision of this Agreement;
(iii) provides any false report;
(iv) if LICENSEE does not have Products available for commercial sale prior to [***];
(v) has not sold Products for any period of one (1) year after the end of the [***] License Year;

(vi) if LICENSEE fails to provide written notice to FOUNDATION for the transfer of this Agreement upon the sale of LICENSEE in accordance to Section 4.5 or for a Sublicense of this Agreement in accordance with Section 4.2

and LICENSEE fails to remedy any such default, breach, or false report within sixty (60) days after receiving written notice thereof by FOUNDATION.

7.3 LICENSEE may terminate the license granted hereunder at any time upon sixty (60) days notice to FOUNDATION. FOUNDATION agrees that any expenses initiated by FOUNDATION during the sixty (60) day termination period will not be LICENSEE'S financial obligation although all other obligations under this Agreement shall continue to accrue during the sixty (60) day notice period, including the obligation to make any payments due under this Agreement.

7.4 Upon termination of this Agreement for any reason, including the end of term as specified above, all rights and obligations under this Agreement shall terminate, except those that have accrued prior to termination and except as specified in this Agreement.

ARTICLE 8: PUBLICATION AND CONFIDENTIALITY

8.1 It is the policy of FOUNDATION and Cornell to promote and safeguard free and open inquiry by faculty, students and others. To further this policy, FOUNDATION and Cornell shall retain the right to publish information described in Applications and Patents.

8.2 Both parties agree to keep any information identified as confidential by the disclosing party confidential using methods at least as stringent as each party uses to protect its own confidential information, except as may be necessary to maintain an action against LICENSEE for breach of this Agreement or to audit LICENSEE as specified under Section 5.8. "Confidential Information" shall include the progress report required under Section 4.7 and any other information marked confidential or accompanied by correspondence indicating such information is confidential exchanged between the parties hereto. The confidentiality and use obligations set forth above apply to all or any part of the Confidential Information disclosed hereunder except to the extent that:

(a) LICENSEE or FOUNDATION can show by written record that it possessed the information prior to its receipt from the other party;

(b) The information was already available to the public or became so through no fault of the LICENSEE or FOUNDATION;

(c) The information is subsequently disclosed to LICENSEE or FOUNDATION by a third party that has the right to disclose it free of any obligations of confidentiality; or

(d) Five years have elapsed from the expiration of this Agreement.

ARTICLE 9: ARBITRATION AND JUDICIAL REMEDIES

9.1 If a controversy arises under or related to this Agreement, and any disputed claim by either party against the other under this Agreement excluding any dispute relating to patent validity or infringement arising under this Agreement, the parties shall endeavor to resolve such controversy or dispute by mutual, good faith conciliation and mediation and, failing that, may mutually agree to settle the controversy or dispute by arbitration in accordance with the Licensing Agreement Arbitration Rules of the American Arbitration Association.

(i) Upon request by either party, arbitration will be by a third party arbitrator mutually agreed upon in writing by LICENSEE and FOUNDATION within thirty (30) days of such arbitration request. If the parties fail to mutually agree upon said third party arbitrator within the allotted thirty days, then the arbitration will be by a panel of three arbitrators comprising one arbitrator selected by each party within a further thirty (30) day period and a third arbitrator selected by the preceding two arbitrators. If one party fails to select an arbitrator within the allotted thirty day period, then said arbitration panel will consist solely of the arbitrator chosen by the other party.

(ii) The parties shall be entitled to discovery in like manner as if the arbitration were a civil suit in the New York Superior Court. The Arbitrator may limit the scope, time and/or issues involved in discovery.

(iii) Any arbitration shall be held at Ithaca, NY, unless the parties hereto mutually agree in writing to another venue.

9.2 FOUNDATION reserves the right and power to proceed with direct judicial remedies against LICENSEE without conciliation, mediation or arbitration for breach of the royalty payment and sales reporting provisions of this Agreement after giving written notice of such breach to LICENSEE followed by an opportunity period of thirty (30) days in which to cure such breach. In collecting overdue royalty payments and securing compliance with reporting obligations, FOUNDATION may use all judicial remedies available.

ARTICLE 10: INDEMNIFICATION

10.1 LICENSEE agrees to indemnify and hold harmless FOUNDATION and Cornell and their respective trustees, officers, employees, students, and agents against any and all claims for death, illness, personal injury, property damage, damages, expenses, losses and improper business practices arising out of (i) the manufacture, use, sale, or other disposition of Patents or Products by LICENSEE, Sublicensee, or their customers, (ii) a third party's use of a Products purchased, leased, or otherwise acquired from LICENSEE or Sublicensee, (iii) a third party's manufacture or provision of a Products at the request of LICENSEE or Sublicensee.

10.2 FOUNDATION shall not be liable for any indirect, special, consequential, or other damages whatsoever, whether grounded in tort (including negligence), strict liability, contract or otherwise. FOUNDATION shall not have any responsibilities or liabilities whatsoever with respect to Products.
10.3 LICENSEE and Sublicensee shall at all times comply, through insurance or self-insurance, with all statutory workers' compensation and employers' liability requirements covering any and all employees with respect to activities performed under this Agreement.

10.4 LICENSEE agrees to obtain and maintain insurance against liability, damage, destruction and loss comparable to that which is maintained by companies in similar businesses at similar stages in their growth.
10.5 The provisions of this article shall survive termination of this Agreement.

ARTICLE 11: WARRANTIES AND LIMITATIONS

11.1 FOUNDATION and LICENSEE each represent and warrant that they have the right to enter into this Agreement. FOUNDATION warrants that it has the right to convey to LICENSEE the rights granted under this Agreement.
11.2 FOUNDATION warrants that is the owner of Applications and Patents.
11.3 FOUNDATION makes no representation or warranty that Applications will result in issued Patents.
11.4 FOUNDATION makes no representations or warranties concerning the validity or scope of Patents.
11.5 FOUNDATION does not warrant that Products made, used, sold, leased, imported, exported or otherwise disposed of under the license of this Agreement is or will be free from infringement of patents of third parties.
11.6 Nothing herein shall be construed as granting by implication, estoppel, or otherwise any licenses or rights under patents or other rights of FOUNDATION or Cornell or other persons other than Patents, regardless of whether such patents or other rights are dominant or subordinate to any Patents.
11.7 FOUNDATION is under no obligation to furnish any technology or information other than that described and claimed in Applications and Patents.
11.8 Nothing herein shall be construed to grant LICENSEE rights under any applications or patents other than Applications and Patents.
11.9 FOUNDATION does not make any representations, extend any warranties of any kind, express or implied, or assume any responsibility whatever concerning the manufacture, use, or sale, lease or other disposition by LICENSEE or its vendees or transferees of Products.
11.10 Except as expressly set forth in this Agreement, FOUNDATION MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF PRODUCTS WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER RIGHTS OR ANY OTHER EXPRESS OR IMPLIED WARRANTIES.

ARTICLE 12: MARKING

12.1 Prior to the issuance of patents on the Applications, LICENSEE shall mark, and agrees to require that Sublicensees shall mark, Products (or their containers or labels) made, sold, leased, imported, exported or otherwise disposed of by it under the license granted in this Agreement with the words "Patent Pending," and following the issuance of one or more Patents, with the numbers of Patents.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 Terms in this Agreement which appear capitalized, other than the names of the parties and article headings, have the meanings given in Article 2 and retain those meanings whether used in the singular or plural.
13.2 This Agreement shall be binding upon and be to the benefit of the Parties hereto and their heirs, successors and assignees. However, neither Party shall assign this Agreement, in whole or in part, without the written consent of the other.

13.3 All issues and questions concerning the construction, validity and interpretation of this Agreement and the Schedules and Exhibits hereto shall be governed by, and construed in accordance with, the laws of the State of New York without giving effect to any choice of law or conflict of law rules or provisions (whether of the State of New York or any other jurisdiction) that would cause the application of the laws of any jurisdiction other than the State of New York. In furtherance of the foregoing, the internal law of the State of New York shall control the interpretation and construction of this Agreement (and all Schedules and Exhibits hereto), even though under that jurisdiction's choice of law or conflict of law analysis, the substantive law of such other jurisdiction would ordinarily apply. The parties hereto hereby irrevocably and unconditionally submit to the exclusive jurisdiction of any State court sitting in Tompkins County, State of New York or Federal court sitting in Syracuse, New York over any suit, action or proceeding arising out of or relating to this Agreement and agree that no such suit, action or proceeding shall be brought in any other court, forum or jurisdiction. The parties hereto hereby irrevocably and unconditionally waive any objection to the laying of venue of any such suit, action or proceeding brought in any such court and any claim that any such suit, action or proceeding brought in any such court has been brought in an inconvenient forum.

13.4 All notices required or permitted hereunder shall be in writing and be served on the parties at the addresses set forth below. Any such notices shall be either (a) sent by a nationally recognized overnight courier, in which case notice shall be deemed delivered when delivery is made according to the records of such courier, (b) sent by facsimile, in which case notice shall be deemed delivered upon receipt of confirmation of transmission of such facsimile notice, or (c) sent by personal delivery, in which case notice shall be deemed delivered upon receipt. Any notice by facsimile or personal delivery and delivered after 5:00 p.m., Eastern Daylight Time, shall be deemed received on the next Business Day. A party's address may be changed by written notice to the other parties; provided, however, that no notice of a change of address shall be affected until actual receipt of such notice.

In the case of FOUNDATION:

President
Cornell Research Foundation, Inc.
20 Thornwood Drive, Suite 105
Ithaca, NY 14850

In the case of LICENSEE:
President
Nanofluidics, Inc.
31 Dutch Mill Road
Ithaca, NY 14850

13.5 No term or provision of this Agreement shall be waived and no breach excused unless such waiver or consent shall be in writing and signed by the party claimed to have waived or consented. No waiver of a breach shall be deemed to be a waiver of a different or subsequent breach.

13.6 This Agreement may not be modified, changed or terminated orally. No change, modification, addition or amendment shall be valid unless in writing and signed by the parties hereto.

13.7 In the event any provision of this Agreement is determined to be invalid or unenforceable, the remaining provisions shall remain in full force and effect.

13.8 This Agreement constitutes and contains the entire agreement of the parties respecting its subject matter and supersedes any and all prior negotiations, correspondence, understandings and agreements, whether written or oral, between the parties respecting its subject matter.

IN WITNESS of this Agreement, FOUNDATION and LICENSEE have caused this Agreement to be executed by their duly authorized officers on the dates indicated.

Cornell Research Foundation, Inc.

By: /s/ Richard S. Cahoon
Richard S. Cahoon

Nanofluidics, Inc.

By: /s/ Stephen W. Turner
Stephen W. Turner

Title:	Senior Vice President	Title:	President
Date:	March 2, 2004	Date:	March 2, 2004

EXHIBIT A - ROYALTY REPORT

Report royalty payment information to the Cornell Research Foundation, Inc (CRF) using the report format or facsimile attached to these instructions. This minimal information must be provided in order to correctly record royalty related events required by your license agreement with CRF.

Use a separate report to record royalty information for each license agreement. For each licensee agreement, report royalty sales by CRF docket number, which identifies the technology. List each contributing technology if more than one technology is used to produce a royalty generating process/product. This level of detail permits evaluation of the use of each technology under license with your company.

Submit this information along with appropriate payment to:

Cornell Research Foundation, Inc.
ATTN: Finance and Accounting
20 Thornwood Drive, Suite 105
Ithaca, NY 14850
(607) 257-1081
www.crf.cornell.edu

For your convenience, payments may be made by FEDWIRE or ACH to:

Tompkins Trust Company
The Commons
Ithaca, NY 14851
(607) 273-3210
www.tompkinstrust.com

Account: [***], ABA: [***]

ROYALTY REPORT – [licensee NAME]

LICENSEE NAME: CRF LICENSE NUMBER:

REPORTING PERIOD:

Individual to contact concerning this information:

Name: Phone # or email ID:

For each product/item subject to a royalty payment provision, provide the following information as applicable.

PRODUCT/ITEM:

CRF Docket Number	Country	Number of Units/Products Sold	Gross Sales By Country	Net Sales By Country	Royalty Rate	Less Minimum Royalty Payment Made	Net Royalty Payment Made

	Total Payment

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

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, and 333-251153) 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, and the Pacific Biosciences of California, Inc. 2020 Inducement Equity Incentive Plan, and

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

of our report dated February 26, 2021, with respect to the consolidated financial statements of Pacific Biosciences of California, Inc. included in this Annual Report (Form 10-K) for the year ended December 31, 2020.

/s/ Ernst & Young LLP

Redwood City, California
February 26, 2021

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 26, 2021

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 26, 2021

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, 2020, 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, 2020 (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 26, 2021

/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, 2020, 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, 2020 (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 26, 2021

/s/ Susan Kim

Susan Kim
Chief Financial Officer
(Principal Financial Officer)