UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(MARK ONE)

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

For the fiscal year ended October 31, 2019

or

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

For transition period from to

Commission File Number: 001-15405

Agilent Technologies, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**77-0518772**
(State or other jurisdiction of incorporation or organization)	(IRS Employer Identification No.)

Address of principal executive offices: 5301 Stevens Creek Blvd., Santa Clara, California 95051
Registrant's telephone number, including area code: (800) 227-9770
Securities registered pursuant to Section 12(b) of the Act:

Title of each Class	Trading Symbol	Name of each Exchange on which registered
Common Stock, $0.01 par value	A	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None

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

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

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

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

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

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

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

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

The aggregate market value of the registrant's common equity held by non-affiliates as of April 30, 2019, was approximately $18.9 billion. Shares of stock held by officers, directors and 5 percent or more stockholders have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of December 10, 2019, there were 310,183,415 outstanding shares of common stock, par value $0.01 per share.

DOCUMENTS INCORPORATED BY REFERENCE

Document Description	**10-K Part**
Portions of the Proxy Statement for the Annual Meeting of Stockholders (the "Proxy Statement") to be held on March 18, 2020, and to be filed pursuant to Regulation 14A within 120 days after registrant's fiscal year ended October 31, 2019 are incorporated by reference into Part III of this Report	III

TABLE OF CONTENTS

Forward-Looking Statements

This report contains forward-looking statements including, without limitation, statements regarding growth opportunities, including for revenue and our end markets, strength and drivers of the markets we sell into, sales funnels, our strategic direction, new product and service introductions and the position of our current products and services, market demand for and adoption of our products, the ability of our products and solutions to address customer needs and meet industry requirements, our focus on differentiating our product solutions, improving our customers' experience and growing our earnings, future financial results, our operating margin, mix, our investments, including in manufacturing infrastructure, research and development and expanding and improving our applications and solutions portfolios, expanding our position in developing countries and emerging markets, our focus on balanced capital allocation, our contributions to our pension and other defined benefit plans, impairment of goodwill and other intangible assets, the effect of the U.S. Tax Cuts and Jobs Act of 2017 (the "Tax Act") and U.S. and other tariffs, the impact of foreign currency movements, our hedging programs and other actions to offset the effects of tariffs and foreign currency movements, our future effective tax rate, tax valuation allowance and unrecognized tax benefits, the impact of local government regulations on our ability to pay vendors or conduct operations, our ability to satisfy our liquidity requirements, including through cash generated from operations, the potential impact of adopting new accounting pronouncements, indemnification, source and supply of materials used in our products, our sales, our purchase commitments, our capital expenditures, the integration and effects of our acquisitions and other transactions, and our stock repurchase program and dividends that involve risks and uncertainties. Our actual results could differ materially from the results contemplated by these forward-looking statements due to various factors, including those discussed in Part I Item 1A and elsewhere in this Form 10-K.

PART I

Item 1. *Business*

Overview

Agilent Technologies Inc. ("we", "Agilent" or the "company"), incorporated in Delaware in May 1999, is a global leader in life sciences, diagnostics and applied chemical markets, providing application focused solutions that include instruments, software, services and consumables for the entire laboratory workflow.

For fiscal year ended October 31, 2019, we have three business segments comprised of the life sciences and applied markets business, diagnostics and genomics business and the Agilent CrossLab business.

Our life sciences and applied markets business provides application-focused solutions that include instruments and software that enable customers to identify, quantify and analyze the physical and biological properties of substances and products, as well as enable customers in the clinical and life sciences research areas to interrogate samples at the molecular and cellular level. Our diagnostics and genomics business is comprised of six areas of activity providing active pharmaceutical ingredients ("APIs") for oligo-based therapeutics as well as solutions that include reagents, instruments, software and consumables which enable customers in the clinical and life sciences research areas to interrogate samples at the cellular and molecular level. The Agilent CrossLab business spans the entire lab with its extensive consumables and services portfolio, which is designed to improve customer outcomes. In addition, we conduct centralized order fulfillment and supply chain operations for our businesses through the order fulfillment and supply chain organization ("OFS"). OFS provides resources for manufacturing, engineering and strategic sourcing to our respective businesses. Each of our businesses, together with OFS and Agilent Technologies Research Laboratories, is supported by our global infrastructure organization, which provides shared services in the areas of finance, information technology, legal, certain procurement services, workplace services and human resources.

We sell our products primarily through direct sales, but we also utilize distributors, resellers, manufacturer's representatives and electronic commerce. As of October 31, 2019, we employed approximately 16,300 people worldwide. Our primary research and development and manufacturing sites are in California, Colorado, Delaware, Massachusetts, Texas and Vermont in the U.S. and in Australia, China, Denmark, Germany, Italy, Japan, Malaysia, Singapore and the United Kingdom.

Life Sciences and Applied Markets Business

Our life sciences and applied markets business provides application-focused solutions that include instruments and software that enable customers to identify, quantify and analyze the physical and biological properties of substances and products, as well as enable customers in the clinical and life sciences research areas to interrogate samples at the molecular and cellular level. Key product categories include: liquid chromatography ("LC") systems and components; liquid chromatography mass spectrometry ("LCMS") systems; gas chromatography ("GC") systems and components; gas chromatography mass spectrometry ("GCMS") systems; inductively coupled plasma mass spectrometry ("ICP-MS") instruments; atomic absorption ("AA") instruments; microwave plasma-atomic emission spectrometry ("MP-AES") instruments; inductively coupled plasma optical emission spectrometry ("ICP-OES") instruments; raman spectroscopy; cell analysis plate based assays; flow cytometer; real-time cell analyzer; cell imaging systems; microplate reader; laboratory software for sample tracking; information management and analytics; laboratory automation and robotic systems; dissolution testing; vacuum pumps and measurement technologies.

We employed approximately 5,400 people as of October 31, 2019 in our life sciences and applied markets business.

Life Sciences and Applied Markets

Our life sciences and applied markets business focuses primarily on the following five markets:

The Pharmaceutical, Biopharmaceutical, CRO & CMO Market. This market consists of “for-profit” companies who participate across the pharmaceutical value chain in the areas of therapeutic research, discovery & development, clinical trials, manufacturing and quality assurance and quality control. One sub-segment of this market is core and emerging pharmaceutical companies ("pharma"). A second sub-segment includes biopharmaceutical companies ("biopharma"), contract research organizations ("CROs") and contract manufacturing organizations ("CMOs"). Biopharma companies and, to a somewhat lesser extent, CROs and CMOs typically participate in specific points in the pharmaceutical industry value chain. Additionally, due to the relatively low drug efficacy within oncology, pharma companies are partnering with diagnostic companies to bring validated tests to the market with their new drugs.

The Academic and Government Market. This market consists primarily of “not-for-profit” organizations and includes academic institutions, large government institutes and privately funded organizations. The academic and government market plays an influential role in technology adoption and therapeutic developments for pharmaceutical and molecular diagnostics companies. After decades of investment in basic biomedical research by government funding bodies, the focus has widened to include translational research - multidisciplinary scientific efforts directed at accelerating therapy development.

The Chemical & Energy Market. The natural gas and petroleum refining markets use our products to measure and control the quality of their finished products and to verify the environmental safety of their operations. Petroleum refiners use our measurement solutions to analyze crude oil composition, perform raw material analysis, verify and improve refining processes and ensure the overall quality of gasoline, fuels, lubricants and other products. Our solutions are also used in the development, manufacturing and quality control of fine chemicals and other industrial applications such as materials analysis.

The Environmental & Forensics Market. Our instruments, software and workflow solutions are used by the environmental market for applications such as laboratory and field analysis of chemical pollutants in air, water, soil and solid waste. Environmental industry customers include all levels of government, the industrial and manufacturing sectors, engineering and consulting companies, commercial testing laboratories and colleges and universities. Drug testing and forensics laboratories use our instruments, software and workflow solutions for applications such as analyzing evidence associated with crime, screening athletes for performance enhancing drugs, analyzing samples for recreational drugs, or detecting and identifying biological and chemical warfare agents. Some of our instruments are used in mobile laboratories as well. Customers include local, state, federal, and international law enforcement agencies and health laboratories.

The Food Market. Our instruments, software, and workflow solutions are used throughout the food production chain, including incoming inspection, new product development, quality control and assurance, and packaging. For example, our mass spectrometer portfolio is used to analyze contaminants and residual pesticides in food. There is also a significant food safety market involved in analyzing food for pathogen contamination, accurate verification of species type and evidence of genetically modified content.

Life Sciences and Applied Markets Products and Applications

Our products fall into eight main areas of work: liquid chromatography, gas chromatography, mass spectrometry, spectroscopy, software and informatics, lab automation and robotics, vacuum technology and cell analysis.

Our key products and applications include the following technologies:

Liquid Chromatography

A liquid chromatograph ("LC") or a high-performance liquid chromatograph ("HPLC") is used to separate molecules of a liquid mixture to determine the quantity and identity of the molecules present. The Agilent LC portfolio is modular in construction and can be configured as analytical and preparative systems. These systems can be stepwise upgraded to highly sophisticated, automated workflow solutions such as method development, multi-method/walk-up, high-capacity/high-throughput or multi-dimensional LC and can be extended to application-based analyzers e.g. for bio-molecular separations, chiral analysis or size exclusion chromatography. As a leader in liquid chromatography, we continue to expand our application space with new HPLC columns, new services and diagnostics offerings and ongoing instrument and software product enhancements.

Gas Chromatography

Agilent is the world's leading provider of gas chromatographs, both laboratory and portable models. GC's are used to separate any gas, liquid or solid that can be vaporized and then detect the molecules present to determine their identity and quantity. Agilent provides custom or standard analyzers configured for specific chemical analysis applications, such as detailed speciation of a complex hydrocarbon stream, calculation of gas calorific values in the field, or analysis of a new bio-fuel formulation. We also offer related software, accessories and consumable products for these and other similar instruments.

Mass Spectrometry

A mass spectrometer (“MS”) identifies and quantifies chemicals based on a chemical's molecular mass and characteristic patterns of fragment ion masses that result when a molecule is broken apart. Liquid chromatography is commonly used to separate compounds and introduce them to the MS system. The combined use of LC and MS is frequently used both to identify and quantify chemical compounds. Mass spectrometry is an important tool in analyzing small molecules and can also be used to characterize and quantify proteins and other biological entities. Agilent's LCMS portfolio includes instruments built around four main analyzer types - single quadrupole, triple quadrupole, time-of-flight ("TOF") and quadrupole time-of-flight ("QTOF"). We significantly expanded our mass spectrometry portfolio in recent years with a focus on improving performance, sensitivity, and ease of use.

Spectroscopy

Spectroscopy is a technique for analyzing the individual chemical components of substances based on the absorption or emission of electromagnetic radiation of specific wavelengths of light. Our spectroscopy instruments include AA spectrometers, microwave plasma-atomic emission spectrometers ("MP-AES"), ICP-OES, ICP-MS, fluorescence spectrophotometers, ultraviolet- visible ("UV-Vis") spectrophotometers, Fourier Transform infrared ("FT-IR" spectrophotometers, near-infrared ("NIR") spectrophotometers, raman spectrometers and sample automation products. We also offer related software, accessories and consumable products for these and other similar instruments.

Software and Informatics

We provide software for instrument control, data acquisition, data analysis, laboratory content and business process management, and informatics. Our software facilitates the compliant use of instruments in pharmaceutical quality assurance/quality control environments. With our OpenLab Laboratory Software Suite, Agilent has a scalable, open software platform that enables customers to capture, analyze, and share scientific data throughout the lab and across the enterprise.

Lab Automation and Robotics

We offer a comprehensive suite of workflow solutions to our life science customers with the addition of automated liquid handling and robotics that range from standalone instrumentation to bench-top automation solutions. These solutions strengthen our offering of automated sample preparation solutions across a broad range of applications.

Vacuum Technology

Our vacuum technologies products are used to create, control, measure and test vacuum environments in life science, industrial and scientific applications where ultra-clean, high-vacuum environments are needed. Vacuum technologies' customers are typically OEMs that manufacture equipment for these applications, or government and research organizations that require vacuum solutions in their facilities. Products include a wide range of high and ultra-high vacuum pumps (diffusion, turbomolecular and ion getter), intermediate vacuum pumps (rotary vane, sorption and dry scroll), vacuum instrumentation (vacuum control instruments, sensor gauges and meters) and vacuum components (valves, flanges and other mechanical hardware). These products also include helium mass spectrometry and helium-sensing leak detection instruments used to identify and measure leaks in hermetic or vacuum environments. In addition to product sales, we also offer a wide range of services including an exchange and rebuild program, assistance with the design and integration of vacuum systems, applications support and training in basic and advanced vacuum technologies.

Cell Analysis

Our cell analysis tools are used to study cell signaling pathways, general cell function and behavior through metabolic profile analysis, real-time cellular impedance measurements, and traditional cytometry techniques. Characterizing cellular behavior and function is an increasingly critical step in understanding normal behavior versus diseased states, advancements of those diseases, and response to therapies, providing researchers with a more targeted approach for drug discovery and ultimately more effective therapeutics. Our cell analysis portfolio includes cell analysis plate-based assays, flow cytometer, real-time cell analyzer, microplate reader, cell imaging system and related consumables. Cell analysis customers are typically academic institutions and pharma and biopharma companies.

Life Sciences and Applied Markets Customers

We had approximately 23,700 customers for our life sciences and applied markets business in fiscal 2019. No single customer represented a material amount of the net revenue of the life sciences and applied markets business. A significant number of our life sciences and applied markets customers are also customers of our Agilent CrossLab business.

The life sciences and applied markets business is susceptible to seasonality in its orders and revenues primarily related to U.S. and foreign government budgets, chemical and energy and environmental customers and large pharmaceutical company budgets. Historically, the result is that our first and fourth fiscal quarters tend to deliver the strongest profits for this group. However, general economic trends, new product introductions and competition might overshadow this trend in any given year.

Life Sciences and Applied Markets Sales, Marketing and Support

The life sciences and applied markets channels focus on the therapeutics and human disease research customer base (pharma, biopharma, CRO, CMO and generics), clinical customer base (high complexity clinical testing labs), emerging life sciences opportunities in life science research institutes and applied markets (chemical and energy, food, environmental and forensics). We deploy a multi-channel approach, marketing products to our customers through direct sales, electronic commerce, resellers, manufacturers' representatives and distributors. We primarily use direct sales to market our solutions to our pharmaceutical, biopharmaceutical, clinical, life science research and applied market accounts. Sales agents supplement direct sales by providing broader geographic coverage and coverage of smaller accounts. Our active reseller program augments our ability to provide more complete solutions to our customers. We sell our consumable products through distributors, electronic commerce and direct sales.

Our products typically come with standard warranties, and extended warranties are available for additional cost.

Life Sciences and Applied Markets Manufacturing

Our manufacturing supports our diverse product range and customer-centric focus. We assemble highly configurable products to individual customer orders and make standard products to stock. We employ advanced manufacturing techniques and supply chain management systems to reduce costs and manufacturing cycle times. Our manufacturing process then converts these designs into standard as well as custom products for shipment to customers. We selectively use third parties to provide some supply chain processes for manufacturing, warehousing and logistics. Inside the U.S., we have manufacturing facilities in California, Delaware, Massachusetts and Vermont. Outside of the U.S., we have manufacturing facilities in Germany, Malaysia and Singapore. We have FDA registered sites in California, Vermont, Germany and Singapore.

Life Sciences and Applied Markets Competition

The markets for analytical instruments in which we compete are characterized by evolving industry standards and intense competition. Our principal competitors in the life sciences and applied markets arena include: Danaher Corporation, PerkinElmer Inc., Shimadzu Corporation, Thermo Fisher Scientific Inc. and Waters Corporation. Agilent competes on the basis of product performance, reliability, support quality, applications expertise, global channel coverage and price.

Diagnostics and Genomics Business

Our diagnostics and genomics business includes the genomics, nucleic acid contract manufacturing and research and development, pathology, companion diagnostics, reagent partnership and biomolecular analysis businesses.

Our diagnostics and genomics business is comprised of six areas of activity providing active pharmaceutical ingredients ("APIs") for oligo-based therapeutics as well as solutions that include reagents, instruments, software and consumables, which enable customers in the clinical and life sciences research areas to interrogate samples at the cellular and molecular level. First, our genomics business includes arrays for DNA mutation detection, genotyping, gene copy number determination, identification of gene rearrangements, DNA methylation profiling, gene expression profiling, as well as next generation sequencing ("NGS") target enrichment and genetic data management and interpretation support software. This business also includes solutions that enable clinical labs to identify DNA variants associated with genetic disease and help direct cancer therapy. Second, our nucleic acid solutions business provides equipment and expertise focused on production of synthesized oligonucleotides under pharmaceutical good manufacturing practices ("GMP") conditions for use as API in an emerging class of drugs that utilize nucleic acid molecules for disease therapy. Third, our pathology solutions business is focused on product offerings for cancer diagnostics and anatomic pathology workflows. The broad portfolio of offerings includes immunohistochemistry ("IHC"), in situ hybridization ("ISH"), hematoxylin and eosin ("H&E") staining and special staining. Fourth, we also collaborate with a number of major pharmaceutical companies to develop new potential pharmacodiagnostics, also known as companion diagnostics, which may be used to identify patients most likely to benefit from a specific targeted therapy. Fifth, the reagent partnership business is a provider of reagents used for turbidimetry and flow cytometry. Finally, our biomolecular analysis business provides complete workflow solutions, including instruments, consumables and software, for quality control analysis of nucleic acid samples. Samples are analyzed using quantitative and qualitative techniques to ensure accuracy in further genomics analysis techniques utilized in clinical and life science research applications.

We employed approximately 2,800 people as of October 31, 2019 in our diagnostics and genomics business.

Diagnostics and Genomics Market

Within the diagnostics and genomics business, we focus primarily on the diagnostics and clinical market. A significant part of our clinical diagnostic customers are in pathology labs throughout the world. Our high-quality, automated pathology tissue staining platforms and solutions are used most heavily by the large labs located in hospitals, medical centers, and reference labs. The market is skewed towards mature economies, with most of the market in North America, Western Europe and Japan. The mix is changing, however, as emerging markets increase spending on human health.

The clinical market for genomics consists of high complexity clinical labs performing patient testing, including “for-profit” reference laboratories, hospital labs, and molecular diagnostic companies. While these labs primarily purchase in vitro diagnostics ("IVD") labeled testing kits, they often develop and validate their own molecular based tests. Analyte Specific Reagents ("ASRs") are often used by these labs.

Diagnostics and Genomics Products

Our products fall into eight main areas of work: pathology products, specific proteins and flow reagents, companion diagnostics, target enrichment, cytogenetic research solutions and microarrays, PCR and qPCR instrumentation and molecular biology reagents, nucleic acid solutions and automated electrophoresis and microfluidics.

Pathology

This area consists of routine clinical solutions for tissue-based cancer diagnostics with solutions that comprise antibodies, reagents, instruments and software targeting both primary and advanced cancer diagnostics. Our CoverStainer and Artisan based product families target primary cancer diagnostics through hematoxylin and eosin staining as well as special stains for additional insights and detection of potentially carcinogenic tissue. Dako Omnis and Autostainer based IHC solution and Instant Quality Fluorescence In Situ Hybridization ("IQFISH") technologies provide advanced tumor typing through investigation of protein and gene expression. These products also include companion diagnostic tests that are used to help identify patients most likely to benefit from a specific targeted therapy.

Specific Proteins and Flow Reagents

Our reagent OEM business is a provider of clinical diagnostic products within the areas of specific proteins for turbidimetry and reagents for flow cytometry. These are sold to OEM customers as customized reagent solutions supplied to top IVD companies or through retail partners.

Companion Diagnostics

In our companion diagnostics business, we partner with a number of major pharmaceutical companies to develop new potential pharmacodiagnostics, which may be used to identify patients most likely to benefit from a specific targeted therapy. We support pharmaceutical companies during each phase of their drug development process, from early pre-clinical through commercial launch activities. Companion diagnostics has a history of developing clinically relevant and validated tests, with accurate and effective scoring and interpretation guidelines, that enable successful regulatory approvals in our worldwide markets.

Target Enrichment

We provide a target enrichment portfolio composed of two main platforms, SureSelect and HaloPlex, both enabling customers to select specific target regions of the genome for sequencing. Customers can customize our products for their regions of interest using the SureDesign software, or they can choose from a wide range of catalog products, including gene panels for specific applications and Exome designs, which allow analysis of the entire coding sequences of the genome. The technologies provide an easy sample prep workflow that can be automated with the Agilent Bravo platform for scalability. HaloPlex provides less-than-24-hours fast workflow, which makes it suitable for labs that require fast turnaround time from sample to results. These products are used for mutation detection and genotyping. Results can be easily analyzed using Agilent software solutions GeneSpring or SureCall. Our solutions also enable clinical labs to identify DNA variants associated with genetic diseases and help direct cancer therapy.

Cytogenetic Research Solutions and Microarrays

We provide microarrays for comparative genomic hybridization (“CGH”), mostly used by customers in cytogenetic laboratories. The arrays allow customers to detect genome-wide copy number alterations, with high levels of resolution (from entire chromosomal copy number changes to specific microdeletions or duplications). The arrays are offered in many formats allowing the customers to choose from different levels of resolution and number of samples per arrays. Arrays can also be customized using the SureDesign software. In addition to the microarrays, Agilent's solution includes reagents for sample processing, hardware for reading the microarrays, and software to help users view the data in a meaningful way. In addition to the CGH portfolio, the cytogenetics solution comprises a line of oligonucleotide probes for fluorescent in situ hybridization ("FISH") called SureFISH. Additionally, Agilent provides a wide range of microarrays to the research market for different types of applications: gene expression, microRNA, methylation, splice variants, and chromatin immunoprecipitation applications. Arrays are offered as catalog designs or customizable designs, with no minimum order size and short delivery time, which differentiates us from other vendors and enables researchers the maximum flexibility in their studies.

PCR and qPCR Instrumentation and Molecular Biology Reagents

Polymerase chain ceaction ("PCR") is a standard laboratory method used to amplify the amount of genetic material of a given sample to enable further interrogation. Quantitative PCR ("qPCR") or real time PCR is also a standard method used in genomic research facilities to measure the amount of a specific nucleic acid sequence within a sample. There are several applications for qPCR, among the most common are identifying the expression level of a specific gene, or calculating the amount of a specific pathogen present in a sample. Agilent offers a complete portfolio of PCR & qPCR instruments, as well as specialty enzymes for amplifying difficult sample types. In addition to PCR and qPCR enzymes, Agilent offers a wide range of molecular biology reagents including tools for cloning and mutagenesis applications.

Nucleic Acid Solutions

Our nucleic acid solutions business is a contract manufacturing and development services business with equipment and expertise focused on mid to large scale production of synthesized oligonucleotide APIs under pharmaceutical GMP conditions for an emerging class of drugs that utilize oligonucleotide molecules for disease therapy. These drugs have advanced from single strand DNA molecules to complex, highly modified molecules including antisense, aptamers, double-stranded RNA, and RNA mixtures. These advancements in the technology have greatly improved the efficacy of delivery and stability of the oligos in-vivo. Our nucleic acid solutions business offers industry leading experience to efficiently advance our customer's oligo drug candidates from clinical trials to commercial launch with a common goal of patient health and safety.

Automated Electrophoresis and Microfluidics

Automated electrophoresis is a separation technique for bio molecules such as proteins, peptides and nucleic acids (RNA and DNA) and is used to determine the identity of a molecule by either size or charge. It is widely used as a QC tool to check sample integrity prior to subsequent analysis. Prominent examples are nucleic acid preparation products in front of polymerase chain reaction, NGS and microarrays.

Diagnostics and Genomics Customers

We had approximately 11,500 customers for our diagnostics and genomics business in fiscal 2019. No single customer represented a material amount of the net revenue of the diagnostics and genomics business.

Diagnostics and Genomics Sales, Marketing and Support

The diagnostics and genomics channels focus on the therapeutics and human disease research customer base (pharma, biopharma, CRO, CMO and generics), clinical customer base (pathology labs and high complexity clinical testing labs) and on emerging life sciences opportunities in life science research institutes. We deploy a multi-channel approach, marketing products to our customers through direct sales, electronic commerce, resellers, manufacturers' representatives and distributors. We primarily use direct sales to market our solutions to our pharmaceutical, biopharmaceutical and clinical accounts. Sales agents supplement direct sales by providing broader geographic coverage and coverage of smaller accounts. Our active reseller program augments our ability to provide more complete solutions to our customers. We sell our consumable products through distributors, telesales, electronic commerce and direct sales. We utilize telesales for more mature product lines, as well as for reorders of reagent products.

Diagnostics and Genomics Manufacturing

Our manufacturing supports our diverse product range and customer-centric focus. We assemble highly configurable products to individual customer orders and make standard products to stock. We employ advanced manufacturing techniques and supply chain management systems to reduce costs and manufacturing cycle times. We selectively use third parties to provide some supply chain processes for manufacturing, warehousing and logistics. In the U.S., we have manufacturing facilities in California, Colorado and Texas. Outside of the U.S., we have manufacturing facilities in Denmark and Malaysia. Our FDA registered sites include California, Colorado, Texas and Denmark. We utilize just-in-time manufacturing and so typically do not maintain a high level of inventory.

Diagnostics and Genomics Competition

The markets for diagnostics and genomics analytical products in which we compete are characterized by evolving industry standards and intense competition. Our principal competitors in the diagnostics and genomics arena include: Roche Ventana Medical Systems, Inc., a member of the Roche Group, Leica Biosystems, Inc., a division of Danaher Corporation, Abbott

Laboratories, Ilumina, Inc. and Affymetrix, Inc., a division of Thermo Fisher Scientific Inc. Agilent competes on the basis of product performance, reliability, support quality, applications expertise, whole solution offering, global channel coverage and price.

Diagnostics and Genomics Government Regulation

Some of the products the diagnostics and genomics business sells are subject to regulatory approval by the FDA and other regulatory bodies throughout the world. These regulations govern a wide variety of product related activities, from quality management, design and development to labeling, manufacturing, promotion, sales and distribution. We continually invest in our manufacturing infrastructure to gain and maintain certifications necessary for the level of clearance.

Agilent CrossLab Business

The Agilent CrossLab business spans the entire lab with its extensive consumables and services portfolio, which is designed to improve customer outcomes. The majority of the portfolio is vendor neutral, meaning Agilent can serve and supply customers regardless of their instrument purchase choices. Solutions range from chemistries and supplies to services and software helping to connect the entire lab. Key product categories in consumables include GC and LC columns, sample preparation products, custom chemistries, and a large selection of laboratory instrument supplies. Services include startup, operational, training and compliance support, software as a service, as well as asset management and consultative services that help increase customer productivity. Custom service and consumable bundles are tailored to meet the specific application needs of various industries and to keep instruments fully operational and compliant with the respective industry requirements.

Our Agilent CrossLab business employed approximately 5,500 people as of October 31, 2019.

Agilent CrossLab Markets

The Pharmaceutical, Biopharmaceutical, CRO & CMO Market. Our services and consumable products support customers in this market that consists of "for-profit" companies who participate across the pharmaceutical value chain in the areas of therapeutic research, discovery and development, clinical trials, manufacturing and quality assurance and quality control. One sub-segment of this market is core and emerging pharmaceutical companies ("pharma"). A second sub-segment includes biopharmaceutical companies ("biopharma"), contract research organizations ("CROs") and contract manufacturing organizations ("CMOs"). Biopharma companies and, to a somewhat lesser extent, CROs and CMOs typically participate in specific points in the pharmaceutical industry value chain. Additionally, due to the relatively low drug efficacy within oncology, pharma companies are partnering with diagnostic companies to bring validated tests to the market with their new drugs.

The Academic and Government Market. Our services and consumable products support customers in this market that consists primarily of "not-for-profit" organizations and includes academic institutions, large government institutes and privately funded organizations. The academic and government market plays an influential role in technology adoption and therapeutic developments for pharmaceutical and molecular diagnostics companies. After decades of investment in basic biomedical research by government funding bodies, the focus has widened to include translational research - multidisciplinary scientific efforts directed at accelerating therapy development.

The Chemical & Energy Market. The natural gas and petroleum refining markets use our services and consumable products to support their quality control and environmental safety reviews. Petroleum refiners use our services and consumable products to support their analysis of crude oil composition and raw materials, as well as help improve their refining processes and improve the quality of their products. Our services and consumable products are also used in the development, manufacturing and quality control of fine chemicals and other industrial applications, such as material analysis.

The Environmental & Forensics Market. Our services and consumable products support the environmental industry customers that perform laboratory and field analysis of chemical pollutants in air, water, soil and solid waste. Environmental industry customers include all levels of government, the industrial and manufacturing sectors, engineering and consulting companies, commercial testing laboratories and colleges and universities. Our services and consumable products also support drug testing and forensics laboratories that are involved with analyzing evidence associated with crime, screening athletes for performance enhancing drugs, analyzing samples for recreational drugs, or detecting and identifying biological and chemical warfare agents. Customers include local, state, federal, and international law enforcement agencies and commercial testing laboratories.

The Food Market. Our services and consumable products support the food production chain, including incoming inspection, new product development, quality control and assurance, and packaging. Our services and consumable products also support the food safety market in their work to analyze food for concerns ranging from pathogen contamination, genetic modification, species verification and others.

The Diagnostics and Clinical Market. Our services and consumable products support clinical diagnostic customers in pathology labs throughout the world. The market is skewed towards the mature economies, with most of the market in North America, Western Europe and Japan. The mix is changing, however, as emerging markets increase spending on human health.

Agilent CrossLab Products and Applications

Chemistries and Supplies

We offer a broad range of market specific consumables and supplies to complete customers' analytical workflows from sample preparation through separation and analysis to storage, with the support of our technology platforms. This includes sample preparation consumables such as solid phase extraction ("SPE") and filtration products, self-manufactured GC and LC columns, chemical standards, and instrument replacement parts. Consumable products also include scientific instrument parts and supplies such as filters and fittings for GC systems; xenon lamps and cuvettes for UV-Vis-NIR, fluorescence, FT-IR and raman spectroscopy instruments; and graphite furnace tubes, hollow cathode lamps and specialized sample introduction glassware for our AA, ICP-OES and ICP-MS products.

Services and Support

We offer a wide range of startup, operational, educational and compliance support services for our measurement and data handling systems. Our support services include maintenance, troubleshooting, repair and training for all of our chemical and bioanalytical instrumentation hardware and software products. Special service bundles have also been designed to meet the specific application needs of various industries. As customers continue to outsource laboratory operations and consolidate suppliers, our enterprise services consist of a broad portfolio of integrated laboratory management services including instrument services, lab supply management, asset management, procurement, informatics and scientific services. Advancements in our offering software and service solutions will help our customers operate a more digitally connected smart lab that can derive more value out of data analytics, artificial intelligence and robotics.

Remarketed Instruments

We refurbish and resell certified pre-owned instruments to value-oriented customers who demand Agilent quality and performance at a budget conscious price.

Agilent CrossLab Customers

We had approximately 52,500 Agilent CrossLab customers in fiscal 2019 and no single customer represented a material amount of the net revenue of the Agilent CrossLab business. A significant number of our Agilent CrossLab customers are also customers of our life sciences and applied markets business.

The service and consumables business is mostly recurring in nature, and is not as susceptible to market seasonality and industry cycles in comparison to our instrument businesses. The vendor neutral portion of the portfolio allows the business to perform relatively independent from our instrument business.

Agilent CrossLab Sales, Marketing and Support

We deploy a multi-channel approach, marketing products and services to our customers through direct sales, electronic commerce, resellers, manufacturers' representatives and distributors. We primarily use direct sales to market our solutions to our large accounts. Sales agents supplement direct sales by providing broader geographic coverage and coverage of smaller accounts. Our active reseller program augments our ability to provide more complete solutions to our customers. We utilize telesales to enhance the transactional sales model of our products. All channels are supported by technical product and application specialists to meet our customer’s specific requirements.

We deliver our support services to customers in a variety of ways, including on-site assistance with repair or exchange of returned products, telephone support and self-diagnostic services provided over the Internet. We also offer special industry-focused service bundles that are designed to meet the specific needs of hydrocarbon processing, environmental, pharmaceutical and biopharmaceutical customers to keep instruments fully operational and compliant with the respective industry requirements. Our products typically come with standard warranties, and extended warranties are available for additional cost.

Agilent CrossLab Manufacturing

Our primary manufacturing sites for the consumables business are in California and Delaware in the U.S., and in the Netherlands and the United Kingdom outside of the U.S. Our direct service delivery organization is regionally based operating in 30 countries.

Agilent CrossLab Competition

Our principal competitors in the services and consumable products arena include many of our competitors from the instrument business, such as: Danaher Corporation, PerkinElmer, Inc., Shimadzu Corporation, Thermo Fisher Scientific Inc. and Waters Corporation, as well as numerous niche consumables and service providers. Agilent competes on the basis of product performance, reliability, support quality, applications expertise, global channel coverage and price.

Agilent Technologies Research Laboratories

Agilent Technologies Research Laboratories ("Agilent Labs") is our central research organization based in Santa Clara, California. The Research Labs create competitive advantage through high-impact technology, driving market leadership and growth in Agilent's core businesses and expanding Agilent's footprint into adjacent markets. At the cross-roads of the organization, the Research Labs are able to identify and enable synergies across Agilent's businesses to create competitive differentiation and compelling customer value.

The technical staff have advanced degrees that cover a wide range of scientific and engineering fields, including molecular and cell biology, chemistry, physics, pathology, mathematics, software and informatics, artificial intelligence, deep and machine learning, image processing, nano/microfabrication, fluidics, and business.

Global Infrastructure Organization

We provide support to our businesses through our global infrastructure organization. This support includes services in the areas of finance, tax, treasury, legal, real estate, insurance services, workplace services, human resources, information technology services, order administration and other corporate infrastructure expenses. Generally, these organizations are managed from Santa Clara, California, with operations and services provided worldwide. As of the end of October 2019, our global infrastructure organization employed approximately 2,600 people worldwide.

Agilent Order Fulfillment Organizations

Our order fulfillment and supply chain organization (“OFS”) focuses on order fulfillment and supply chain operations in our businesses. OFS provides resources for manufacturing, engineering and strategic sourcing to our respective businesses. In general, OFS employees are dedicated to specific businesses and the associated costs are directly allocated to those businesses.

The following discussions of Research and Development, Backlog, Intellectual Property, Materials, Environmental and Acquisition and Disposal of Material Assets include information common to each of our businesses.

Research and Development

We anticipate that we will continue to have significant research and development expenditures in order to maintain our competitive position with a continuing flow of innovative, high-quality products and services. Our research and development efforts focus on potential new products and product improvements covering a wide variety of technologies, none of which is individually significant to our operations. Our research seeks to improve on various technical competencies in software, systems and solutions, life sciences and diagnostics. In each of these research fields, we conduct research that is focused on specific product development for release in the short-term as well as other research that is intended to be the foundation for future products over a longer time-horizon. Most of our product development research is designed to improve products already in production, focus on major new product releases, and develop new product segments for the future. We remain committed to invest significantly in research and development and have focused our development efforts on key strategic opportunities to align our business with available markets and position ourselves to capture market share.

Backlog

We believe that backlog is not a meaningful indicator of future business prospects for our business segments since a significant portion of our revenue for a given quarter is derived from the current quarter's orders. Therefore, we believe that backlog information is not material to an understanding of our business.

Intellectual Property

We generate patent and other intellectual property rights covering significant inventions and other innovations in order to create a competitive advantage. While we believe that our licenses, patents and other intellectual property rights have value, in general no single license, patent or other intellectual property right is in itself material. In addition, our intellectual property rights may be challenged, invalidated or circumvented or may otherwise not provide significant competitive advantage.

Materials

Our life sciences and applied markets, diagnostics and genomics and Agilent CrossLab businesses all purchase materials from thousands of suppliers on a global basis. Some of the parts that require custom design work are not readily available from alternate suppliers due to their unique design or the length of time necessary for design work. Our long-term relationships with suppliers allow us to proactively manage technology road maps and product discontinuance plans and monitor their financial health. To address any potential disruption in our supply chain, we use a number of techniques, including qualifying multiple sources of supply and redesign of products for alternative components. In addition, while we generally attempt to keep our inventory at minimal levels, we do purchase incremental inventory as circumstances warrant to protect the supply chain.

Environmental

Our R&D, manufacturing and distribution operations involve the use of hazardous substances and are regulated under international, federal, state and local laws governing health and safety and the environment. We apply strict standards for protection of the environment and occupational health and safety to sites inside and outside the U.S., even if not subject to regulation imposed by foreign governments. We believe that our properties and operations at our facilities comply in all material respects with applicable environmental laws and occupational health and safety laws. We are also regulated under a number of international, federal, state, and local laws regarding recycling, product packaging and product content requirements. We believe we are substantially in compliance with such environmental, product content/disposal and recycling laws.

We maintain a comprehensive Environmental Site Liability insurance policy which may cover certain clean-up costs or legal claims related to environmental contamination. This policy covers specified active, inactive and divested locations.

Information about our Executive Officers

The names of our current executive officers and their ages, titles and biographies appear below:

Henrik Ancher-Jensen, 54, has served as our Senior Vice President, Agilent and President, Order Fulfillment since September 2013. From September 2012 to September 2013, Mr. Ancher-Jensen served as our Vice President, Global Product Supply, Diagnostics and Genomics Group. From September 2010 to September 2012 he served as Corporate Vice President, Global Operations of Dako A/S, a Danish diagnostics company, and as Dako's Vice President, Supply Chain and Chief Information Officer from 2006 to September 2010. Prior to joining Dako, he spent more than 15 years in senior management roles and management consulting with Chr. Hansen, Deloitte Consulting and NVE.

Mark Doak, 64, has served as our Senior Vice President, Agilent and President, Agilent CrossLab Group since September 2014. From August 2008 to September 2014, Mr. Doak served as our Vice President and General Manager of the Services and Support Division. Prior to that, he held several senior management positions across functions in marketing, quality and services.

Rodney Gonsalves, 54, has served as our Vice President, Corporate Controllership and Chief Accounting Officer since May 2015. From September 2009 to May 2015, Mr. Gonsalves served as Vice President and operational CFO for various business groups within the company, most recently for the Life Sciences and Applied Markets Group. Prior to that, Mr. Gonsalves served in various capacities for Agilent, including as vice president of Investor Relations, controller, corporate governance and customer financing in Agilent's Global Infrastructure Organization, and controller for the Photonics Systems Business Unit. Before joining Agilent, Mr. Gonsalves held a variety of positions in finance with Hewlett- Packard Co.

Dominique P. Grau, 60, has served as our Senior Vice President, Human Resources since August 2014. From May 2012 to August 2014 Mr. Grau served as Vice President, Worldwide Human Resources. Prior to that, he served as Vice President, Compensation, Benefits and HR Services from May 2006 to May 2012. Mr. Grau had previously served in various capacities for Agilent and Hewlett-Packard Company.

Robert W. McMahon, 51, has served as our Senior Vice President since August 2018 and Chief Financial Officer since September 2018. He previously served as the Chief Financial Officer of Hologic, Inc., a medical technology company from May 2014 to August 2018. Prior to Hologic, Mr. McMahon spent 20 years with Johnson & Johnson most recently as Worldwide Vice President of Finance and Business Development for Ortho Clinical Diagnostics a division of Johnson & Johnson's Medical Device and Diagnostics Group.

Michael R. McMullen, 58, has served as Chief Executive Officer since March 2015 and as President since September 2014. From September 2014 to March 2015 he also served as Chief Operating Officer. From September 2009 to September 2014 he served as Senior Vice President, Agilent and President, Chemical Analysis Group. Prior to that, he served in various capacities for Agilent, including as our Vice President and General Manager of the Chemical Analysis Solutions Unit of the Life Sciences and Chemical Analysis Group and Country Manager for Agilent's China, Japan and Korea Life Sciences and Chemical Analysis Group. Prior to that, Mr. McMullen served as Controller for the Hewlett-Packard Company and Yokogawa Electric Joint Venture from July 1996 to March 1999. Since September 2018, Mr. McMullen has served as a member of the Board of Directors of Coherent, Inc.

Samraat S. Raha, 47, has served as our Senior Vice President, Agilent and President, Diagnostics and Genomics Group since April 2018. From May 2017 to April 2018, Mr. Raha served as our Senior Vice President, Strategy and Corporate Development. From June 2013 to January 2017 he served as Vice President, Global Marketing for Illumina, Inc. and from 2008 to 2012 he served as Vice President and General Manager, Genomic Assays / NextGen qPCR for Life Technologies, Inc.

Michael Tang, 45, has served as our Senior Vice President, General Counsel and Secretary since January 2016. From May 2015 to January 2016 he served as Vice President, Assistant General Counsel and Secretary and from November 2013 to April 2015 he served as Vice President, Assistant General Counsel and Assistant Secretary. From March 2012 to October 2013 he served as Business Development Manager in Agilent's Corporate Development group. Prior to that, Mr. Tang served in various capacities in Agilent's legal department. Before joining Agilent, Mr. Tang worked at Wilson Sonsini Goodrich & Rosati, a California law firm and Fenwick & West LLP, a California law firm.

Jacob Thaysen, 44, has served as our Senior Vice President, Agilent and President, Life Sciences and Applied Markets Group, since April 2018. From November 2014 to April 2018 he served as Senior Vice President, Agilent and President, Diagnostics and Genomics Group. From October 2013 to November 2014 he served as Vice President and General Manager of the Diagnostics and Genomics business. Prior to that he served as Vice President and General Manager of the Genomics Solutions unit from January 2013 to October 2013. Before joining Agilent, he served in various capacities at Dako A/S, a Danish diagnostics company, including as Corporate Vice President of R&D, Vice President, System Development, R&D, Vice President, Strategic Marketing and Vice President, Global Sales Operations. Prior to Dako, Mr. Thaysen worked as a management consultant and Chief Technical Officer and founder of a high-tech start-up company.

Investor Information

We are subject to the informational requirements of the Securities Exchange Act of 1934 ("Exchange Act"). Therefore, we file periodic reports, proxy statements and other information with the Securities and Exchange Commission ("SEC"). The SEC maintains an Internet site (http://www.sec.gov) that contains reports, proxy and information statements and other information regarding issuers that file electronically.

Our financial and other information can be accessed at our Investor Relations website. The address is www.investor.agilent.com. We make available, free of charge, copies of our annual report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after filing such material electronically or otherwise furnishing it to the SEC.

Our Amended and Restated Bylaws, Corporate Governance Standards, the charters of our Audit and Finance Committee, our Compensation Committee, our Executive Committee and our Nominating/Corporate Governance Committee, as well as our Standards of Business Conduct (including code of ethics provisions that apply to our principal executive officer, principal financial officer, principal accounting officer and senior financial officers) are available on our website at www.investor.agilent.com under "Corporate Governance". These items are also available in print to any stockholder in the United States and Canada who requests them by calling (877) 942-4200. This information is also available by writing to the company at the address on the cover of this Annual Report on Form 10-K.

Item 1A. Risk Factors

Risks, Uncertainties and Other Factors That May Affect Future Results

Our operating results and financial condition could be harmed if the markets into which we sell our products decline or do not grow as anticipated.

Visibility into our markets is limited. Our quarterly sales and operating results are highly dependent on the volume and timing of orders received during the fiscal quarter, which are difficult to forecast and may be cancelled by our customers. In addition, our revenue and earnings forecasts for future fiscal quarters are often based on the expected seasonality of our markets. However, the markets we serve do not always experience the seasonality that we expect as customer spending policies and budget allocations, particularly for capital items, may change. Any decline in our customers' markets or in general economic conditions would likely result in a reduction in demand for our products and services. Also, if our customers' markets decline, we may not be able to collect on outstanding amounts due to us. Such declines could harm our consolidated financial position, results of operations, cash flows and stock price, and could limit our profitability. Also, in such an environment, pricing pressures could intensify. Since a significant portion of our operating expenses is relatively fixed in nature due to sales, research and development and manufacturing costs, if we were unable to respond quickly enough these pricing pressures could further reduce our operating margins.

If we do not introduce successful new products and services in a timely manner to address increased competition through frequent new product and service introductions, rapid technological changes and changing industry standards, our products and services may become obsolete, and our operating results may suffer.

We generally sell our products in industries that are characterized by increased competition through frequent new product and service introductions, rapid technological changes and changing industry standards. Without the timely introduction of new products, services and enhancements, our products and services may become technologically obsolete over time, in which case our revenue and operating results could suffer. The success of our new products and services will depend on several factors, including our ability to:

- properly identify customer needs and predict future needs;
- innovate and develop new technologies, services and applications;
- appropriately allocate our research and development spending to products and services with higher growth prospects;
- successfully commercialize new technologies in a timely manner;
- manufacture and deliver new products in sufficient volumes and on time;
- differentiate our offerings from our competitors' offerings;
- price our products competitively;
- anticipate our competitors' development of new products, services or technological innovations; and
- control product quality in our manufacturing process.

In addition, if we fail to accurately predict future customer needs and preferences or fail to produce viable technologies, we may invest in research and development of products and services that do not lead to significant revenue, which would adversely affect our profitability. Even if we successfully innovate and develop new and enhanced products and services, we may incur substantial costs in doing so, and our operating results may suffer. In addition, promising new products may fail to reach the market or realize only limited commercial success because of real or perceived concerns of our customers. Furthermore, as we collaborate with pharmaceutical customers to develop drugs such as companion diagnostics assays or provide drug components like active pharmaceutical ingredients, we face risks that those drug programs may be cancelled upon clinical trial failures.

General economic conditions may adversely affect our operating results and financial condition.

Our business is sensitive to negative changes in general economic conditions, both inside and outside the United States. Slower global economic growth and uncertainty in the markets in which we operate may adversely impact our business resulting in:

- reduced demand for our products, delays in the shipment of orders, or increases in order cancellations;
- increased risk of excess and obsolete inventories;
- increased price pressure for our products and services; and
- greater risk of impairment to the value, and a detriment to the liquidity, of our investment portfolio.

Failure to adjust our purchases due to changing market conditions or failure to accurately estimate our customers' demand could adversely affect our income.

Our income could be harmed if we are unable to adjust our purchases to reflect market fluctuations, including those caused by the seasonal nature of the markets in which we operate. The sale of our products and services are dependent, to a large degree, on customers whose industries are subject to seasonal trends in the demand for their products. During a market upturn, we may not be able to purchase sufficient supplies or components to meet increasing product demand, which could materially affect our results. In the past, we have experienced a shortage of parts for some of our products. In addition, some of the parts that require custom design are not readily available from alternate suppliers due to their unique design or the length of time necessary for design work. Should a supplier cease manufacturing such a component, we would be forced to reengineer our product. In addition to discontinuing parts, suppliers may also extend lead times, limit supplies or increase prices due to capacity constraints or other factors. In order to secure components for the production of products, we may continue to enter into non-cancelable purchase commitments with vendors, or at times make advance payments to suppliers, which could impact our ability to adjust our inventory to declining market demands. If demand for our products is less than we expect, we may experience additional excess and obsolete inventories and be forced to incur additional expenses.

Demand for some of our products and services depends on the capital spending policies of our customers, research and development budgets and on government funding policies.

Our customers include pharmaceutical companies, laboratories, universities, healthcare providers, government agencies and public and private research institutions. Many factors, including public policy spending priorities, available resources, mergers and consolidations, institutional and governmental budgetary policies and spending priorities, and product and economic cycles, have a significant effect on the capital spending policies of these entities. Fluctuations in the research and development budgets at these organizations could have a significant effect on the demand for our products and services. Research and development budgets fluctuate due to changes in available resources, consolidation, spending priorities, general economic conditions and institutional and governmental budgetary policies. The timing and amount of revenue from customers that rely on government funding or research may vary significantly due to factors that can be difficult to forecast, including changes in spending authorizations and budgetary priorities for our products and services. If demand for our products and services is adversely affected, our revenue and operating results would suffer.

Economic, political, foreign currency and other risks associated with international sales and operations could adversely affect our results of operations.

Because we sell our products worldwide, our business is subject to risks associated with doing business internationally. We anticipate that revenue from international operations will continue to represent a majority of our total revenue. International revenue and costs are subject to the risk that fluctuations in foreign currency exchange rates could adversely affect our financial results when translated into U.S. dollars for financial reporting purposes. The unfavorable effects of changes in foreign currency exchange rates have decreased revenues by approximately 2 percentage points in the year ended October 31, 2019. When movements in foreign currency exchange rates have a negative impact on revenue, they will also have a positive impact by reducing our costs and expenses. In addition, many of our employees, contract manufacturers, suppliers, job functions, outsourcing activities and manufacturing facilities are located outside the United States. Accordingly, our future results could be harmed by a variety of factors, including:

- interruption to transportation flows for delivery of parts to us and finished goods to our customers;
- changes in a specific country's or region's political, economic or other conditions;
- changes in diplomatic and trade relationships, such as the United Kingdom's exit from the European Union, including new tariffs, trade protection measures, import or export licensing requirements, new or different customs duties trade embargoes and sanctions and other trade barriers;
- tariffs imposed by the U.S. on goods from other countries and tariffs imposed by other countries on U.S. goods, including the tariffs enacted and proposed by the U.S. government on various imports from China and by the Chinese government on certain U.S. goods;
- negative consequences from changes in or differing interpretations of laws and regulations, including those related to tax and import/export;
- difficulty in staffing and managing widespread operations;
- differing labor regulations;
- differing protection of intellectual property;
- unexpected changes in regulatory requirements; and
- geopolitical uncertainty or turmoil, including terrorism and war.

We sell our products into many countries and we also source many components and materials for our products from and manufacture our products in various countries. Tariffs recently announced and implemented could have negative impact on our business, results of operations and financial condition. It may be time-consuming and expensive for us to alter our business operations in order to adapt to any such change. Further, additional tariffs, the scope and duration of which, if implemented, remains uncertain, which have been proposed or threatened and the potential escalation of a trade war and retaliatory measures could have a material adverse effect on our business, results of operations and financial condition.

Most of our accounting and tax processes including general accounting, cost accounting, accounts payable, accounts receivables and tax functions are centralized at locations in India and Malaysia. If conditions change in those countries, it may adversely affect operations, including impairing our ability to pay our suppliers and collect our receivables. Our results of operations, as well as our liquidity, may be adversely affected and possible delays may occur in reporting financial results.

In addition, although the majority of our products are priced and paid for in U.S. dollars, a significant amount of certain types of expenses, such as payroll, utilities, tax, and marketing expenses, are paid in local currencies. Our hedging programs reduce, but do not always entirely eliminate, within any given twelve-month period, the impact of currency exchange rate movements, and therefore fluctuations in exchange rates, including those caused by currency controls, could impact our business, operating results and financial condition by resulting in lower revenue or increased expenses. For expenses beyond that twelve-month period, our hedging strategy does not mitigate our exposure. In addition, our currency hedging programs involve third party financial institutions as counterparties. The weakening or failure of financial institution counterparties may adversely affect our hedging programs and our financial condition through, among other things, a reduction in available counterparties, increasingly unfavorable terms, and the failure of the counterparties to perform under hedging contracts.

Our strategic initiatives to adjust our cost structure could have long-term adverse effects on our business and we may not realize the operational or financial benefits from such actions.

We have implemented multiple strategic initiatives across our businesses to adjust our cost structure, and we may engage in similar activities in the future. These strategic initiatives and our regular ongoing cost reduction activities may distract management, could slow improvements in our products and services and limit our ability to increase production quickly if demand for our products increases. In addition, delays in implementing our strategic initiatives, unexpected costs or failure to meet targeted improvements may diminish the operational and financial benefits we realize from such actions. Any of the above circumstances could have an adverse effect on our business and operating results and financial condition.

Our business will suffer if we are not able to retain and hire key personnel.

Our future success depends partly on the continued service of our key research, engineering, sales, marketing, manufacturing, executive and administrative personnel. If we fail to retain and hire a sufficient number of these personnel, we will not be able to maintain or expand our business. The markets in which we operate are very dynamic, and our businesses continue to respond with reorganizations, workforce reductions and site closures. We believe our pay levels are very competitive within the regions that we operate. However, there is intense competition for certain highly technical specialties in geographic areas where we continue to recruit, and it may become more difficult to hire and retain our key employees.

Our acquisitions, strategic investments and alliances, joint ventures, exiting of businesses and divestitures may result in financial results that are different than expected.

In the normal course of business, we frequently engage in discussions with third parties relating to possible acquisitions, strategic investments and alliances, joint ventures and divestitures, and generally expect to complete several transactions per year. In addition, we may decide to exit a particular business within our product portfolio. As a result of such transactions, our financial results may differ from our own or the investment community's expectations in a given fiscal quarter, or over the long term. We may have difficulty developing, manufacturing and marketing the products of a newly acquired company in a way that enhances the performance of our combined businesses or product lines. Acquired businesses may also expose us to new risks and new markets and we may have difficulty addressing these risks in a cost effective and timely manner. Transactions such as acquisitions have resulted, and may in the future result in, unexpected significant costs and expenses. In the future, we may be required to record charges to earnings during the period if we determine there is an impairment of goodwill or intangible assets, up to the full amount of the value of the assets, or, in the case of strategic investments and alliances, consolidate results, including losses, of third parties or write down investment values or loans and convertible notes related to the strategic investment.

Integrating the operations of acquired businesses within Agilent could be a difficult, costly and time-consuming process that involves a number of risks. Acquisitions and strategic investments and alliances may require us to integrate and collaborate with a different company culture, management team, business model, business infrastructure and sales and distribution methodology and assimilate and retain geographically dispersed, decentralized operations and personnel. Depending on the size and complexity of an acquisition, our successful integration of the entity depends on a variety of factors, including introducing new products and meeting revenue targets as expected, the retention of key employees and key customers, increased exposure to certain governmental regulations and compliance requirements and increased costs and use of resources. Further, the integration of acquired businesses is likely to result in our systems and internal controls becoming increasingly complex and more difficult to manage. Any difficulties in the assimilation of acquired businesses into our control system could harm our operating results or cause us to fail to meet our financial reporting obligations.

Even if we are able to successfully integrate acquired businesses within Agilent, we may not be able to realize the revenue and other synergies and growth that we anticipated from the acquisition in the time frame that we expected, and the costs of achieving these benefits may be higher than what we expected. As a result, the acquisition and integration of acquired businesses may not contribute to our earnings as expected, we may not achieve our operating margin targets when expected, or at all, and we may not achieve the other anticipated strategic and financial benefits of such transactions.

A successful divestiture depends on various factors, including our ability to effectively transfer liabilities, contracts, facilities and employees to the purchaser, identify and separate the intellectual property to be divested from the intellectual property that we wish to keep and reduce fixed costs previously associated with the divested assets or business. In addition, if customers of the divested business do not receive the same level of service from the new owners, this may adversely affect our other businesses to the extent that these customers also purchase other Agilent products. In exiting a business, we may still retain liabilities associated with the support and warranty of those businesses and other indemnification obligations. All of these efforts require varying levels of management resources, which may divert our attention from other business operations. If we do not realize the expected benefits or synergies of such transactions, our consolidated financial position, results of operations, cash flows and stock price could be negatively impacted.

If we fail to maintain an effective system of internal controls, we may not be able to accurately report our financial results, which could lead to a loss of investor confidence in our financial statements and have an adverse effect on our stock price.

Effective internal controls are necessary for us to provide reliable and accurate financial statements and to effectively prevent fraud. We devote significant resources and time to comply with the internal control over financial reporting requirements of the Sarbanes Oxley Act of 2002 and continue to enhance our controls. However, we cannot be certain that we will be able to prevent future significant deficiencies or material weaknesses. Inadequate internal controls could cause investors to lose confidence in our reported financial information, which could have a negative effect on investor confidence in our financial statements, the trading price of our stock and our access to capital.

Our customers and we are subject to various governmental regulations. Compliance with or changes in such regulations may cause us to incur significant expenses, and if we fail to maintain satisfactory compliance with certain regulations, we may be forced to recall products and cease their manufacture and distribution, and we could be subject to civil or criminal penalties.

Our customers and we are subject to various significant international, federal, state and local regulations, including but not limited to regulations in the areas of health and safety, packaging, product content, employment, labor and immigration, import/export controls, trade restrictions and anti-competition. In addition, as a global organization, we are subject to data privacy and security laws, regulations, and customer-imposed controls in numerous jurisdictions as a result of having access to and processing confidential, personal, sensitive and/or patient health data in the course of our business. The EU's General Data Protection Regulation ("GDPR"), which became effective in May 2018, applies to all of our activities related to products and services that we offer to EU customers and workers. The GDPR established new requirements regarding the handling of personal data and includes significant penalties for non-compliance (including possible fines of up to 4 percent of total company revenue). Other governmental authorities around the world have passed or are considering similar types of legislative and regulatory proposals concerning data protection. Each of these privacy, security and data protection laws and regulations could impose significant limitations and increase our cost of providing our products and services where we process end user personal data and could harm our results of operations and expose us to significant fines, penalties and other damages.

We must also 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.

These regulations are complex, change frequently and have tended to become more stringent over time. We may be required to incur significant expenses to comply with these regulations or to remedy any violations of these regulations. Any failure by us to comply with applicable government regulations could also result in the cessation of our operations or portions of our operations, product recalls or impositions of fines and restrictions on our ability to carry on or expand our operations. In addition, because many of our products are regulated or sold into regulated industries, we must comply with additional regulations in marketing our products. We develop, configure and market our products to meet customer needs created by these regulations. Any significant change in these regulations could reduce demand for our products, force us to modify our products to comply with new regulations or increase our costs of producing these products. If demand for our products is adversely affected or our costs increase, our operating results and business would suffer.

Our products and operations are also often subject to the rules of industrial standards bodies, like the International Standards Organization, as well as regulation by other agencies such as the FDA. We also must comply with work safety rules. If we fail to adequately address any of these regulations, our businesses could be harmed.

We are subject to extensive regulation by the FDA and certain similar foreign regulatory agencies, and failure to comply with such regulations could harm our reputation, business, financial condition and results of operations.

A number of our products are subject to regulation by the FDA and certain similar foreign regulatory agencies. In addition, a number of our products may in the future be subject to regulation by the FDA and certain similar foreign regulatory agencies. These regulations govern a wide variety of product-related activities, from quality management, design and development to labeling, manufacturing, promotion, sales and distribution. If we or any of our suppliers or distributors fail to comply with FDA and other applicable regulatory requirements or are perceived to potentially have failed to comply, we may face, among other things, warning letters; adverse publicity affecting both us and our customers; investigations or notices of non-compliance, fines,

injunctions, and civil penalties; import or export restrictions; partial suspensions or total shutdown of production facilities or the imposition of operating restrictions; increased difficulty in obtaining required FDA clearances or approvals or foreign equivalents; seizures or recalls of our products or those of our customers; or the inability to sell our products. Any such FDA or other regulatory agency actions could disrupt our business and operations, lead to significant remedial costs and have a material adverse impact on our financial position and results of operations. In addition, the global regulatory environment has become increasingly stringent. For example, the EU has adopted the EU In Vitro Diagnostic Regulation (the "EU IVDR"), which imposes stricter requirements for the marketing and sale of medical devices, including in the area of clinical evaluation requirements, quality systems and post-market surveillance. Manufacturers will have until May 2022 to meet the EU IVDR requirements for in vitro diagnostic medical devices currently on the market. Failure to meet these requirements could adversely impact our business in the EU and other regions that tie their product registrations to the EU requirements.

Some of our products are subject to particularly complex regulations such as regulations of toxic substances and failure to comply with such regulations could harm our business.

Some of our products and related consumables are used in conjunction with chemicals whose manufacture, processing, distribution and notification requirements are regulated by the U.S. Environmental Protection Agency ("EPA") under the Toxic Substances Control Act, and by regulatory bodies in other countries under similar laws. The Toxic Substances Control Act regulations govern, among other things, the testing, manufacture, processing and distribution of chemicals, the testing of regulated chemicals for their effects on human health and safety and the import and export of chemicals. The Toxic Substances Control Act prohibits persons from manufacturing any chemical in the United States that has not been reviewed by the EPA for its effect on health and safety, and placed on an EPA inventory of chemical substances. We must ensure conformance of the manufacturing, processing, distribution of and notification about these chemicals to these laws and adapt to regulatory requirements in all applicable countries as these requirements change. If we fail to comply with the notification, record-keeping and other requirements in the manufacture or distribution of our products, then we could be subject to civil penalties, criminal prosecution and, in some cases, prohibition from distributing or marketing our products until the products or component substances are brought into compliance.

Our business may suffer if we fail to comply with government contracting laws and regulations.

We derive a portion of our revenue from direct and indirect sales to U.S., state, local, and foreign governments and their respective agencies. Such contracts are subject to various procurement laws and regulations, and contract provisions relating to their formation, administration and performance. Failure to comply with these laws, regulations or provisions in our government contracts could result in the imposition of various civil and criminal penalties, termination of contracts, forfeiture of profits, suspension of payments, increased pricing pressure or suspension from future government contracting. If our government contracts are terminated, if we are suspended from government work, or if our ability to compete for new contracts is adversely affected, our business could suffer.

Our reputation, ability to do business and financial statements may be harmed by improper conduct by any of our employees, agents or business partners.

We cannot provide assurance that our internal controls and compliance systems will always protect us from acts committed by employees, agents or business partners of ours (or of businesses we acquire or partner with) that would violate U.S. and/or non-U.S. laws, including the laws governing payments to government officials, bribery, fraud, kickbacks and false claims, pricing, sales and marketing practices, conflicts of interest, competition, employment practices and workplace behavior, export and import compliance, money laundering and data privacy. In particular, the U.S. Foreign Corrupt Practices Act, the U.K. Bribery Act and similar anti-bribery laws in other jurisdictions generally prohibit companies and their intermediaries from making improper payments to government officials for the purpose of obtaining or retaining business, and we operate in many parts of the world that have experienced governmental corruption to some degree. Any such improper actions or allegations of such acts could damage our reputation and subject us to civil or criminal investigations in the United States and in other jurisdictions and related shareholder lawsuits, could lead to substantial civil and criminal, monetary and non-monetary penalties and could cause us to incur significant legal and investigatory fees. In addition, the government may seek to hold us liable as a successor for violations committed by companies in which we invest or that we acquire. We also rely on our suppliers to adhere to our supplier standards of conduct, and material violations of such standards of conduct could occur that could have a material effect on our business, reputation and financial statements.

Our retirement and post retirement pension plans are subject to financial market risks that could adversely affect our future results of operations and cash flows.

We have significant retirement and post retirement pension plan assets and obligations. The performance of the financial markets and interest rates impact our plan expenses and funding obligations. Significant decreases in market interest rates, decreases in the fair value of plan assets and investment losses on plan assets will increase our funding obligations, and adversely impact our results of operations and cash flows.

The impact of consolidation and acquisitions of competitors is difficult to predict and may harm our business.

The life sciences industry is intensely competitive and has been subject to increasing consolidation. Consolidation in our industries could result in existing competitors increasing their market share through business combinations and result in stronger competitors, which could have a material adverse effect on our business, financial condition and results of operations. We may not be able to compete successfully in increasingly consolidated industries and cannot predict with certainty how industry consolidation will affect our competitors or us.

If we are unable to successfully manage the consolidation and streamlining of our manufacturing operations, we may not achieve desired efficiencies and our ability to deliver products to our customers could be disrupted.

Although we utilize manufacturing facilities throughout the world, we have consolidated, and may further consolidate, our manufacturing operations to certain of our plants to achieve efficiencies and gross margin improvements. Additionally, we typically consolidate the production of products from our acquisitions into our supply chain and manufacturing processes, which are technically complex and require expertise to operate. If we are unable to establish processes to efficiently and effectively produce high quality products in the consolidated locations, we may not achieve the anticipated synergies and production may be disrupted, which could adversely affect our business and operating results.

Our operating results may suffer if our manufacturing capacity does not match the demand for our products.

Because we cannot immediately adapt our production capacity and related cost structures to rapidly changing market conditions, when demand does not meet our expectations, our manufacturing capacity may exceed our production requirements. If during an economic downturn we had excess manufacturing capacity, then our fixed costs associated with excess manufacturing capacity would adversely affect our gross margins, and operating results. If, during a general market upturn or an upturn in one of our segments, we cannot increase our manufacturing capacity to meet product demand, we may not be able to fulfill orders in a timely manner which could lead to order cancellations, contract breaches or indemnification obligations. This inability could materially and adversely limit our ability to improve our results.

Dependence on contract manufacturing and outsourcing other portions of our supply chain, including logistics and third-party package delivery services, may adversely affect our ability to bring products to market and damage our reputation. Dependence on outsourced information technology and other administrative functions may impair our ability to operate effectively.

As part of our efforts to streamline operations and to manage costs, we outsource aspects of our manufacturing processes and other functions and continue to evaluate additional outsourcing. If our contract manufacturers or other outsourcers fail to perform their obligations in a timely manner or at satisfactory quality levels, our ability to bring products to market and our reputation could suffer. For example, during a market upturn, our contract manufacturers may be unable to meet our demand requirements, which may preclude us from fulfilling our customers' orders on a timely basis. The ability of these manufacturers to perform is largely outside of our control. If one or more of the third-party package delivery providers experiences a significant disruption in services or institutes a significant price increase, we may have to seek alternative providers, our costs could increase, and the delivery of our products could be prevented or delayed. Additionally, changing or replacing our contract manufacturers, logistics providers or other outsourcers could cause disruptions or delays. In addition, we outsource significant portions of our information technology ("IT") and other administrative functions. Since IT is critical to our operations, any failure to perform on the part of our IT providers could impair our ability to operate effectively. In addition to the risks outlined above, problems with manufacturing or IT outsourcing could result in lower revenue and unexecuted efficiencies, and impact our results of operations and our stock price.

Environmental contamination from past and ongoing operations could subject us to substantial liabilities.

Certain properties we have previously owned or leased are undergoing remediation for subsurface contamination. Although we are indemnified for liability relating to the required remediation at some of those properties, we may be subject to liability if these indemnification obligations are not fulfilled. In other cases, we have agreed to indemnify the current owners of certain properties for liabilities related to contamination, including companies with which we have previously been affiliated such as HP, Inc., Hewlett-Packard Enterprise (formerly Hewlett-Packard Company) and Varian Medical Systems, Inc. Further, other properties we have previously owned or leased at which we have operated in the past, or for which we have otherwise contractually assumed, or provided indemnities for, certain actual or contingent environmental liabilities may or do require remediation. While we are not aware of any material liabilities associated with any potential environmental contamination at any of those properties or facilities, we may be exposed to material liability if environmental contamination at material levels is found to exist. In addition, in connection with the acquisition of certain companies, we have assumed other costs and potential or contingent liabilities for environmental matters. Any significant costs or liabilities could have an adverse effect on results of operations.

Our current and historical manufacturing processes and operations involve, or have involved, the use of certain substances regulated under various foreign, federal, state and local environment protection and health and safety laws and regulations. As a result, we may become subject to liabilities for environmental contamination and these liabilities may be substantial. Although our policy is to apply strict standards for environmental protection and health and safety at our sites inside and outside the United States, we may not be aware of all conditions that could subject us to liability. Further, in the event that any future climate change legislation would require that stricter standards be imposed by domestic or international environmental regulatory authorities, we may be required to make certain changes and adaptations to our manufacturing processes. Failure to comply with these environmental protection and health and safety laws and regulations could result in civil, criminal, regulatory, administrative or contractual sanction, including fines, penalties or suspensions. If we have any violations of, or incur liabilities pursuant to these laws or regulations, our financial condition and operating results could be adversely affected.

Third parties may claim that we are infringing their intellectual property and we could suffer significant litigation or licensing expenses or be prevented from selling products or services.

From time to time, third parties may claim that one or more of our products or services infringe their intellectual property rights. We analyze and take action in response to such claims on a case by case basis. Any dispute or litigation regarding patents or other intellectual property could be costly and time-consuming due to the complexity of our technology and the uncertainty of intellectual property litigation and could divert our management and key personnel from our business operations. A claim of intellectual property infringement could force us to enter into a costly or restrictive license agreement, which might not be available under acceptable terms or at all, could require us to redesign our products, which would be costly and time-consuming, and/or could subject us to significant damages or to an injunction against the development and sale of certain of our products or services. Our intellectual property portfolio may not be useful in asserting a counterclaim, or negotiating a license, in response to a claim of intellectual property infringement. In certain of our businesses, we rely on third party intellectual property licenses and we cannot ensure that these licenses will continue to be available to us in the future or can be expanded to cover new products on favorable terms or at all.

Third parties may infringe our intellectual property and we may suffer competitive injury or expend significant resources enforcing our rights.

Our success depends in large part on our proprietary technology, including technology we obtained through acquisitions. We rely on various intellectual property rights, including patents, copyrights, trademarks and trade secrets, as well as confidentiality provisions and licensing arrangements, to establish our proprietary rights. If we do not enforce our intellectual property rights successfully, our competitive position may suffer which could harm our operating results.

Our pending patent, copyright and trademark registration applications may not be allowed or competitors may challenge the validity or scope of our patents, copyrights or trademarks. In addition, our patents, copyrights, trademarks and other intellectual property rights may not provide us with a significant competitive advantage.

We may need to spend significant resources monitoring and enforcing our intellectual property rights and we may not be aware of or able to detect or prove infringement by third parties. Our competitive position may be harmed if we cannot detect infringement and enforce our intellectual property rights quickly or at all. In some circumstances, we may choose to not pursue enforcement because an infringer has a dominant intellectual property position or for other business reasons. In addition, competitors might avoid infringement by designing around our intellectual property rights or by developing non-infringing competing technologies. Intellectual property rights and our ability to enforce them may be unavailable or limited in some countries which could make it easier for competitors to capture market share and could result in lost revenues. Furthermore, some of our intellectual property is licensed to others which may allow them to compete with us using that intellectual property.

Changes in tax laws, unfavorable resolution of tax examinations, or exposure to additional tax liabilities could have a material adverse effect on our results of operations, financial condition and liquidity.

We are subject to taxes in the U.S., Singapore and various foreign jurisdictions. Governments in the jurisdictions in which we operate implement changes to tax laws and regulations periodically. Any implementation of tax laws that fundamentally change the taxation of corporations in the U.S. or Singapore could materially impact our effective tax rate and could have a significant adverse impact on our financial results.

The U.S. Tax Cuts and Job Act ("the Tax Act") significantly changed the taxation of U.S. based multinational corporations. Our compliance with the Tax Act requires the use of estimates in our financial statements and exercise of significant judgment in accounting for its provisions. The implementation of the Tax Act requires interpretations and implementing regulations by the Internal Revenue Service ("IRS"), as well as state tax authorities. The legislation could be subject to potential amendments and technical corrections, any of which could materially lessen or increase certain adverse impacts of the legislation. As regulations and guidance evolve with respect to the Tax Act, and as we gather information and perform more analysis, our results may differ from previous estimates and may materially affect our financial position.

We are also subject to examinations of our tax returns by tax authorities in various jurisdictions around the world. We regularly assess the likelihood of adverse outcomes resulting from ongoing tax examinations to determine the adequacy of our provision for taxes. These assessments can require a high degree of judgment and estimation. Intercompany transactions associated with the sale of inventory, services, intellectual property and cost share arrangements are complex and affect our tax liabilities. The calculation of our tax liabilities involves dealing with uncertainties in the application of complex tax laws and regulations in multiple jurisdictions. There can be no assurance that the outcomes from ongoing tax examinations will not have an adverse effect on our operating results and financial condition. A difference in the ultimate resolution of tax uncertainties from what is currently estimated could have an adverse effect on our financial results and condition.

If tax incentives change or cease to be in effect, our income taxes could increase significantly.

We benefit from tax incentives extended to our foreign subsidiaries to encourage investment or employment. Several jurisdictions have granted us tax incentives which require renewal at various times in the future. The incentives are conditioned on achieving various thresholds of investments and employment, or specific types of income. Our taxes could increase if the incentives are not renewed upon expiration. If we cannot or do not wish to satisfy all or parts of the tax incentive conditions, we may lose the related tax incentive and could be required to refund tax incentives previously realized. As a result, our effective tax rate could be higher than it would have been had we maintained the benefits of the tax incentives.

We have outstanding debt and may incur other debt in the future, which could adversely affect our financial condition, liquidity and results of operations.

We are party to a $1 billion five-year unsecured credit facility that will expire on March 13, 2024. As of October 31, 2019, the company had $115 million outstanding under the credit facility. On August 7, 2019, we entered into an amendment to the credit agreement, which provides for a $500 million short-term loan facility that was used in full to complete the acquisition of BioTek. On October 21, 2019, we entered into a second amendment to the credit agreement, which refreshed the amount available

for additional incremental term loan facilities under the credit agreement to permit additional incremental facilities of up to $500 million. We had no borrowings under the additional incremental facilities as of October 31, 2019. We also currently have outstanding an aggregate principal amount of $1.8 billion in senior unsecured notes. We may borrow additional amounts in the future and use the proceeds from any future borrowing for general corporate purposes, future acquisitions, expansion of our business or repurchases of our outstanding shares of common stock

Our incurrence of this debt and increases in our aggregate levels of debt, may adversely affect our operating results and financial condition by, among other things:

- increasing our vulnerability to downturns in our business, to competitive pressures and to adverse economic and industry conditions;
- requiring the dedication of an increased portion of our expected cash flows from operations to service our indebtedness, thereby reducing the amount of expected cash flows available for other purposes, including capital expenditures, acquisitions, stock repurchases and dividends; and
- limiting our flexibility in planning for, or reacting to, changes in our business and our industry.

Our credit facility imposes restrictions on us, including restrictions on our ability to create liens on our assets and engage in certain types of sale and leaseback transactions and the ability of our subsidiaries to incur indebtedness, and requires us to maintain compliance with specified financial ratios. Our ability to comply with these ratios may be affected by events beyond our control. In addition, the indentures governing our senior notes contain covenants that may adversely affect our ability to incur certain liens or engage in certain types of sale and leaseback transactions. If we breach any of the covenants and do not obtain a waiver from the lenders or noteholders, then, subject to applicable cure periods, our outstanding indebtedness could be declared immediately due and payable.

If we suffer a loss to our factories, facilities or distribution system due to catastrophe, our operations could be seriously harmed.

Our factories, facilities and distribution system are subject to catastrophic loss due to fire, flood, terrorism, increasing severity or frequency of extreme weather events, or other natural or man-made disasters. In particular, several of our facilities could be subject to a catastrophic loss caused by earthquake due to their locations. Our production facilities, headquarters and laboratories in California, and our production facilities in Japan, are all located in areas with above-average seismic activity. If any of our facilities were to experience a catastrophic loss, it could disrupt our operations, delay production, shipments and revenue and result in large expenses to repair or replace the facility. If such a disruption were to occur, we could breach agreements, our reputation could be harmed, and our business and operating results could be adversely affected. In addition, because we have consolidated our manufacturing facilities and we may not have redundant manufacturing capability readily available, we are more likely to experience an interruption to our operations in the event of a catastrophe in any one location. Although we carry insurance for property damage and business interruption, we do not carry insurance or financial reserves for interruptions or potential losses arising from earthquakes or terrorism. Also, our third-party insurance coverage will vary from time to time in both type and amount depending on availability, cost and our decisions with respect to risk retention. Economic conditions and uncertainties in global markets may adversely affect the cost and other terms upon which we are able to obtain third-party insurance. If our third-party insurance coverage is adversely affected or to the extent we have elected to self-insure, we may be at a greater risk that our financial condition will be harmed by a catastrophic loss.

If we experience a significant disruption in, or breach in security of, our information technology systems, or if we fail to implement new systems and software successfully, our business could be adversely affected.

We rely on several centralized information technology systems throughout our company to provide products and services, keep financial records, process orders, manage inventory, process shipments to customers and operate other critical functions. Our information technology systems may be susceptible to damage, disruptions or shutdowns due to power outages, hardware failures, computer viruses, attacks by computer hackers, telecommunication failures, user errors, catastrophes or other unforeseen events. Our information technology systems also may experience interruptions, delays or cessations of service or produce errors

in connection with system integration, software upgrades or system migration work that takes place from time to time. If we were to experience a prolonged system disruption in the information technology systems that involve our interactions with customers or suppliers, it could result in the loss of sales and customers and significant incremental costs, which could adversely affect our business. In addition, security breaches of our information technology systems could result in the misappropriation or unauthorized disclosure of confidential information belonging to us or to our employees, partners, customers or suppliers, which could result in our suffering significant financial or reputational damage.

Adverse conditions in the global banking industry and credit markets may adversely impact the value of our cash investments or impair our liquidity.

As of October 31, 2019, we had cash and cash equivalents of approximately $1,382 million invested or held in a mix of money market funds, time deposit accounts and bank demand deposit accounts. Disruptions in the financial markets may, in some cases, result in an inability to access assets such as money market funds that traditionally have been viewed as highly liquid. Any failure of our counterparty financial institutions or funds in which we have invested may adversely impact our cash and cash equivalent positions and, in turn, our operating results and financial condition.

Regulations related to "conflict minerals" may cause us to incur additional expenses and could limit the supply and increase the cost of certain metals used in manufacturing our products.

We are subject to the rules of the SEC which require disclosures by public companies of specified minerals, known as conflict minerals, that are necessary to the functionality or production of products manufactured or contracted to be manufactured. The rule, which requires an annual disclosure report to be filed with the SEC by May 31st of each year, requires companies to perform due diligence, disclose and report whether or not such minerals originate from the Democratic Republic of Congo or an adjoining country. Our ongoing implementation of these rules could affect sourcing at competitive prices and availability in sufficient quantities of certain minerals used in the manufacture of our products, including tin, tantalum, gold and tungsten. The number of suppliers who provide conflict-free minerals may be limited. In addition, there may be material costs associated with complying with the disclosure requirements, such as costs related to the due diligence process of determining the source of certain minerals used in our products, as well as costs of possible changes to products, processes, or sources of supply as a consequence of such verification activities. As our supply chain is complex and we use contract manufacturers for some of our products, we may not be able to sufficiently verify the origins of the relevant minerals used in our products through the due diligence procedures that we implement, which may harm our reputation. We may also encounter challenges to satisfy those customers who require that all of the components of our products be certified as conflict-free, which could place us at a competitive disadvantage if we are unable to do so.

We cannot assure that we will continue to pay dividends on our common stock.

Since the first quarter of fiscal year 2012, we have paid a quarterly dividend on our common stock. The timing, declaration, amount and payment of any future dividends fall within the discretion of our Board of Directors and will depend on many factors, including our available cash, estimated cash needs, earnings, financial condition, operating results, capital requirements, as well as limitations in our contractual agreements, applicable law, regulatory constraints, industry practice and other business considerations that our Board of Directors considers relevant. A change in our dividend program could have an adverse effect on the market price of our common stock.

Item 1B. ***Unresolved Staff Comments***

None.

Item 2. ***Properties***

As of October 31, 2019, we owned or leased a total of approximately 6.6 million square feet of space worldwide. Of that, we owned approximately 4.5 million square feet and leased the remaining 2.1 million square feet. Our sales and support facilities occupied a total of approximately 0.8 million square feet. Our manufacturing plants, R&D facilities and warehouse and

administrative facilities occupied approximately 5.8 million square feet. All of our businesses share sales offices throughout the world.

Information about each of our businesses appears below:

Life Sciences & Applied Markets Business. Our life sciences and applied markets business has manufacturing and R&D facilities in Australia, China, Germany, Italy, Malaysia, Singapore, United Kingdom and the United States.

Diagnostics and Genomics Business. Our diagnostics and genomics business has manufacturing and R&D facilities in Belgium, Denmark, Malaysia and the United States.

Agilent CrossLab Business. Our Agilent CrossLab business has manufacturing and R&D facilities in Australia, China, Germany, Japan, Netherlands, Singapore, United Kingdom and the United States.

Item 3. ***Legal Proceedings***

We are involved in lawsuits, claims, investigations and proceedings, including, but not limited to, intellectual property, commercial, real estate, environmental and employment matters, which arise in the ordinary course of business. There are no matters pending that we currently believe are probable and reasonably possible of having a material impact to our business, consolidated financial condition, results of operations or cash flows.

Item 4. ***Mine Safety Disclosures***

Not applicable.

PART II

Item 5. ***Market for the Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities***

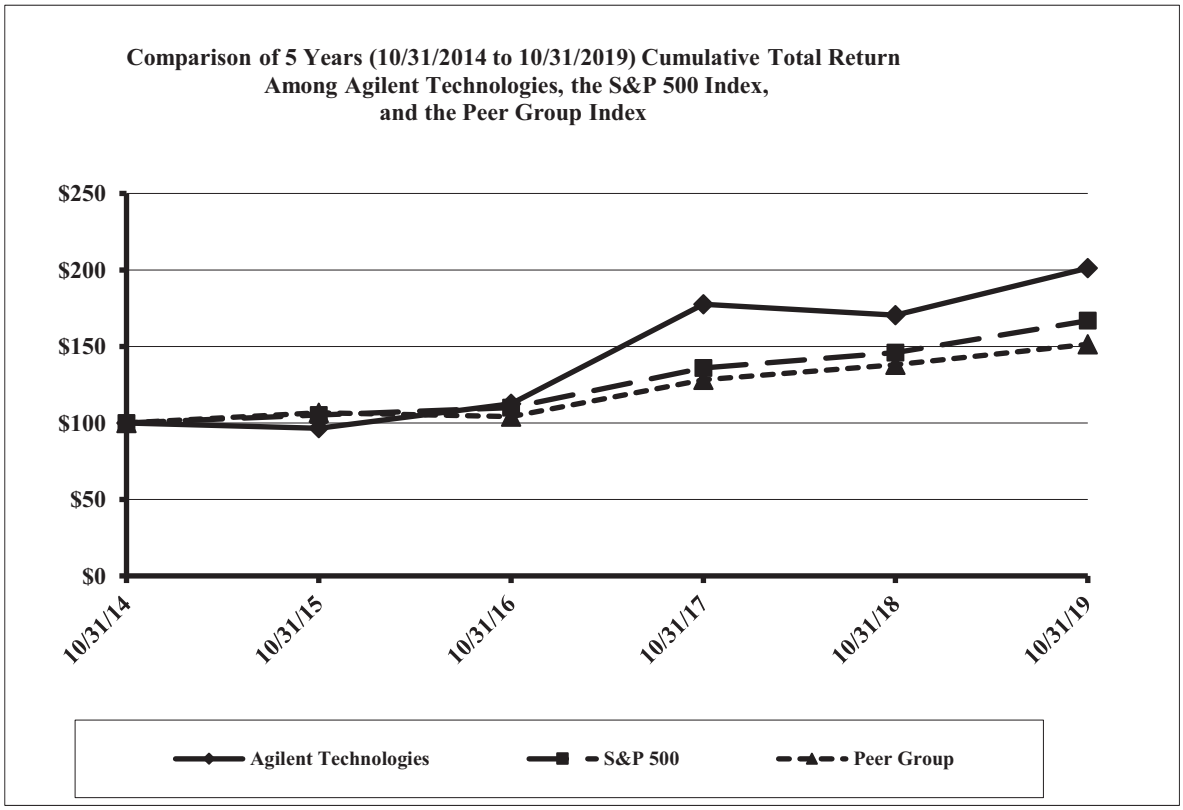
Our common stock is listed on the New York Stock Exchange with the ticker symbol “A”. As of December 2, 2019, there were 20,989 common stockholders of record.

The information required by this item with respect to equity compensation plans is included under the caption "*Equity Compensation Plans"* in our Proxy Statement for the Annual Meeting of Stockholders to be held March 18, 2020, to be filed with the Securities and Exchange Commission pursuant to Regulation 14A, and is incorporated herein by reference.

STOCK PRICE PERFORMANCE GRAPH

The graph below shows the cumulative total stockholder return on our common stock with the cumulative total return of the S&P 500 Index and our peer group, consisting of all companies in the Health Care and Materials Indexes of the S&P 500, assuming an initial investment of $100 on October 31, 2014 and the reinvestment of all dividends. The cumulative returns on our common stock have also been adjusted to reflect the spin-off of our electronic measurement business into an independent publicly traded company called Keysight Technologies, Inc. on November 1, 2014.

Agilent's stock price performance shown in the following graph is not indicative of future stock price performance. The data for this performance graph was compiled for us by Standard and Poor's.



	Base Period	INDEXED RETURNS Years Ending				
Company Name / Index	**10/31/2014**	**10/31/2015**	**10/31/2016**	**10/31/2017**	**10/31/2018**	**10/31/2019**
Agilent Technologies	**100**	96.51	112.56	177.46	170.53	201.15
S&P 500	**100**	105.20	109.94	135.93	145.91	166.81
Peer Group	**100**	106.66	104.08	128.12	138.06	151.39

ISSUER PURCHASES OF EQUITY SECURITIES

The table below summarizes information about the company's purchases, based on trade date, of its equity securities registered pursuant to Section 12 of the Exchange Act during the quarterly period ended October 31, 2019. The total number of shares of common stock purchased by the company during the fiscal year ended October 31, 2019 is 10,436,060 shares.

Period	Total Number of Shares of Common Stock Purchased(1)	Weighted Average Price Paid per Share of Common Stock(2)	Total Number of Shares of Common Stock Purchased as Part of Publicly Announced Plans or Programs(1)	Maximum Approximate Dollar Value of Shares of Common Stock that May Yet Be Purchased Under the Plans or Programs
August 1, 2019 through August 31, 2019	234,947	69.42	234,947	$ 1,060
September 1, 2019 through September 30, 2019	208,701	75.77	208,701	$ 1,044
October 1, 2019 through October 31, 2019	222,205	$ 74.93	222,205	$ 1,027
Total	665,853	$ 73.25	665,853	

(1) On November 19, 2018 we announced that our board of directors had approved a new share repurchase program (the "2019 repurchase program") designed, among other things, to reduce or eliminate dilution resulting from issuance of stock under the company's employee equity incentive programs. The 2019 share repurchase program authorizes the purchase of up to $1.75 billion of our common stock at the company's discretion and has no fixed termination date. As of October 31, 2019, we had remaining authorization to repurchase up to $1.03 billion of our common stock under this program. The 2019 repurchase program does not require the company to acquire a specific number of shares and may be suspended, amended or discontinued at any time. As of October 31, 2019, all repurchased shares have been retired.

(2) The weighted average price paid per share of common stock does not include the cost of commissions.

Item 6. ***Selected Financial Data***

SELECTED FINANCIAL DATA
(Unaudited)

	Years Ended October 31,				
	2019	2018	2017	2016	2015
	(in millions, except per share data)				
Consolidated Statement of Operations Data:					
Net revenue	$ 5,163	$ 4,914	$ 4,472	$ 4,202	$ 4,038
Income from continuing operations before taxes	$ 919	$ 946	$ 803	$ 544	$ 480
Income from continuing operations	$ 1,071	$ 316	$ 684	$ 462	$ 438
Loss from discontinued operations, net of taxes	$ —	$ —	$ —	$ —	$ (37)
Net income	$ 1,071	$ 316	$ 684	$ 462	$ 401
Net income per share — basic:					
Income from continuing operations	$ 3.41	$ 0.98	$ 2.12	$ 1.42	$ 1.32
Loss from discontinued operations, net of taxes	—	—	—	—	(0.12)
Net income per share – basic	$ 3.41	$ 0.98	$ 2.12	$ 1.42	$ 1.20
Net income per share — diluted:					
Income from continuing operations	$ 3.37	$ 0.97	$ 2.10	$ 1.40	$ 1.31
Loss from discontinued operations, net of taxes	—	—	—	—	(0.11)
Net income per share – diluted	$ 3.37	$ 0.97	$ 2.10	$ 1.40	$ 1.20
Weighted average shares used in computing basic net income per share	314	321	322	326	333
Weighted average shares used in computing diluted net income per share	318	325	326	329	335
Cash dividends declared per common share	$ 0.656	$ 0.596	0.528	$ 0.460	$ 0.400

	October 31,				
	2019	2018	2017	2016	2015
	(in millions)				
Consolidated Balance Sheet Data:					
Cash and cash equivalents	$ 1,382	$ 2,247	$ 2,678	$ 2,289	$ 2,003
Working capital	$ 1,109	$ 2,677	$ 2,906	$ 2,690	$ 2,710
Total assets	$ 9,452	$ 8,541	$ 8,426	$ 7,794	$ 7,479
Long-term debt	$ 1,791	$ 1,799	$ 1,801	$ 1,904	$ 1,655
Stockholders' equity	$ 4,748	$ 4,567	$ 4,831	$ 4,243	$ 4,167

Item 7. ***Management's Discussion and Analysis of Financial Condition and Results of Operations***

The following discussion should be read in conjunction with the consolidated financial statements and notes thereto included elsewhere in this Annual Report on Form 10-K. This report contains forward-looking statements including, without limitation, statements regarding growth opportunities, including for revenue and our end markets, strength and drivers of the markets we sell into, sales funnels, our strategic direction, new product and service introductions and the position of our current products and services, market demand for and adoption of our products, the ability of our products and solutions to address customer needs and meet industry requirements, our focus on differentiating our product solutions, improving our customers' experience and growing our earnings, future financial results, our operating margin, mix, our investments, including in manufacturing infrastructure, research and development and expanding and improving our applications and solutions portfolios, expanding our position in developing countries and emerging markets, our focus on balanced capital allocation, our contributions to our pension and other defined benefit plans, impairment of goodwill and other intangible assets, the effect of the U.S. Tax Cuts and Jobs Act of 2017 (the "Tax Act") and U.S. and other tariffs, the impact of foreign currency movements, our hedging programs and other actions to offset the effects of tariffs and foreign currency movements, our future effective tax rate, tax valuation allowance and unrecognized tax benefits, the impact of local government regulations on our ability to pay vendors or conduct operations, our ability to satisfy our liquidity requirements, including through cash generated from operations, the potential impact of adopting new accounting pronouncements, indemnification, source and supply of materials used in our products, our sales, our purchase commitments, our capital expenditures, the integration and effects of our acquisitions and other transactions and our stock repurchase program and dividends, that involve risks and uncertainties. Our actual results could differ materially from the results contemplated by these forward-looking statements due to various factors, including those discussed in Part I Item 1A and elsewhere in this Form 10-K.

Overview and Executive Summary

Agilent Technologies Inc. ("we", "Agilent" or the "company"), incorporated in Delaware in May 1999, is a global leader in life sciences, diagnostics and applied chemical markets, providing application focused solutions that include instruments, software, services and consumables for the entire laboratory workflow.

In 2019, we acquired 100 percent of the stock of ACEA Biosciences Inc. ("ACEA"), a developer of cell analysis tools, for $250 million. In addition, we completed the acquisition of privately-owned Lionheart Technologies LLC ("BioTek"), a leader in the design, manufacture and distribution of innovative life science instrumentation for $1.17 billion. The financial results of these businesses have been included in our financial results from the date of the close.

In 2018, we acquired seven businesses for a combined purchase price of approximately $536 million. The largest of which was Advanced Analytical Technologies, Inc. ("AATI") for approximately $268 million in cash. In 2017, we acquired two businesses for a combined purchase price of approximately $125 million in cash.

Agilent's net revenue of $5,163 million in 2019 increased 5 percent when compared to 2018. Foreign currency movements for 2019 had an overall unfavorable impact on revenue of approximately 2 percentage points compared to 2018. Acquisitions in 2019 had an overall favorable impact of 2 percentage points when compared to 2018. Revenue in the life sciences and applied markets business increased 1 percent in 2019 when compared to 2018. Foreign currency movements had an unfavorable impact on revenue of 2 percentage points in 2019 when compared to 2018. Revenue in the diagnostics and genomics business increased 8 percent in 2019 when compared to 2018. Foreign currency movements had an unfavorable impact on revenue of 3 percentage points in 2019 when compared to 2018. Revenue in the Agilent CrossLab business increased 8 percent in 2019 when compared to 2018. Foreign currency movements had an unfavorable impact on revenue of 3 percentage points in 2019 when compared to 2018.

Agilent's net revenue of $4,914 million increased 10 percent in 2018 when compared to 2017. Foreign currency movements for 2018 had an overall favorable impact on revenue of approximately 2 percentage points compared to 2017. Acquisitions in 2018 had an overall favorable impact of 1 percentage point when compared to 2017. Revenue in the life sciences and applied markets business increased 9 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact on revenue of 2 percentage point in 2018 when compared to 2017. Revenue in the diagnostics and genomics business increased 10 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact of 3 percentage points on revenue in 2018 when compared to 2017. Revenue in the Agilent CrossLab business increased 11 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact on revenue of 2 percentage points in 2018 when compared to 2017.

Net income was $1,071 million in 2019 compared to net income of $316 million and $684 million in 2018 and 2017, respectively. Net income for the year ended October 31, 2019 was impacted by a discrete tax benefit of $299 million related to restructuring and the extension of the company's tax incentive in Singapore. Net income for the year ended October 31, 2018 was impacted by a discrete tax charge of $552 million related to the enactment of the Tax Act that was passed on December 22, 2017. As of October 31, 2019 and 2018, we had cash and cash equivalents balances of $1,382 million and $2,247 million, respectively.

On May 28, 2015 we announced that our board of directors had approved a share repurchase program (the "2015 repurchase program"). The 2015 share repurchase program authorizes the purchase of up to $1.14 billion of our common stock at the company's discretion through and including November 1, 2018. The 2015 repurchase program did not require the company to acquire a specific number of shares and could have been suspended or discontinued at any time. During the year ended October 31, 2017, we repurchased and retired approximately 4.1 million shares for $194 million under this authorization. During the year ended October 31, 2018, we repurchased and retired approximately 6.4 million shares for $422 million under this authorization. As of October 31, 2018, we had remaining authorization to repurchase up to $188 million of our common stock under this program which expired on November 1, 2018.

On November 19, 2018 we announced that our board of directors had approved a new share repurchase program (the "2019 repurchase program") designed, among other things, to reduce or eliminate dilution resulting from issuance of stock under the company's employee equity incentive programs. The 2019 share repurchase program authorizes the purchase of up to $1.75 billion of our common stock at the company's discretion and has no fixed termination date. The 2019 repurchase program does not require the company to acquire a specific number of shares and may be suspended, amended or discontinued at any time. During the year ended October 31, 2019, we repurchased and retired approximately 10.4 million shares for $723 million under this authorization. As of October 31, 2019, we had remaining authorization to repurchase up to $1.03 billion of our common stock under this program.

During the year ended October 31, 2019, cash dividends of 0.656 per share, or $206 million were declared and paid on the company's outstanding common stock. During the year ended October 31, 2018, cash dividends of 0.596 per share, or $191 million were declared and paid on the company's outstanding common stock. During the year ended October 31, 2017, cash dividends of 0.528 per share, or $170 million were declared and paid on the company's outstanding common stock.

On November 20, 2019 we declared a quarterly dividend of $0.18 per share of common stock, or approximately $56 million which will be paid on January 22, 2020 to shareholders of record as of the close of business on December 31, 2019. The timing and amounts of any future dividends are subject to determination and approval by our board of directors.

Looking forward, we continue to focus on differentiating product solutions, improving our customers' experience, continued growth and earnings expansion. We remain optimistic that we have the ability and resilience to manage any changing market conditions to deliver positive results in fiscal year 2020. In addition, we remain focused on a balanced capital allocation through our dividend and share repurchase programs. We expect foreign currency to negatively impact revenue for 2020 but we also anticipate the contribution from our recent acquisitions to partially offset the currency impact.

Critical Accounting Policies and Estimates

The preparation of financial statements in accordance with accounting principles generally accepted in the U.S. requires management to make estimates and assumptions that affect the amounts reported in our consolidated financial statements and accompanying notes. Management bases its estimates on historical experience and various other assumptions believed to be reasonable. Although these estimates are based on management's best knowledge of current events and actions that may impact the company in the future, actual results may be different from the estimates. 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 and if different estimates that reasonably could have been used or changes in the accounting estimate that are reasonably likely to occur could materially change the financial statements. Our critical accounting policies are those that affect our financial statements materially and involve difficult, subjective or complex judgments by management. Those policies are revenue recognition, inventory valuation, retirement and post-retirement plan assumptions, valuation of goodwill and purchased intangible assets and accounting for income taxes.

Revenue Recognition. On November 1, 2018, we adopted Accounting Standard Codification Topic 606, *Revenue from Contracts with Customers* ("ASC 606").

We enter into contracts to sell products, services or combinations of products and services. Products may include hardware or software and services may include one-time service events or services performed over time.

We derive revenue primarily from the sale of analytical and diagnostics products and services. A performance obligation is a promise in a contract to transfer a distinct product or service to a customer and is the unit of account under ASC 606. Revenue is recognized when control of the promised products or services is transferred to our customers and the performance obligation

is fulfilled in an amount that reflects the consideration that we expect to be entitled in exchange for those products or services, the transaction price. For equipment, consumables, and most software licenses, control transfers to the customer at a point in time. We use present right to payment, legal title, physical possession of the asset, and risks and rewards of ownership as indicators to determine the transfer of control to the customer. Where acceptance is not a formality, the customer must have documented their acceptance of the product or service. For products that include installation, if the installation meets the criteria to be considered a separate performance obligation, product revenue is recognized when control has passed to the customer, and recognition of installation revenue occurs once completed. Product revenue, including sales to resellers and distributors is reduced for provisions for warranties, returns, and other adjustments in the period the related sales are recorded.

Service revenue includes extended warranty, customer and software support including: Software as a Service, post contract support, consulting including companion diagnostics, and training and education. Instrument service contracts and software maintenance contracts are typically annual contracts, which are billed at the beginning of the contract or maintenance period. Revenue for these contracts is recognized on a straight-line basis to revenue over the service period, as a time-based measure of progress best reflects our performance in satisfying this obligation. There are no deferred costs associated with the service contract, as the cost of the service is recorded when the service is performed. Service calls not included in a support contract are recognized to revenue at the time a service is performed.

We have sales from standalone software. These arrangements typically include software licenses and maintenance contracts, both of which we have determined are distinct performance obligations. We determine the amount of the transaction price to allocate to the license and maintenance contract based on the relative standalone selling price of each performance obligation. Software license revenue is recognized at the point in time when control has been transferred to the customer. The revenue allocated to the software maintenance contract is recognized on a straight-line basis over the maintenance period, which is the contractual term of the contract, as a time-based measure of progress best reflects our performance in satisfying this obligation. Unspecified rights to software upgrades are typically sold as part of the maintenance contract on a when-and-if-available basis.

Our multiple-element arrangements are generally comprised of a combination of instruments, installation or other start-up services, and/or software, and/or support or services. Hardware and software elements are typically delivered at the same time and revenue is recognized when control passes to the customer. Service revenue is deferred and recognized over the contractual period or as services are rendered and accepted by the customer. Our arrangements generally do not include any provisions for cancellation, termination, or refunds that would significantly impact recognized revenue.

For contracts with multiple performance obligations, we allocate the consideration to which we expect to be entitled to each performance obligation based on relative standalone selling prices and recognize the related revenue when or as control of each individual performance obligation is transferred to customers. We estimate the standalone selling price by calculating the average historical selling price of our products and services per country for each performance obligation. Stand-alone selling prices are determined for each distinct good or service in the contract and then we allocate the transaction price in proportion to those standalone selling prices by performance obligations.

A portion of our revenue relate to lease arrangements. Standalone lease arrangements are outside the scope of ASC 606 and are therefore accounted for in accordance with ASC 840, Leases. Each of these contracts is evaluated as a lease arrangement, either as an operating lease or a sales-type capital lease using the current lease classification guidance.

Inventory Valuation. We assess the valuation of our inventory on a periodic basis and make adjustments to the value for estimated excess and obsolete inventory based upon estimates about future demand and actual usage. Such estimates are difficult to make under most economic conditions. The excess balance determined by this analysis becomes the basis for our excess inventory charge. Our excess inventory review process includes analysis of sales forecasts, managing product rollovers and working with manufacturing to maximize recovery of excess inventory. If actual market conditions are less favorable than those projected by management, additional write-downs may be required. If actual market conditions are more favorable than anticipated, inventory previously written down may be sold to customers, resulting in lower cost of sales and higher income from operations than expected in that period.

Retirement and Post-Retirement Benefit Plan Assumptions. Retirement and post-retirement benefit plan costs are a significant cost of doing business. They represent obligations that will ultimately be settled sometime in the future and therefore are subject to estimation. Pension accounting is intended to reflect the recognition of future benefit costs over the employees' average expected future service to Agilent based on the terms of the plans and investment and funding decisions. To estimate the impact of these future payments and our decisions concerning funding of these obligations, we are required to make assumptions using actuarial concepts within the framework of accounting principles generally accepted in the U.S. Two critical assumptions are the discount rate and the expected long-term return on plan assets. Other important assumptions include, expected future salary increases, expected future increases to benefit payments, expected retirement dates, employee turnover, retiree mortality rates, and portfolio composition. We evaluate these assumptions at least annually.

The discount rate is used to determine the present value of future benefit payments at the measurement date - October 31 for both U.S. and non-U.S. plans. For 2019 and 2018, the U.S. discount rates were based on the results of matching expected plan benefit payments with cash flows from a hypothetically constructed bond portfolio. In 2019, discount rates for the U.S. plans decreased compared to the previous year. For 2019 and 2018, the discount rate for non-U.S. plans was generally based on published rates for high quality corporate bonds and in 2019, decreased compared to the previous year. If we changed our discount rate by 1 percent, the impact would be less than $1 million in U.S. pension expense and $13 million on non-U.S. pension expense. Lower discount rates increase present values of the pension benefit obligation and subsequent year pension expense; higher discount rates decrease present values of the pension benefit obligation and subsequent year pension expense.

The company uses alternate methods of amortization as allowed by the authoritative guidance which amortizes the actuarial gains and losses on a consistent basis for the years presented. For U.S. Plans, gains and losses are amortized over the average future lifetime of participants using the corridor method. For most Non-U.S. Plans and U.S. Post-Retirement Benefit Plans, gains and losses are amortized using a separate layer for each year's gains and losses.

In the U.S., target asset allocations for our retirement and post-retirement benefit plans are approximately 80 percent to equities and approximately 20 percent to fixed income investments. Our Deferred Profit-Sharing Plan target asset allocation is approximately 60 percent to equities and approximately 40 percent to fixed income investments. Approximately 3 percent of our U.S. equity portfolio consists of limited partnerships. Outside the U.S., our target asset allocation ranges from 31 to 60 percent to equities, from 38 to 61 percent to fixed income investments, and from zero to 25 percent to real estate, depending on the plan. All plans' assets are broadly diversified. Due to fluctuations in equity markets, our actual allocations of plan assets at October 31, 2019 and 2018 differ from the target allocation. Our policy is to bring the actual allocation in line with the target allocation.

Equity securities include exchange-traded common stock and preferred stock of companies from broadly diversified industries. Fixed income securities include a global portfolio of corporate bonds of companies from diversified industries, government securities, mortgage-backed securities, asset-backed securities, derivative instruments and other. Other investments include a group trust consisting primarily of private equity partnerships.

The expected long-term return on plan assets is estimated using current and expected asset allocations as well as historical and expected returns. Plan assets are valued at fair value. If we changed our estimated return on assets by 1 percent, the impact would be $4 million on U.S. pension expense and $9 million on non-U.S. pension expense. For 2019, actual return on assets was above expectations which, along with contributions during the year, decreased next year’s pension cost as well as resulting in an increase of the funded status at year end. The net periodic pension and post-retirement benefit costs recorded were a $10 million expense in 2019, $3 million benefit in 2018 and $15 million expense in 2017. The years ended October 31, 2018 and 2017 included a gain on curtailment and settlements of $5 million and $32 million, respectively.

Goodwill and Purchased Intangible Assets. Under the authoritative guidance, we have the option to perform a qualitative assessment to determine whether further impairment testing is necessary. The accounting standard gives an entity the option to first assess qualitative factors to determine whether performing the two-step test is necessary. If an entity believes, as a result of its qualitative assessment, that it is more-likely-than-not (i.e. greater than 50% chance) that the fair value of a reporting unit is less than its carrying amount, the quantitative impairment test will be required. Otherwise, no further testing will be required.

The guidance includes examples of events and circumstances that might indicate that a reporting unit's fair value is less than its carrying amount. These include macro-economic conditions such as deterioration in the entity's operating environment or industry or market considerations; entity-specific events such as increasing costs, declining financial performance, or loss of key personnel; or other events such as an expectation that a reporting unit will be sold or a sustained decrease in the stock price on either an absolute basis or relative to peers.

If it is determined, as a result of the qualitative assessment, that it is more-likely-than-not that the fair value of a reporting unit is less than its carrying amount, the provisions of authoritative guidance require that we perform a two-step impairment test on goodwill. In the first step, we compare the fair value of each reporting unit to its carrying value. The second step (if necessary) measures the amount of impairment by applying fair-value-based tests to the individual assets and liabilities within each reporting unit. As defined in the authoritative guidance, a reporting unit is an operating segment, or one level below an operating segment. We aggregate components of an operating segment that have similar economic characteristics into our reporting units.

In fiscal year 2019, we assessed goodwill impairment for our three reporting units which consisted of three segments: life sciences and applied markets, diagnostics and genomics and Agilent CrossLab. We performed a qualitative test for goodwill impairment of the three reporting units, as of September 30, 2019. Based on the results of our qualitative testing, we believe that it is more-likely-than-not that the fair value of each reporting unit is greater than its respective carrying value. Each quarter we review the events and circumstances to determine if goodwill impairment is indicated. There was no impairment of goodwill during the years ended October 31, 2019, 2018 and 2017.

Purchased intangible assets consist primarily of acquired developed technologies, proprietary know-how, trademarks, and customer relationships and are amortized using the best estimate of the asset's useful life that reflect the pattern in which the economic benefits are consumed or used up or a straight-line method ranging from 6 months to 15 years. Our determination of the fair value of the intangible assets acquired involves the use of significant estimates and assumptions. Specifically, our determination of the fair value of the developed product technology and in-process research and development ("IPR&D") acquired involve significant estimates and assumptions related to revenue growth rates and discount rates. Our determination of the fair value of customer relationships acquired involved significant estimates and assumptions related to revenue growth rates, discount rates, and customer attrition rates. Our determination of the fair value of the tradename acquired involved the use of significant estimates and assumptions related to revenue growth rates, royalty rates and discount rates. The company believes that the fair value assigned to the assets acquired and liabilities assumed are based on reasonable assumptions and estimates that marketplace participants would use. Actual results could differ materially from these estimates. IPR&D is initially capitalized at fair value as an intangible asset with an indefinite life and assessed for impairment thereafter. When the IPR&D project is complete, it is reclassified as an amortizable purchased intangible asset and is amortized over its estimated useful life. If an IPR&D project is abandoned, we will record a charge for the value of the related intangible asset to our consolidated statement of operations in the period it is abandoned.

We continually monitor events and changes in circumstances that could indicate carrying amounts of finite-lived intangible assets may not be recoverable. When such events or changes in circumstances occur, we assess the recoverability of finite-lived intangible assets by determining whether the carrying value of such assets will be recovered through undiscounted expected future cash flows. If the total of the undiscounted future cash flows is less than the carrying amount of those assets, we recognize an impairment loss based on the excess of the carrying amount over the fair value of the assets. During 2018, we recorded an impairment charge of $21 million related to purchased intangible assets within the diagnostics and genomics segment that were deemed unrecoverable.

Our indefinite-lived intangible assets are IPR&D intangible assets. The accounting guidance allows a qualitative approach for testing indefinite-lived intangible assets for impairment, similar to the issued impairment testing guidance for goodwill and allows the option to first assess qualitative factors (events and circumstances) that could have affected the significant inputs used in determining the fair value of the indefinite-lived intangible asset to determine whether it is more-likely-than-not (i.e. greater than 50% chance) that the indefinite-lived intangible asset is impaired. An organization may choose to bypass the qualitative assessment for any indefinite-lived intangible asset in any period and proceed directly to calculating its fair value. We performed a qualitative test for impairment of indefinite-lived intangible assets as of September 30, 2019. Based on the results of our qualitative testing, we believe that it is more-likely-than-not that the fair value of these indefinite-lived intangible assets is greater than their respective carrying values. Each quarter we review the events and circumstances to determine if impairment of indefinite-lived intangible asset is indicated. During the year ended October 31, 2019, 2018 and 2017 there were no impairments of indefinite-lived intangible assets.

Accounting for Income Taxes. We must make certain estimates and judgments in determining income tax expense for financial statement purposes. These estimates and judgments 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 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 a subsequent period. On a quarterly basis, we provide for income taxes based upon an estimated annual effective tax rate. The effective tax rate is highly dependent upon the geographic composition of worldwide earnings, tax regulations governing each region, availability of tax credits and the effectiveness of our tax planning strategies. We monitor the changes in many factors and adjust our effective income tax rate on a timely basis. If actual results differ from these estimates, this could have a material effect on our financial condition and results of operations.

Significant management judgment is also required in determining whether deferred tax assets will be realized in full or in part. When it is more-likely-than-not that all or some portion of deferred tax assets may not be realized, a valuation allowance must be established against such deferred tax assets. We consider all available positive and negative evidence on a jurisdiction-by-jurisdiction basis when assessing whether it is more likely than not that deferred tax assets are recoverable. We consider evidence such as our past operating results, the existence of losses in recent years and our forecast of future taxable income.

The calculation of our tax liabilities involves dealing with uncertainties in the application of complex tax law and regulations in a multitude of jurisdictions. Although the guidance on the accounting for uncertainty in income taxes prescribes the use of a recognition and measurement model, the determination of whether an uncertain tax position has met those thresholds will continue to require significant judgment by management. In accordance with the guidance on the accounting for uncertainty in income taxes, for all U.S. and other tax jurisdictions, we recognize potential liabilities for anticipated tax audit issues based on our estimate of whether, and the extent to which, additional taxes and interest will be due. The ultimate resolution of tax

uncertainties may differ from what is currently estimated, which could result in a material impact on income tax expense. If our estimate of income tax liabilities proves to be less than the ultimate assessment, a further charge to expense would be required. If events occur and the payment of these amounts ultimately proves to be unnecessary, the reversal of the liabilities would result in tax benefits being recognized in the period when we determine the liabilities are no longer necessary. We include interest and penalties related to unrecognized tax benefits within the provision for income taxes on the consolidated statements of operations.

On December 22, 2017, the Tax Act was enacted into law. The Tax Act significantly changed the existing U.S. tax law and included numerous provisions that affect our business. There were no substantial changes from our 2018 Annual Report on Form 10-K to the transition tax expenses amount. The company will continue to assess the impact of the further guidance from federal and state tax authorities on its business and consolidated financial statements. Any future adjustments will be recognized as discrete income tax expense or benefit in the period the adjustments are determined. We have completed our analysis and elected to treat global intangible low-tax income ("GILTI") as “current period cost”. See Note 6, "Income Taxes" for more details.

Adoption of New Pronouncements

See Note 2, "New Accounting Pronouncements," to the consolidated financial statements for a description of new accounting pronouncements.

Foreign Currency

Our revenues, costs and expenses, and monetary assets and liabilities are exposed to changes in foreign currency exchange rates as a result of our global operating and financing activities. The unfavorable effects of changes in foreign currency exchange rates has decreased revenue by approximately 2 percentage point for the year ended October 31, 2019. When movements in foreign currency exchange rates have a negative impact on revenue it will also have a positive impact on our costs and expenses. The favorable effects of changes in foreign currency exchange rates has increased revenue by approximately 2 percentage points for the year ended October 31, 2018. When movements in foreign currency exchange rates have a positive impact on revenue it will also have a negative impact on our costs and expenses. We calculate the impact of foreign currency exchange rates movements by applying the actual foreign currency exchange rates in effect during the last month of each quarter of the current year to both the applicable current and prior year periods. We hedge revenues, expenses and balance sheet exposures that are not denominated in the functional currencies of our subsidiaries on a short term and anticipated basis. We do experience some fluctuations within individual lines of the consolidated statement of operations and balance sheet because our hedging program is not designed to offset the currency movements in each category of revenues, expenses, monetary assets and liabilities. Our hedging program is designed to hedge currency movements on a relatively short-term basis (up to a rolling twelve-month period). Therefore, we are exposed to currency fluctuations over the longer term. To the extent that we are required to pay for all, or portions, of an acquisition price in foreign currencies, we may enter into foreign exchange contracts to reduce the risk that currency movements will impact the U.S. dollar cost of the transaction.

Results from Operations

Net Revenue

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
	(in millions)				
Net revenue:					
Products	$ 3,877	$ 3,746	$ 3,397	3%	10%
Services and other	$ 1,286	$ 1,168	$ 1,075	10%	9%
Total net revenue	$ 5,163	$ 4,914	$ 4,472	5%	10%

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
% of total net revenue:					
Products	75%	76%	76%	(1) ppt	—
Services and other	25%	24%	24%	1 ppt	—
Total	100%	100%	100%		

Agilent's net revenue of $5,163 million for the year ended October 31, 2019 increased 5 percent when compared to 2018. Foreign currency movements for 2019 had an unfavorable impact of approximately 2 percentage points when compared to 2018. Agilent's net revenue of $4,914 million increased 10 percent in 2018 when compared to 2017. Foreign currency movements for 2018 had a favorable impact of approximately 2 percentage points when compared to 2017.

Product revenue includes revenue generated from the sales of our analytical instrumentation, software and consumables. Revenue from products increased 3 percent for the year ended October 31, 2019, when compared to 2018. The growth in product revenue was impacted by increased sales within our cell analysis business, mainly due to contributions from our recent acquisitions. In addition, product revenue growth was impacted by strong sales in our consumables and nucleic acid solutions businesses partially offset by revenue weakness in our liquid chromatography, gas chromatography, liquid chromatography mass spectrometry and spectroscopy products. Revenue from products increased 10 percent for the year ended October 31, 2018, when compared to 2017. The growth in product revenue was led by strong revenue growth from products within our spectroscopy, mass spectrometry and our consumables businesses.

Services and other revenue primarily consists of revenue generated from Agilent CrossLab services and services in the diagnostics and genomics business. Some of the prominent services in the Agilent CrossLab business include repair and maintenance on multi-vendor instruments, compliance services and installation services. Some of the prominent services in the diagnostics and genomics business include consulting services related to the companion diagnostics and nucleic acid businesses.

Services and other revenue increased 10 percent in 2019 as compared to 2018. Services and other revenue in the Agilent CrossLab business increased 9 percent in 2019 as compared to 2018, with a 3 percentage point unfavorable currency impact. Nearly all major service offerings from the Agilent CrossLab business contributed to the revenue growth across all geographic regions. Services in the diagnostics and genomics business is increasing due to growth in service revenue throughout all our businesses.

Services and other revenue increased 9 percent in 2018 as compared to 2017. Services and other revenue increased in all major service categories within our Agilent CrossLab business. Services in the diagnostics and genomics business is increasing due to growth in service revenue in our genomics and pathology businesses.

Net Revenue By Segment

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
	(in millions)				
Net revenue by segment:					
Life sciences and applied markets	$ 2,302	$ 2,270	$ 2,081	1%	9%
Diagnostics and genomics	$ 1,021	$ 943	$ 860	8%	10%
Agilent CrossLab	$ 1,840	$ 1,701	$ 1,531	8%	11%
Total net revenue	$ 5,163	$ 4,914	$ 4,472	5%	10%

Revenue in the life sciences and applied markets business increased 1 percent in 2019 when compared to 2018. Foreign currency movements had an overall unfavorable impact on revenue of 2 percentage points in 2019 when compared to 2018. Acquisitions had an overall favorable impact on revenue growth of 4 percentage points and primarily impacted the pharmaceutical and academia and government markets when compared to the same period last year. As a result, revenue growth was favorable within academia and government, moderate within the pharmaceutical and moderate within the environmental and forensics markets which was mostly offset by declines in revenue from the food market and to a lesser extent from the chemical and energy market when compared to the same period last year. Revenue in the life sciences and applied markets business increased 9 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact of 2 percentage points in 2018 when compared to 2017. For the year ended October 31, 2018, our performance within the life science and applied markets business was led by strong growth throughout the year in the pharmaceutical market. Chemical and energy markets and the environmental and forensics markets continued to show strong growth when compared to 2017.

Revenue in the diagnostics and genomics business increased 8 percent in 2019 when compared to 2018. Foreign currency movements had an overall unfavorable impact on revenue of 3 percentage points in 2019 when compared to 2018. Revenue growth within the diagnostics and clinical market and the pharmaceutical market continued to be strong led by performance from our nucleic acid solutions and biomolecular analysis businesses. Revenue in the diagnostics and genomics business increased 10 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact on revenue of 3 percentage points in 2018 when compared to 2017. For the year ended October 31, 2018, our performance within the diagnostics and genomics business was led by strong growth in our genomics, companion diagnostics and biomolecular analysis businesses.

Revenue in the Agilent CrossLab business increased 8 percent in 2019 when compared to 2018. Foreign currency movements had an overall unfavorable impact on revenue of 3 percentage points in 2019 when compared to 2018. Our performance in the Agilent CrossLab business saw continued growth in all key end markets with strong growth in the pharmaceutical, academia and government and food markets. Revenue generated by Agilent CrossLab increased 11 percent in 2018 when compared to 2017. Foreign currency movements had an overall favorable impact of 2 percent percentage points in 2018 when compared to 2017. Our performance in the Agilent CrossLab business saw continued growth in all key end markets with strong growth in the pharmaceutical and food markets.

Costs and Expenses

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
(in millions, except margin data)					
Gross margin on products	56.7%	57.4%	56.6%	(1) ppt	1 ppt
Gross margin on services and other	47.3%	45.3%	44.2%	2 ppts	1 ppt
Total gross margin	54.3%	54.5%	53.6%	—	1 ppt
Research and development	$ 404	$ 387	$ 341	5%	14%
Selling, general and administrative	$ 1,460	$ 1,389	$ 1,251	5%	11%
Operating margin	18.2%	18.4%	18.1%	—	—

Total gross margin growth for the year ended October 31, 2019 was flat when compared to last year. Total gross margins for the year ended October 31, 2019 reflects the impact of efficiency gains, lower inventory charges and favorable currency impact on costs offset by higher wages and variable pay, product mix, higher expenses related to tariffs and higher amortization expense of intangible assets.

Total gross margin growth for the year ended October 31, 2018 increased 1 percentage point when compared to the prior year. Increases in total gross margins for the year ended October 31, 2018 reflects higher sales volume, favorable business mix, lower manufacturing material costs and lower amortization expense of intangible assets partially offset by higher wages and variable pay, an impairment of certain intangible assets and unfavorable currency movements.

Gross inventory charges were $19 million in 2019, $26 million in 2018 and $24 million in 2017. Sales of previously written down inventory were $6 million in 2019, $8 million in 2018 and $9 million in 2017.

Research and development expenses increased 5 percent for the year ended October 31, 2019 when compared with last year. Research and development expenses increased due to increased program spending on new products related to all of our businesses in addition to higher wages and variable pay and additional expenses related to acquired businesses partially offset by favorable currency movements when compared to spending in the same periods last year. Research and development expenses increased 14 percent for the year ended October 31, 2018 when compared with 2017. Research and development expenses increased due to increased program spending on new products related to all of our businesses in addition to higher wages and variable pay, unfavorable currency movements and additional expenses related to acquired businesses when compared to spending in 2017.

Selling, general and administrative expenses increased 5 percent in 2019 compared to 2018. Selling, general and administrative expenses increase was due to increased wages and variable pay, higher commissions, higher legal expenses, higher acquisition and integration costs and higher transformation initiatives expenses partially offset by operational efficiencies and savings and favorable currency impact. Selling, general and administrative expenses increased 11 percent in 2018 compared to 2017. Selling, general and administrative expenses increase was due to higher wages and variable pay, higher commissions, increased corporate costs, higher share-based compensation expense, higher transformational initiative costs, an impairment of certain intangible assets and unfavorable currency movements.

Total operating margin was flat for the year ended October 31, 2019, when compared to last year. Operating margins was impacted by higher wages and variable pay, higher acquisition and integration costs, higher expenses related to tariffs and higher transformation initiatives expenses offset by operational efficiencies and savings and favorable currency impact. Total operating margin was flat for the year ended October 31, 2018, when compared to 2017. Operating margins was impacted by higher gross margins, lower acquisition and integration costs and lower amortization expense offset by increased wages and variable pay, an impairment of certain intangible assets, higher transformational initiative costs and the additional research and development and selling, general and administrative expenses related to our recent acquisitions.

Interest expense for the years ended October 31, 2019, 2018 and 2017 was $74 million, $75 million and $79 million, respectively, and relates to the interest charged on our senior notes and the amortization of the deferred loss recorded upon termination of the forward starting interest rate swap contracts partially offset by the amortization of deferred gains recorded upon termination of interest rate swap contracts.

At October 31, 2019, our headcount was approximately 16,300 compared to 14,800 in 2018.

Other income (expense), net

For the year ended October 31, 2019, other income (expense), net includes income of $12 million related to the provision of site service costs to, and lease income from, Keysight Technologies, Inc. ("Keysight") and $9 million loss on the extinguishment of debt.

For the year ended October 31, 2018, other income (expense), net includes the net gain of $20 million related to the step-up of our initial investment in Lasergen, $15 million of income related to a special one-time settlement with a third-party, a $5 million pension settlement gain related to the substitutional portion of the defined benefit pension plans established under the Japanese Welfare Pension Insurance Law and income of $12 million related to the provision of site service costs to, and lease income from, Keysight.

For the year ended October 31, 2017, other income (expense), net includes $32 million pension settlement gain related to the substitutional portion of the defined benefit pension plans established under the Japanese Welfare Pension Insurance Law and$12 million of income related to the provision of site service costs to and lease income from Keysight.

Income Taxes

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Provision (benefit) for income taxes	$ (152)	$ 630	$ 119

For 2019, the company's income tax benefit was $152 million with an effective tax rate of (16.5) percent. For the year ended October 31, 2019, our effective tax rate and the resulting provision for income taxes were significantly impacted by the discrete benefit of $299 million related to the extension of the company's tax incentive in Singapore.

For 2018, the company's income tax expense was $630 million with an effective tax rate of 66.6 percent. For the year ended October 31, 2018, our effective tax rate and the resulting provision for income taxes were significantly impacted by the discrete charge of $552 million related to the enactment of the Tax Act as discussed below.

For 2017, the company's income tax expense was $119 million with an effective tax rate of 14.8 percent. Our effective tax rate is impacted by earnings realized in foreign jurisdictions with statutory tax rates lower than the federal statutory tax rate. During the year, the company determined a portion of current year foreign earnings from its low tax jurisdictions would not be considered as indefinitely reinvested. As such, a deferred tax liability for that portion of unremitted foreign earnings was accrued causing an increase in the annual tax expense. Our annual effective tax rate also included tax benefits due to the settlement of an audit in Germany for the years 2005 through 2008 and the lapse of U.S. statute of limitation for the fiscal years 2012 and 2013. This benefit was offset by a deferred tax liability required for the tax expected upon repatriation of related unremitted foreign earnings that were not asserted as indefinitely invested outside the U.S.

The company has negotiated tax holidays in several different jurisdictions, most significantly in Singapore. The tax holidays provide lower rates of taxation on certain classes of income and require various thresholds of investments and employment or specific types of income in those jurisdictions. In December 2018, the tax holiday in Singapore was renegotiated and extended through 2027. Other tax holidays are due for renewal in 2020. As a result of the incentives, the impact of the tax holidays decreased income taxes by $368 million, $87 million, and $93 million in 2019, 2018, and 2017, respectively. The benefit of the tax holidays on net income per share (diluted) was approximately $1.16, $0.27, and $0.29 in 2019, 2018 and 2017, respectively. The increase in the benefit from 2018 to 2019 is primarily due to the Singapore restructuring and tax incentive modifications completed in 2019 in response to Singapore tax law changes. Of the $1.16 benefit of the tax incentives on net income per share (diluted) in 2019, $0.94 of the benefit relates to one-time items from the Singapore restructuring.

2017 U.S. Tax Reform - Tax Cuts and Jobs Act

On December 22, 2017, the Tax Act was enacted into law. The Tax Act enacted significant changes affecting our fiscal year 2018, including, but not limited to, (1) reducing the U.S. federal corporate tax rate and (2) imposing a one-time transition tax on certain unrepatriated earnings of foreign subsidiaries that had not been previously taxed in the U.S.

The Tax Act also established new tax provisions affecting our fiscal year 2019, including, but not limited to, (1) creating a new provision designed to tax global intangible low-tax income ("GILTI"); (2) generally eliminating U.S. federal taxes on dividends from foreign subsidiaries; (3) eliminating the corporate alternative minimum tax ("AMT"); (4) creating the base erosion anti-abuse tax ("BEAT"); (5) establishing a deduction for foreign derived intangible income ("FDII"); (6) repealing domestic production activity deduction; and (7) establishing new limitations on deductible interest expense and certain executive compensation.

ASC 740, Income Taxes, requires companies to recognize the effect of the tax law changes in the period of enactment. However, the SEC staff issued Staff Accounting Bulletin 118 ("SAB 118") which allowed companies to record provisional amounts during a measurement period not extending beyond one year from the Tax Act enactment date. For the year ended October 31, 2018, the company recognized income tax expense related to the Tax Act of $552 million which includes (1) an expense of $499 million of U.S. transition tax and correlative items on deemed repatriated earnings of non-U.S. subsidiaries and (2) an expense of $53 million associated with the impact on deferred taxes resulting from the decreased U.S. corporate tax rate as described below.

Deemed Repatriation Transition Tax (Transition Tax): The Transition Tax is based on the company's total unrepatriated post-1986 earnings and profits ("E&P") of its foreign subsidiaries and the amount of non-U.S. taxes paid (Tax Pools) on such earnings. Historically, the company permanently reinvested a significant portion of these post-1986 E&P outside the U.S. For the remaining portion, the company previously accrued deferred taxes. Since the Tax Act required all foreign earnings to be taxed currently, the company recorded an income tax expense of $651 million for its one-time transition U.S. federal tax and a benefit

of $152 million for the reversal of related deferred tax liabilities. The resulting $499 million net transition tax, reduced by existing tax credits, will be paid over 8 years in accordance with the election available under the Tax Act. We have completed our accounting for charges related to the Transition Tax.

Reduction of U.S. Federal Corporate Tax Rate: The reduction of the corporate income tax rate requires companies to remeasure their deferred tax assets and liabilities as of the date of enactment. The amount recorded for the year ended October31, 2018 for the remeasurement due to tax rate change is $53 million. We have completed our accounting for the measurement of deferred taxes.

GILTI: The Tax Act subjects a U.S. corporation to tax on its GILTI. U.S. GAAP allows companies to make an accounting policy election to either (1) treat taxes due on future GILTI inclusions in the U.S. taxable income as a current-period expense when incurred ("period cost method") or (2) factoring such amounts into a company's measurement of its deferred taxes ("deferred method"). We have completed our analysis and elected to treat GILTI as a "current period cost".

Indefinite Reinvestment Assertion: Prior to the enactment of the Tax Act, the company had indefinite investment assertion on a significant portion of its undistributed earnings from foreign subsidiaries. As a result of the enactment of the Tax Act, we have reevaluated our historic assertion and no longer consider these earnings to be indefinitely reinvested in our foreign subsidiaries. The company has recorded a deferred tax liability of $10 million for foreign withholding taxes on repatriation of remaining undistributed earnings.

In the U.S., tax years remain open back to the year 2016 for federal income tax purposes and the year 2015 for significant states. In other major jurisdictions where the company conducts business, the tax years generally remain open back to the year 2009.

With these jurisdictions and the U.S., it is reasonably possible that there could be significant changes to our unrecognized tax benefits in the next twelve months due to either the expiration of a statute of limitation or a tax audit settlement which will be partially offset by an anticipated tax liability related to unremitted foreign earnings, where applicable. Given the number of years and numerous matters that remain subject to examination in various tax jurisdictions, management is unable to estimate the range of possible changes to the balance of our unrecognized tax benefits.

The calculation of our tax liabilities involves dealing with uncertainties in the application of complex tax law and regulations in a multitude of jurisdictions. Although the guidance on the accounting for uncertainty in income taxes prescribes the use of a recognition and measurement model, the determination of whether an uncertain tax position has met those thresholds will continue to require significant judgment by management. In accordance with the guidance on the accounting for uncertainty in income taxes, for all U.S. and other tax jurisdictions, we recognize potential liabilities for anticipated tax audit issues based on our estimate of whether, and the extent to which, additional taxes and interest will be due. The ultimate resolution of tax uncertainties may differ from what is currently estimated, which could result in a material impact on income tax expense. If our estimate of income tax liabilities proves to be less than the ultimate assessment, a further charge to expense would be required. If events occur and the payment of these amounts ultimately proves to be unnecessary, the reversal of the liabilities would result in tax benefits being recognized in the period when we determine the liabilities are no longer necessary.

Segment Overview

Through October 31, 2019, we have three business segments comprised of the life sciences and applied markets business, diagnostics and genomics business and the Agilent CrossLab business.

In 2019, we adopted new guidance related to the presentation of the net periodic pension and postretirement benefit cost. See Note 2, "New Accounting Pronouncements" for more information. As a result, we have recast our historical segment results to conform to this new presentation required under this guidance.

Life Sciences and Applied Markets

Our life sciences and applied markets business provides application-focused solutions that include instruments and software that enable customers to identify, quantify and analyze the physical and biological properties of substances and products, as well as enable customers in the clinical and life sciences research areas to interrogate samples at the molecular and cellular level. Key product categories include: liquid chromatography ("LC") systems and components; liquid chromatography mass spectrometry ("LCMS") systems; gas chromatography ("GC") systems and components; gas chromatography mass spectrometry ("GCMS") systems; inductively coupled plasma mass spectrometry ("ICP-MS") instruments; atomic absorption ("AA") instruments; microwave plasma-atomic emission spectrometry ("MP-AES") instruments; inductively coupled plasma optical emission spectrometry ("ICP-OES") instruments; raman spectroscopy; cell analysis plate based assays; flow cytometer; real-time

cell analyzer; cell imaging systems; microplate reader; laboratory software for sample tracking; information management and analytics; laboratory automation and robotic systems; dissolution testing; vacuum pumps and measurement technologies.

Net Revenue

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
		(in millions)			
Net revenue	$ 2,302	$ 2,270	$ 2,081	1%	9%

Life science and applied markets business revenue in 2019 increased 1 percent compared to 2018. Foreign currency movements for 2019 had an overall unfavorable currency impact of 2 percentage points on revenue growth when compared to the same period last year. Acquisitions had an overall favorable impact on revenue growth of 3 percentage points when compared to the same period last year. Geographically, revenue increased 12 percent in the Americas with a 1 percentage point unfavorable currency impact, decreased 4 percent in Europe with a 3 percentage point unfavorable currency impact and decreased 2 percent in Asia Pacific with a 1 percentage point unfavorable currency impact. From a product standpoint revenue was driven by strength in sales in our gas chromatography mass spectrometry, cell analysis primarily due to contributions from our recent acquisitions and informatics businesses which was offset by weakness in our liquid chromatography, gas chromatography, liquid chromatography mass spectrometry and spectroscopy products when compared to the same period last year.

End market revenue performance in 2019 were also mixed with the pharmaceutical, academia and government, diagnostics and clinical and forensics markets delivering strong revenue growth, environmental delivering moderate growth while chemical and energy markets decreased modestly, and food delivered weak results compared to the same period last year.

Life science and applied markets business revenue in 2018 increased 9 percent compared to 2017. Foreign currency movements for 2018 had an overall favorable currency impact of 2 percentage points on revenue growth when compared to 2017. Geographically, revenue increased 8 percent in the Americas with no currency impact, increased 12 percent in Europe with a 5 percentage point favorable currency impact and increased 8 percent in Asia Pacific with a 1 percentage point favorable currency impact. From a product standpoint liquid chromatography mass spectrometry, spectroscopy and cell analysis systems led with double digit growth. Gas chromatography mass spectrometry and gas chromatography also posted strong results helped by growth in the chemical and energy markets.

End market performance in 2018 was led by pharmaceutical markets which were strong throughout the year. Chemical and energy markets kept the momentum from 2017 and delivered strong growth. Academic and government and environmental markets also delivered strong growth. Food market contracted mainly driven by consolidations of governmental agencies in China.

Looking forward, despite short term uncertainties, we are optimistic about our long-term growth opportunities in the life sciences and applied markets as our broad portfolio of products and solutions are well suited to address customer needs. We anticipate strong growth from our new product introductions and recent acquisitions as we continue to invest in expanding and improving our applications and solutions portfolio. While we anticipate volatility in our markets, we expect continued growth across most end markets in the long term.

Gross Margin and Operating Margin

The following table shows the life sciences and applied markets business' margins, expenses and income from operations for 2019 versus 2018, and 2018 versus 2017.

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
(in millions, except margin data)					
Total gross margin	61.0%	61.3%	60.3%	—	1 ppt
Research and development	$ 216	$ 220	$ 199	(1)%	10%
Selling, general and administrative	$ 646	$ 630	$ 587	3%	7%
Operating margin	23.5%	23.9%	22.6%	—	1 ppt
Income from operations	$ 542	$ 543	$ 470	—	16%

Gross margin was flat in 2019 compared to 2018. Gross margin was impacted by unfavorable mix and higher expenses related to tariffs which was offset by favorable currency impact. Gross margin increased 1 percentage point in 2018 compared to 2017. The increase was due to increased volume and lower manufacturing material costs.

Research and development expenses decreased 1 percent in 2019 when compared to 2018. Research and development was impacted by lower discretionary spending and a favorable currency offset by additional expenses related to our recent acquisitions as well as higher wages and variable pay. Research and development expenses increased 10 percent in 2018 when compared to 2017. The increase in research and development was due to higher program funding in product development as well as wage and variable pay increases and unfavorable currency related effects.

Selling, general and administrative expenses increased 3 percent in 2019 compared to 2018. Selling, general and administrative expenses was impacted by higher wages and variable pay and additional expenses related to our recent acquisitions partially offset by operational savings and a favorable currency impact. Selling, general and administrative expenses increased 7 percent in 2018 compared to 2017. Selling, general and administrative expenses increased due to increased marketing and sales force investments as well as wages and variable pay increases, higher share-based compensation expense and unfavorable currency related effects.

Operating margin was relatively flat in 2019 compared to 2018. Operating margin reflects relatively flat revenue growth partially offset by an increase in selling, general and administrative expenses. Operating margin increased 1 percentage points in 2018 compared to 2017. The increase in operating margin was a product of revenue growth and improved gross margin offset slightly by unfavorable currency impact.

Income from Operations

Income from operations in 2019 decreased by $1 million or was relatively flat when compared to 2018 on a revenue increase of $32 million. The decrease was due to the impact of our recent acquisitions. Income from operations in 2018 increased by $73 million or 16 percent when compared to 2017 on a revenue increase of $189 million. The increase was due to higher revenues and lower cost of sales on incremental revenues.

Diagnostics and Genomics

Our diagnostics and genomics business includes the genomics, nucleic acid contract manufacturing and research and development, pathology, companion diagnostics, reagent partnership and biomolecular analysis businesses.

Our diagnostics and genomics business is comprised of six areas of activity providing active pharmaceutical ingredients ("APIs") for oligo-based therapeutics as well as solutions that include reagents, instruments, software and consumables, which enable customers in the clinical and life sciences research areas to interrogate samples at the cellular and molecular level. First, our genomics business includes arrays for DNA mutation detection, genotyping, gene copy number determination, identification of gene rearrangements, DNA methylation profiling, gene expression profiling, as well as next generation sequencing ("NGS") target enrichment and genetic data management and interpretation support software. This business also includes solutions that enable clinical labs to identify DNA variants associated with genetic disease and help direct cancer therapy. Second, our nucleic acid solutions business provides equipment and expertise focused on production of synthesized oligonucleotides under pharmaceutical good manufacturing practices ("GMP") conditions for use as API in an emerging class of drugs that utilize nucleic

acid molecules for disease therapy. Third, our pathology solutions business is focused on product offerings for cancer diagnostics and anatomic pathology workflows. The broad portfolio of offerings includes immunohistochemistry ("IHC"), in situ hybridization ("ISH"), hematoxylin and eosin ("H&E") staining and special staining. Fourth, we also collaborate with a number of major pharmaceutical companies to develop new potential pharmacodiagnostics, also known as companion diagnostics, which may be used to identify patients most likely to benefit from a specific targeted therapy. Fifth, the reagent partnership business is a provider of reagents used for turbidimetry and flow cytometry. Finally, our biomolecular analysis business provides complete workflow solutions, including instruments, consumables and software, for quality control analysis of nucleic acid samples. Samples are analyzed using quantitative and qualitative techniques to ensure accuracy in further genomics analysis techniques utilized in clinical and life science research applications.

Net Revenue

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
		(in millions)			
Net revenue	$ 1,021	$ 943	$ 860	8%	10%

Diagnostics and genomics business revenue in 2019 increased 8 percent compared to 2018. Foreign currency movements for 2019 had an overall unfavorable impact on revenue growth of 3 percentage points when compared to the same period last year. Geographically, revenue increased 17 percent in the Americas with a 1 percentage point unfavorable currency impact, was flat in Europe with a 4 percentage point unfavorable currency impact and increased 2 percent in Asia Pacific with a 2 percentage point unfavorable currency impact. The growth in Americas was driven by strong growth in our nucleic acid solutions, companion diagnostics and biomolecular analysis business. In Europe we saw strong growth in the biomolecular analysis business offset by softness in the genomics business. In Asia Pacific the growth was driven by our biomolecular analysis businesses and negatively impacted by softness in the genomics business.

Revenue growth in 2019 was led by strong revenue performance in our nucleic acid solutions, companion diagnostics and biomolecular analysis business. The diagnostics and clinical research market remains strong and growing driven by an aging population and unhealthy lifestyle developments such as poor diet and physical inactivity.

Diagnostics and genomics business revenue in 2018 increased 10 percent compared to 2017. Foreign currency movements for 2018 had an overall favorable impact on revenue growth of 3 percentage points when compared to the same period last year and acquisitions had an overall favorable impact on revenue growth of 2 percentage points when compared to the same period last year. Geographically, revenue increased 11 percent in the Americas with a 1 percentage point unfavorable currency impact, increased 11 percent in Europe with a 6 percentage point favorable currency impact and increased 2 percent in Asia Pacific with a 1 percentage point favorable currency impact. The growth in the Americas was supported by continued strength in our genomics business, strong growth in the companion diagnostic business and our biomolecular analysis business. Europe results represented growth in our genomics and the biomolecular analysis business. The performance in Americas and Europe were led by growth in sales in genomics (particularly target enrichment and arrays). In Asia Pacific, our relatively smaller region, growth increased due to higher shipment volumes in China.

The revenue growth in 2018 was due to positive growth from all businesses and strength in Americas, Europe and China regions. This was led by revenue growth in our arrays and next generation sequencing solution portfolio offering within the genomics business mainly driven by SureSelect NGS target enrichment products, continued ramp in revenue growth in our reagent partnership business due to demand for our reagents and strength in our biomolecular analysis business consumables portfolio. The end markets in diagnostics and clinical research remain strong and growing driven by an aging population and lifestyle.

Looking forward, we are optimistic about our growth opportunities in our end markets and continue to invest in expanding and improving our applications and solutions portfolio. We remain positive about our growth in our end markets, as our OMNIS products, PD-L1 assays and SureFISH continue to gain strength with our customers in clinical oncology applications and our next generation sequencing target enrichment solutions continue to be adopted. Market demand in the nucleic acid solutions business related to therapeutic oligo programs continues to be strong and, with our newly opened nucleic acid solutions production facility in Frederick, we are well positioned to serve more of the market demand. We will continue to invest in research and development and seek to expand our position in developing countries and emerging markets.

Gross Margin and Operating Margin

The following table shows the diagnostics and genomics business's margins, expenses and income from operations for 2019 versus 2018, and 2018 versus 2017.

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
(in millions, except margin data)					
Total gross margin	54.7%	56.3%	55.2%	(2) ppts	1 ppt
Research and development	$ 125	$ 109	$ 89	15%	22%
Selling, general and administrative	$ 248	$ 249	$ 218	—	14%
Operating margin	18.2%	18.4%	19.4%	—	(1) ppt
Income from operations	$ 185	$ 173	$ 167	7%	4%

Gross margin decreased 2 percentage points in 2019 when compared to 2018. The decrease in gross margin was driven by an unfavorable product mix and a higher fixed cost structure due to the addition of a second nucleic acid manufacturing facility that offset gains from higher sales volumes. Gross margin increased 1 percentage point in 2018 when compared to 2017, mainly driven from higher volumes were partially offset by higher wages and variable pay.

Research and development expenses increased 15 percent in 2019 when compared to 2018. The increase was due to additional expenses related to prior year's acquisitions, higher wages and variable pay and increased spending around the development of clinical applications and solutions. Research and development expenses increased 22 percent in 2018 when compared to 2017. The increase was mainly due to additional expenses related to the acquisition of Lasergen, increase in wages and variable pay and unfavorable currency movements.

Selling, general and administrative expenses was flat in 2019 when compared to 2018. Selling, general and administrative expenses were impacted by efficiency gains offsetting higher wages and variable pay. Selling, general and administrative expenses increased 14 percent in 2018 when compared to 2017. Selling, general and administrative expenses increase was due to the additional expenses related to the acquisitions of Lasergen and AATI, increases in wages and variable pay and unfavorable currency movements.

Operating margin was flat in 2019 when compared to 2018. Operating margin was impacted by higher sales volume, offsetting the gross margin deterioration and the increase in research and development spending. Operating margin decreased 1 percentage point in 2018 when compared to 2017. The decline in operating margin was due additional expenses related to the acquisitions of Lasergen and AATI.

Income from Operations

Income from operations in 2019 increased by $12 million or 7 percent when compared to 2018 on a revenue increase of $78 million. The increase was due to higher volume partially offset by the gross margin percentage decline and higher research and development expenses. Income from operations in 2018 increased by $6 million or 4 percent when compared to 2017 on a revenue increase of $83 million. The increase was due to higher volumes partially offset by higher expenses related to the acquisitions.

Agilent CrossLab

The Agilent CrossLab business spans the entire lab with its extensive consumables and services portfolio, which is designed to improve customer outcomes. Most of the portfolio is vendor neutral, meaning Agilent can serve and supply customers regardless of their instrument purchase choices. Solutions range from chemistries and supplies to services and software helping to connect the entire lab. Key product categories in consumables include GC and LC columns, sample preparation products, custom chemistries, and a large selection of laboratory instrument supplies. Services include startup, operational, training and compliance support, software as a service, as well as asset management and consultative services that help increase customer productivity. Custom service and consumable bundles are tailored to meet the specific application needs of various industries and to keep instruments fully operational and compliant with the respective industry requirements.

Net Revenue

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
		(in millions)			
Total net revenue	$ 1,840	$ 1,701	$ 1,531	8%	11%

Agilent CrossLab business revenue in 2019 increased 8 percent when compared to 2018. Foreign currency movements for 2019 had an overall unfavorable impact of 3 percentage points when compared to 2018. Acquisitions in 2018 added 1 percentage point to the revenue growth reported for 2019. Revenue growth in 2019 was driven broadly by our entire services and consumables portfolio. Geographically, revenue increased 9 percent in the Americas with an 1 percentage point unfavorable currency impact, increased 5 percent in Europe with a 5 percentage points unfavorable currency impact and increased 10 percent in Asia Pacific with a 3 percentage points unfavorable currency impact. In 2019, Agilent CrossLab business saw strong revenue growth in all key end markets, except in the diagnostics and clinical market, when compared to the same periods last year.

Agilent CrossLab business revenue in 2018 increased 11 percent when compared to 2017. Foreign currency movements for 2018 had an overall favorable impact of 2 percentage points when compared to 2017. Acquisitions in 2018 did not have a material impact on the revenue growth for 2018. Revenue growth in 2018 was driven by the entire portfolio, including all consumables, all major service categories and remarketed instruments. Geographically, revenue increased 7 percent in the Americas with no currency impact, increased 12 percent in Europe with a 6 percentage point favorable currency impact and increased 15 percent in Asia Pacific with a 2 percentage point favorable currency impact. Agilent CrossLab business saw a broad based and sustained revenue growth in most key end markets throughout 2018, especially from the pharmaceutical and food markets.

Looking forward, we anticipate strength in key end markets will continue to drive our revenue growth in the near term. The Agilent CrossLab portfolio of products and service capabilities are well positioned to succeed in changing market conditions in our key end markets. Geographically, the business is well diversified across all regions to swiftly take advantage of local market opportunities and to help hedge against market volatility in any one region. Other factors for near term revenue growth include continued expansion of digital capabilities and leveraging of our deep understanding of customer work flows.

Gross Margin and Operating Margin

The following table shows the Agilent CrossLab business's margins, expenses and income from operations for 2019 versus 2018 and 2018 versus 2017.

	Years Ended October 31,			2019 over 2018 Change	2018 over 2017 Change
	2019	2018	2017		
(in millions, except margin data)					
Total gross margin	51.8%	50.4%	49.4%	1 ppt	1 ppt
Research and development	$ 58	$ 56	$ 50	3%	12%
Selling, general and administrative	$ 421	$ 413	$ 371	2%	11%
Operating margin	25.8%	22.8%	21.9%	3 ppts	1 ppt
Income from operations	$ 475	$ 388	$ 336	23%	16%

Gross margin for products and services increased 1 percentage point in 2019 when compared to 2018. Gross margin was impacted by higher sales volume, combined with efficiency gains in the service delivery operation and efficiency gains in the logistics and manufacturing processes for the consumables business partially offset by higher wages and variable pay partly due to increased headcount. Gross margin for products and services increased 1 percentage point in 2018 when compared to 2017. Gross margin increase came primarily from higher sales volume.

Research and development expenses increased 3 percent in 2019 when compared to 2018. Research and development increased due to higher wages and variable pay and additional research and development expenditures from our prior year's acquisitions. Research and development expenses increased 12 percent in 2018 when compared to 2017. Research and development increase was primarily due to higher wages across the various research organizations, and due to increased headcount in the areas of software development, iLab development and customer training curriculum development.

Selling, general and administrative expenses increased 2 percent in 2019 when compared to 2018. Selling, general and administrative expenses were impacted by additional operating expenses from our prior year's acquisitions and overall higher wages and variable pay partially offset by a favorable impact from foreign currency movements. Selling, general and administrative expenses increased 11 percent in 2018 when compared to 2017. Selling, general and administrative expenses increased due to higher wages, higher variable pay, increased corporate infrastructure costs, and increased sales force investments.

Operating margin increased 3 percentage points in 2019 when compared to 2018. The increase in operating margin was driven by the higher sales volume, combined with efficiency gains across the service delivery operations, order fulfillment processes and other operations. Operating margin increased 1 percentage point in 2018 when compared to 2017. The increase in operating margin was primarily due to higher sales volume.

Income from Operations

Income from operations in 2019 increased by $87 million or 23 percent when compared to 2018 on a revenue increase of $139 million. Income from operations in 2018 increased by $52 million or 16 percent when compared to 2017 on a revenue increase of $170 million.

Financial Condition

Liquidity and Capital Resources

Our financial position as of October 31, 2019 consisted of cash and cash equivalents of $1,382 million as compared to $2,247 million as of October 31, 2018.

As of October 31, 2019, approximately $1,310 million of our cash and cash equivalents is held outside of the U.S. by our foreign subsidiaries and can be repatriated to the U.S. as local working capital and other regulatory conditions permit. We utilize a variety of funding strategies to ensure that our worldwide cash is available in the locations in which it is needed.

As a result of the Tax Act, we are required to pay a one-time transition tax on deferred foreign income not previously subject to U.S. federal income tax. This is offset by tax attributes that results in a net tax payable of $200 million. The first installment of $36 million was paid in the second quarter of 2019 and the remaining will be paid over the next seven years. As part of the business integration of some of our prior acquisitions, we undertook corporate restructurings in the fourth quarter of fiscal year 2019 that involved on-shoring certain intangible properties held by our foreign subsidiaries to the United States. These restructurings resulted in a cash tax liability of $231 million which is payable in the first quarter of fiscal year 2020.

We believe our cash and cash equivalents, cash generated from operations, and ability to access capital markets and credit lines will satisfy, for at least the next twelve months, our liquidity requirements, both globally and domestically, including the following: working capital needs, capital expenditures, business acquisitions, stock repurchases, cash dividends, contractual obligations, commitments, principal and interest payments on debt, and other liquidity requirements associated with our operations.

Net Cash Provided by Operating Activities

Net cash provided by operating activities was $1,021 million in 2019 as compared to $1,087 million provided in 2018 and $889 million provided in 2017. We paid approximately $118 million under our variable and incentive pay programs in 2019, as compared to a total of $103 million paid in 2018 and $91 million in 2017. Net cash paid for income taxes was approximately $159 million in 2019, as compared to $102 million in 2018 and $63 million in 2017. For the year ended October 31, 2019, the net change of zero in tax-related assets and liabilities related to the enactment of the U.S. Tax Act compared to $552 million in the same period of 2018, which primarily consisted of an estimated provision of $499 million of U.S. transition tax on deemed repatriated earnings of non-U.S. subsidiaries as well as an estimated $53 million associated with the impact on deferred taxes resulting from the decreased U.S. corporate income tax rate. For the years ended October 31, 2019, 2018 and 2017, other assets and liabilities used cash of $43 million, $4 million and $98 million, respectively. The increase in cash usage for the year ended October 31, 2019 and October 31, 2017 in other assets and liabilities is primarily due to taxes.

In 2019, the change in accounts receivable used cash of $106 million, $65 million in 2018, and $81 million in 2017. Days' sales outstanding as of October 31, were 61 days in 2019, 54 days in 2018 and 55 days in 2017. The change in accounts payable provided cash of $29 million in 2019, $40 million in 2018 and $2 million in 2017. Cash used in inventory was $36 million in 2019, $83 million in 2018 and $61 million in 2017. Inventory days on-hand decreased to 97 days in 2019 compared to 98 days in 2018 and increased compared to 95 days in 2017.

We made no contributions to our U.S defined benefit plans in 2019 and 2018. We contributed $25 million to our U.S. defined benefit plans in 2017. We contributed $21 million each year to our non-U.S. defined benefit plans in 2019, 2018 and 2017, respectively. We did not contribute to our U.S. post-retirement benefit plans in 2019, 2018 and 2017. Our non-U.S. defined benefit plans are generally funded ratably throughout the year. Total contributions in 2019 were $21 million or equal to total contribution in 2018. Our annual contributions are highly dependent on the relative performance of our assets versus our projected liabilities, among other factors. We do not expect to contribute to our U.S. plans and U.S. post-retirement benefit plans during 2020. We expect to contribute $24 million to our non-U.S. defined benefit plans during 2020.

Net Cash Used in Investing Activities

Net cash used in investing activities in 2019 was $1,590 million and in 2018 was $705 million as compared to net cash used of $304 million in 2017.

Investments in property, plant and equipment were $155 million in 2019, $177 million in 2018 and $176 million in 2017. In 2019 we invested $1,408 million in acquisitions of businesses and intangible assets, net of cash acquired for the acquisition of two businesses compared to the acquisition of seven businesses for $516 million in 2018 and the acquisition of two businesses for $128 million in 2017. In 2019 there were approximately $23 million in purchases of fair value investments compared to $11 million outlay in 2018 and $1 million in 2017.

Net Cash Used in Financing Activities

Net cash used in financing activities in 2019 was $299 million compared to $797 million in 2018 and $202 million in 2017.

Treasury Stock Repurchases

On May 28, 2015 we announced that our board of directors had approved a share repurchase program (the "2015 repurchase program"). The 2015 share repurchase program authorizes the purchase of up to $1.14 billion of our common stock at the company's discretion through and including November 1, 2018. The 2015 repurchase program did not require the company to acquire a specific number of shares and could have been suspended or discontinued at any time. During the year ended October 31, 2017, we repurchased and retired approximately 4.1 million shares for $194 million under this authorization. During the year ended October 31, 2018, we repurchased and retired approximately 6.4 million shares for $422 million under this authorization. As of October 31, 2018, we had remaining authorization to repurchase up to $188 million of our common stock under this program which expired on November 1, 2018.

On November 19, 2018 we announced that our board of directors had approved a new share repurchase program (the "2019 repurchase program") designed, among other things, to reduce or eliminate dilution resulting from issuance of stock under the company's employee equity incentive programs. The 2019 share repurchase program authorizes the purchase of up to $1.75 billion of our common stock at the company's discretion and has no fixed termination date. The 2019 repurchase program does not require the company to acquire a specific number of shares and may be suspended, amended or discontinued at any time. During the year ended October 31, 2019, we repurchased and retired approximately 10.4 million shares for $723 million under this authorization. As of October 31, 2019, we had remaining authorization to repurchase up to $1.03 billion of our common stock under this program.

Dividends

For the years ended October 31, 2019, 2018 and 2017 cash dividends of $206 million, $191 million and $170 million were paid on the company's outstanding common stock, respectively. On November 20, 2019 we declared a quarterly dividend of $0.18 per share of common stock, or approximately $56 million which will be paid on January 22, 2020 to shareholders of record as of the close of business on December 31, 2019. The timing and amounts of any future dividends are subject to determination and approval by our board of directors.

Credit Facility

On March 13, 2019, Agilent entered into a credit agreement with a group of financial institutions which provides for a $1 billion five-year unsecured credit facility that will expire on March 13, 2024. The credit facility replaces the existing credit facility which terminated on the closing date of the new facility. For the year ended October 31, 2019, we borrowed $305 million and repaid $190 million. As of October 31, 2019, the company had borrowings of $115 million outstanding under the credit facility. We were in compliance with the covenants for the credit facility during the year ended October 31, 2019. On August 7, 2019, we entered into an amendment to the credit agreement, which provides for a $500 million short-term loan facility that was used in full to complete the BioTek acquisition and which is outstanding at October 31, 2019. On October 21, 2019, we entered into a second amendment to the credit agreement, which refreshed the amount available for additional incremental term loan facilities under the credit agreement to permit additional incremental facilities of up to $500 million. We had no borrowings under the additional incremental facilities as of October 31, 2019.

Short-term and Long-term Debt

On October 24, 2007, the company issued an aggregate principal amount of $600 million in senior notes ("2017 senior notes"). On October 20, 2014, we settled the redemption of $500 million of the $600 million outstanding aggregate principal amount of our 2017 senior notes. The 2017 senior notes were repayable within one year as of October 31, 2017 and were reclassified to short-term debt. The remaining $100 million in 2017 senior notes matured and were paid in full on November 1, 2017.

On July 13, 2010, the company issued an aggregate principal amount of $500 million in senior notes ("2020 senior notes"). The 2020 senior notes were issued at 99.54% of their principal amount. The notes were scheduled to mature on July 15, 2020, and bear interest at a fixed rate of 5.00% per annum. The interest was payable semi-annually on January 15th and July 15th of each year and payments commenced on January 15, 2011.

On August 9, 2011, we terminated our interest rate swap contracts related to our 2020 senior notes that represented the notional amount of $500 million. The asset value, including interest receivable, upon termination for these contracts was approximately $34 million. The gain was deferred and amortized to interest expense over the remaining life of the 2020 senior notes.

On September 17, 2019, we repaid the $500 million outstanding aggregate principal amount of our 2020 senior notes due July 15, 2020 that were called for redemption on August 16, 2019. The redemption price of approximately $512 million included a $12 million prepayment penalty. The redemption price was computed in accordance with the terms of the 2020 senior notes as the present value of the remaining scheduled payments of principal and unpaid interest related to the redemption. The prepayment penalty plus amortization of the previously deferred interest swap gain of $4 million and amortization of previously deferred debt issuance costs and discount of $1 million was recorded in other income (expense) net in the consolidated statement of operations. We also paid accrued and unpaid interest of $4 million on the 2020 senior notes up to but not including the redemption date.

On September 10, 2012, the company issued an aggregate principal amount of $400 million in senior notes ("2022 senior notes"). The 2022 senior notes were issued at 99.80% of their principal amount. The notes will mature on October 1, 2022, and bear interest at a fixed rate of 3.20% per annum. The interest is payable semi-annually on April 1st and October 1st of each year and payments commenced on April 1, 2013.

In July 2012, Agilent executed treasury lock agreements for $400 million in connection with future interest payments to be made on our 2022 senior notes issued on September 10, 2012. The treasury lock contracts were terminated on September 10, 2012 and we recognized a deferred gain in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2022 senior notes. The remaining gain to be amortized related to the treasury lock agreements at October 31, 2019 was $1 million.

On June 18, 2013, the company issued aggregate principal amount of $600 million in senior notes ("2023 senior notes"). The 2023 senior notes were issued at 99.544% of their principal amount. The notes will mature on July 15, 2023 and bear interest at a fixed rate of 3.875% per annum. The interest is payable semi-annually on January 15th and July 15th of each year and payments commenced January 15, 2014.

On September 15, 2016, the company issued aggregate principal amount of $300 million in senior notes ("2026 senior notes"). The 2026 senior notes were issued at 99.624%% of their principal amount. The notes will mature on September 22, 2026 and bear interest at a fixed rate of 3.050% per annum. The interest is payable semi-annually on March 22nd and September 22nd of each year and payments commenced March 22, 2017.

In February 2016, Agilent executed three forward-starting pay fixed/receive variable interest rate swaps for the notional amount of $300 million in connection with future interest payments to be made on our 2026 senior notes issued on September 15, 2016. The swap arrangements were terminated on September 15, 2016 with a payment of $10 million and we recognized this as a deferred loss in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2026 senior notes.The remaining loss to be amortized related to the interest rate swap agreements at October 31, 2019 was $7 million.

On September 5, 2019, the company issued an aggregate principal amount of $500 million in senior notes ("2029 senior notes"). The 2029 senior notes were issued at 99.316% of their principal amount. The notes will mature on September 15, 2029, and bear interest at a fixed rate of 2.75% per annum. The interest is payable semi-annually on March 15th and September 15th of each year and payments commence on March 15, 2020.

In August 2019, Agilent executed treasury lock agreements for $250 million in connection with future interest payments to be made on our 2029 senior notes issued on September 5, 2019. The treasury lock contracts were terminated on September 6, 2019 and we recognized a deferred loss of $6 million in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2029 senior notes. The remaining loss to be amortized related to the treasury lock agreements at October 31, 2019 was $6 million.

Capital Leases

The company leases certain property and equipment under capital leases. As of October 31, 2019, the current and non-current portion of the company's capital lease obligations had an aggregate carrying value of approximately $6 million.

Off Balance Sheet Arrangements and Other

We have contractual commitments for non-cancelable operating leases. See Note 16, "Commitments and Contingencies", to our consolidated financial statements for further information on our non-cancelable operating leases.

Our liquidity is affected by many factors, some of which are based on normal ongoing operations of our business and some of which arise from fluctuations related to global economics and markets. Our cash balances are generated and held in many locations throughout the world. Local government regulations may restrict our ability to move cash balances to meet cash needs under certain circumstances. We do not currently expect such regulations and restrictions to impact our ability to pay vendors and conduct operations throughout our global organization.

Contractual Commitments

Our cash flows from operations are dependent on a number of factors, including fluctuations in our operating results, accounts receivable collections, inventory management, and the timing of tax and other payments. As a result, the impact of contractual obligations on our liquidity and capital resources in future periods should be analyzed in conjunction with such factors.

The following table summarizes our total contractual obligations at October 31, 2019 for Agilent operations and excludes amounts recorded in our consolidated balance sheet (in millions):

	Less than one year	One to three years	Three to five years	More than five years
Operating leases	$ 52	$ 70	$ 35	$ 56
Commitments to contract manufacturers and suppliers	481	12	—	—
Other purchase commitments	77	—	—	—
Retirement plans	24	—	—	—
Transitional pension contributions to our U.S. 401(k) plan	$ 6	$ 3	$ —	$ —
Total	$ 640	$ 85	$ 35	$ 56

Operating Leases. Commitments under operating leases relate primarily to leasehold property, see Note 16, "Commitments and Contingencies".

Commitments to Contract Manufacturers and Suppliers. We purchase components from a variety of suppliers and use several contract manufacturers to provide manufacturing services for our products. During the normal course of business, we issue purchase orders with estimates of our requirements several months ahead of the delivery dates. The above amounts represent the commitments under the open purchase orders with our suppliers that have not yet been received. However, our agreements

with these suppliers usually provide us the option to cancel, reschedule, and adjust our requirements based on our business needs prior to firm orders being placed. We expect to fulfill most of our purchase commitments for inventory within one year.

In addition to the above-mentioned commitments to contract manufacturers and suppliers, in the past we recorded a liability for firm, non-cancelable and unconditional purchase commitments for quantities in excess of our future demand forecasts consistent with our policy relating to excess inventory. As of October 31, 2019 and 2018, the liability for our firm, non-cancelable and unconditional purchase commitments was less than $1 million. These amounts are included in other accrued liabilities in our consolidated balance sheet.

Other Purchase Commitments. We have categorized "other purchase commitments" related to contracts with professional services suppliers. Typically, we can cancel contracts without penalties. For those contracts that are not cancelable without penalties, we are disclosing the termination fees and costs or commitments for continued spending that we are obligated to pay to a supplier under each contact's termination period before such contract can be cancelled. Our contractual obligations with these suppliers under "other purchase commitments" were approximately $77 million within the next year. Approximately $25 million of the contracts relate to penalties that will reduce over the next 14 years.

Retirement Plans. Commitments under the retirement plans relate to expected contributions to be made to our U.S. and non-U.S. defined benefit plans and to our post-retirement medical plans for the next year only. Contributions after next year are impractical to estimate. Effective May 1, 2016 until April 30, 2022, we will provide an additional transitional company contribution for certain eligible employees equal to 3 percent, 4 percent or 5 percent of an employee's annual eligible compensation due to the U.S. Retirement Plan benefits being frozen.

We had no material off-balance sheet arrangements as of October 31, 2019 or October 31, 2018.

On Balance Sheet Arrangements

The following table summarizes our total contractual obligations on our October 31, 2019 balance sheet (in millions):

	Less than one year	One to three years	Three to five years	More than five years
Senior notes	$ —	$ 400	$ 600	$ 800
Credit facility	115	—	—	—
Short term loan	500	—	—	—
Interest expense	59	118	69	87
Transition tax	35	—	39	90
Capital leases	1	1	1	3
Total	$ 710	$ 519	$ 709	$ 980

Other long-term liabilities as of October 31, 2019 and October 31, 2018 include $328 million and $607 million, respectively, related to long-term income tax liabilities. Of these amounts, $199 million and $215 million related to uncertain tax positions as of October 31, 2019 and October 31, 2018, respectively. We are unable to accurately predict when these amounts will be realized or released. However, it is reasonably possible that there could be significant changes to our unrecognized tax benefits in the next twelve months due to either the expiration of a statute of limitations or a tax audit settlement. The remaining $129 million in other long-term liabilities relates to the one-time transition tax payable.

Item 7A. ***Quantitative and Qualitative Disclosures About Market Risk***

We are exposed to foreign currency exchange rate risks inherent in our sales commitments, anticipated sales, and assets and liabilities denominated in currencies other than the functional currency of our subsidiaries. We hedge future cash flows denominated in currencies other than the functional currency using sales forecasts up to twelve months in advance. Our exposure

to exchange rate risks is managed on an enterprise-wide basis. This strategy utilizes derivative financial instruments, including option and forward contracts, to hedge certain foreign currency exposures with the intent of offsetting gains and losses that occur on the underlying exposures with gains and losses on the derivative contracts hedging them. We do not currently and do not intend to utilize derivative financial instruments for speculative trading purposes. To the extent that we are required to pay for all, or portions, of an acquisition price in foreign currencies, we may enter into foreign exchange contracts to reduce the risk that currency movements will impact the cost of the transaction.

Our operations generate non-functional currency cash flows such as revenues, third party vendor payments and inter-company payments. In anticipation of these foreign currency cash flows and in view of volatility of the currency market, we enter into such foreign exchange contracts as are described above to manage our currency risk. Approximately 51 percent of our revenue in 2019, 53 percent of our revenue in 2018 and 51 percent of our revenues in 2017 were generated in U.S. dollars. The unfavorable effects of changes in foreign currency exchange rates, principally as a result of the strength of the U.S. dollar, has decreased revenue by approximately 2 percentage points in the year ended October 31, 2019. We calculate the impact of foreign currency exchange rates movements by applying the actual foreign currency exchange rates in effect during the last month of each quarter to the current year to both the applicable current and prior year periods.

We performed a sensitivity analysis assuming a hypothetical 10 percent adverse movement in foreign exchange rates to the hedging contracts and the underlying exposures described above. As of October 31, 2019 and 2018, the analysis indicated that these hypothetical market movements would not have a material effect on our consolidated financial position, results of operations, statement of comprehensive income or cash flows.

We are also exposed to interest rate risk due to the mismatch between the interest expense we pay on our loans at fixed rates and the variable rates of interest we receive from cash, cash equivalents and other short-term investments. We have issued long-term debt in U.S. dollars or foreign currencies at fixed interest rates based on the market conditions at the time of financing. We believe that the fair value of our fixed rate debt changes when the underlying market rates of interest change, and we may use interest rate swaps to modify such market risk.

We performed a sensitivity analysis assuming a hypothetical 10 percent adverse movement in interest rates relating to the underlying fair value of our fixed rate debt. As of October 31, 2019 and 2018, the sensitivity analyses indicated that a hypothetical 10 percent adverse movement in interest rates would result in an immaterial impact to the fair value of our fixed interest rate debt.

Item 8. ***Financial Statements and Supplementary Data***

Index to Consolidated Financial Statements

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Stockholders of Agilent Technologies, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Agilent Technologies, Inc. and its subsidiaries (the "Company") as of October 31, 2019 and 2018, and the related consolidated statements of operations, comprehensive income, equity and cash flows for each of the three years in the period ended October 31, 2019, including the related notes and schedule of valuation and qualifying accounts for each of the three years in the period ended October 31, 2019 appearing under Item 15(a)(2) (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of October 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of October 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended October 31, 2019 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of October 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2019.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

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

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

As described in Management's Report on Internal Control over Financial Reporting, management has excluded ACEA Biosciences ("ACEA") and Lionheart Technologies LLC ("BioTek") from its assessment of internal control over financial reporting as of October 31, 2019 because they were acquired by the Company in purchase business combinations during 2019. We have also excluded ACEA and BioTek from our audit of internal control over financial reporting. ACEA and BioTek are wholly-owned subsidiaries whose total assets and total revenues excluded from management's assessment and our audit of internal control over financial reporting collectively represent approximately 2% and less than 2%, respectively, of the related consolidated financial statement amounts as of and for the year ended October 31, 2019.

Definition and Limitations of Internal Control over Financial Reporting

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

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

Critical Audit Matters

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

Uncertain Tax Positions

As described in Note 6 to the consolidated financial statements, the Company has recorded liabilities for uncertain tax positions of $227 million as of October 31, 2019. As disclosed by management, the estimate of the Company's tax liabilities relating to uncertain tax positions requires management to assess uncertainties and to make judgments about the application of complex tax law and regulations in a multitude of jurisdictions. The Company is subject to taxes in the U.S., Singapore and various other foreign jurisdictions and is subject to examinations of its tax returns by tax authorities in various jurisdictions around the world. The Company has a number of years and matters which remain subject to examination by tax authorities in various jurisdictions that could result in significant changes to unrecognized tax benefits due to either the expiration of a statute of limitation or a tax audit settlement which will be partially offset by an anticipated tax liability related to unremitted foreign earnings, where applicable.

The principal considerations for our determination that performing procedures relating to uncertain tax positions is a critical audit matter are there was significant judgment by management when determining uncertain tax positions, including a high degree of estimation uncertainty relative to the numerous and complex tax laws, tax audits, and potential for significant adjustments as a result of such audits. This in turn led to a high degree of auditor judgment, effort, and subjectivity in performing procedures to evaluate the timely identification and accurate measurement of uncertain tax positions. Also, the evaluation of audit evidence available to support the tax liabilities for uncertain tax positions is complex and required significant auditor judgment as the nature of the evidence is often highly subjective, and the audit effort involved the use of professionals with specialized skill and knowledge to assist in evaluating the audit evidence obtained.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the identification and recognition of the liability for uncertain tax positions, and controls addressing completeness of the uncertain tax positions, as well as controls over measurement of the liability. These procedures also included, among others, testing the completeness, accuracy, and relevance of information used in the calculation of the liability for uncertain tax positions, including intercompany agreements, international, federal, and state filing positions, and the related final tax returns, testing the calculation of the liability for uncertain tax positions by jurisdiction, including management's assessment of the technical merits of tax positions and estimates of the amount of tax benefit expected to be sustained, testing the completeness of management's assessment of both the identification of uncertain tax positions and possible outcomes of each uncertain tax position, and evaluating the status and results of income tax audits with the relevant tax authorities. Professionals with specialized skill and knowledge were used to assist in the evaluation of the Company's uncertain tax positions related to the application of relevant tax laws.

Valuation of acquired developed product technology intangible assets - BioTek acquisition

As described in Notes 1 and 3 to the consolidated financial statements, in 2019 the Company completed the acquisition of BioTek for consideration of $1.17 billion, of which $387 million of developed product technology intangible assets were recorded. Management estimated the fair value of the developed product technology using the multi-period excess earnings method under the income approach by discounting forecasted future cash flows directly related to products expecting to result from the projects, net of returns on contributory assets. Management's determination of the fair value of the developed product technology intangible assets acquired involved the use of significant estimates and assumptions related to revenue growth rates and the discount rates.

The principal considerations for our determination that performing procedures relating to the valuation of acquired developed product technology intangible assets in connection with the BioTek acquisition is a critical audit matter are (i) there was a high degree of auditor judgment and subjectivity in applying procedures relating to the fair value measurement of acquired developed product technology intangible assets due to the significant amount of judgment by management when developing the estimate, (ii) significant audit effort was required in evaluating the significant assumptions relating to the estimate, such as the revenue growth rates and the discount rates, and (iii) the audit effort involved the use of professionals with specialized skill and knowledge to assist in evaluating the audit evidence obtained from these procedures.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the acquisition accounting, including controls over management's valuation of the acquired developed product technology intangible assets and controls over the development of the assumptions related to the valuation of the acquired developed product technology intangible assets, including the revenue growth rates and the discount rates. These procedures also included, among others, reading the purchase agreement, testing management's process for estimating the fair value of the acquired developed technology intangible assets, testing the completeness, accuracy, and relevance of underlying data used in estimating the fair value of the acquired developed technology intangible assets, and evaluating the appropriateness of the valuation methods and the reasonableness of the significant assumptions, including the revenue growth rates and the discount rates. Evaluating the reasonableness of the revenue growth rates involved considering the past performance of the acquired business, as well as economic and industry forecasts. Professionals with specialized skill and knowledge were used to assist in the evaluation of the Company's fair value estimate and certain significant assumptions, including the discount rates.

/s/ PricewaterhouseCoopers LLP

San Jose, California
December 19, 2019

We have served as the Company's auditor since 1999.

AGILENT TECHNOLOGIES, INC.

CONSOLIDATED STATEMENT OF OPERATIONS

	Years Ended October 31,		
	2019	2018	2017
	(in millions, except per share data)		
Net revenue:			
Products	$ 3,877	$ 3,746	$ 3,397
Services and other	1,286	1,168	1,075
Total net revenue	5,163	4,914	4,472
Costs and expenses:			
Cost of products	1,680	1,595	1,473
Cost of services and other	678	639	600
Total costs	2,358	2,234	2,073
Research and development	404	387	341
Selling, general and administrative	1,460	1,389	1,251
Total costs and expenses	4,222	4,010	3,665
Income from operations	941	904	807
Interest income	36	38	22
Interest expense	(74)	(75)	(79)
Other income (expense), net	16	79	53
Income before taxes	919	946	803
Provision (benefit) for income taxes	(152)	630	119
Net income	$ 1,071	$ 316	$ 684
Net income per share:			
Basic	$ 3.41	$ 0.98	$ 2.12
Diluted	$ 3.37	$ 0.97	$ 2.10
Weighted average shares used in computing net income per share:			
Basic	314	321	322
Diluted	318	325	326

The accompanying notes are an integral part of these consolidated financial statements.

AGILENT TECHNOLOGIES, INC.
CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME
(in millions)

	Years Ended October 31,		
	2019	2018	2017
Net income	$ 1,071	$ 316	$ 684
Other comprehensive income (loss):			
Gain (loss) on derivative instruments, net of tax expense (benefit) of $(2), $1 and $0	(4)	6	—
Amounts reclassified into earnings related to derivative instruments, net of tax expense (benefit) of $(2), $1 and $0	(6)	3	(1)
Foreign currency translation, net of tax expense (benefit) of $(10), $7 and $3	10	(58)	41
Net defined benefit pension cost and post retirement plan costs:			
Change in actuarial net loss, net of tax expense (benefit) of $(25), $(3) and $52	(93)	(7)	123
Change in net prior service benefit, net of tax benefit of $(2), $(2) and $(3)	(6)	(6)	(6)
Other comprehensive income (loss)	(99)	(62)	157
Total comprehensive income	$ 972	$ 254	$ 841

The accompanying notes are an integral part of these consolidated financial statements.

AGILENT TECHNOLOGIES, INC.

CONSOLIDATED BALANCE SHEET

	October 31,	
	2019	2018
	(in millions, except par value and share data)	
ASSETS		
Current assets:		
Cash and cash equivalents	$ 1,382	$ 2,247
Accounts receivable, net	930	776
Inventory	679	638
Other current assets	198	187
Total current assets	3,189	3,848
Property, plant and equipment, net	850	822
Goodwill	3,593	2,973
Other intangible assets, net	1,107	491
Long-term investments	102	68
Other assets	611	339
Total assets	$ 9,452	$ 8,541
LIABILITIES AND EQUITY		
Current liabilities:		
Accounts payable	$ 354	$ 340
Employee compensation and benefits	334	304
Deferred revenue	336	324
Short-term debt	616	—
Other accrued liabilities	440	203
Total current liabilities	2,080	1,171
Long-term debt	1,791	1,799
Retirement and post-retirement benefits	360	239
Other long-term liabilities	473	761
Total liabilities	4,704	3,970
Commitments and contingencies (Note 16)		
Total equity:		
Stockholders' equity:		
Preferred stock; $0.01 par value; 125 million shares authorized; none issued and outstanding	—	—
Common stock; $0.01 par value; 2 billion shares authorized; 309 million shares at October 31, 2019 and 318 million shares at October 31, 2018 issued	3	3
Additional paid-in-capital	5,277	5,308
Accumulated deficit	(18)	(336)
Accumulated other comprehensive loss	(514)	(408)
Total stockholders' equity	4,748	4,567
Non-controlling interest	—	4
Total equity	4,748	4,571
Total liabilities and equity	$ 9,452	$ 8,541

The accompanying notes are an integral part of these consolidated financial statements.

AGILENT TECHNOLOGIES, INC.

CONSOLIDATED STATEMENT OF CASH FLOWS

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Cash flows from operating activities:			
Net income	$ 1,071	$ 316	$ 684
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	238	210	212
Share-based compensation	72	70	60
Deferred taxes	(255)	(16)	102
Excess and obsolete inventory related charges	19	26	24
Gain on step acquisition	—	(20)	—
Asset impairment charges	—	21	—
Loss on extinguishment of debt	9	—	—
Other	6	9	7
Changes in assets and liabilities:			
Accounts receivable, net	(106)	(65)	(81)
Inventory	(36)	(83)	(61)
Accounts payable	29	40	2
Employee compensation and benefits	23	31	38
Changes in assets and liabilities due to Tax Act	—	552	—
Treasury lock agreement payment	(6)	—	—
Other assets and liabilities	(43)	(4)	(98)
Net cash provided by operating activities	1,021	1,087	889
Cash flows from investing activities:			
Investments in property, plant and equipment	(155)	(177)	(176)
Proceeds from the sale of property, plant and equipment	—	1	—
Proceeds from divestitures	—	—	2
Payment to acquire fair value investment	(23)	(11)	(1)
Payment in exchange for convertible note	(3)	(2)	(1)
Payment to acquire intangible assets	(1)	—	—
Acquisitions of businesses and intangible assets, net of cash acquired	(1,408)	(516)	(128)
Net cash used in investing activities	(1,590)	(705)	(304)
Cash flows from financing activities:			
Issuance of common stock under employee stock plans	54	56	66
Payment of taxes related to net share settlement of equity awards	()	(30)	(14)
Treasury stock repurchases	(723)	(422)	(194)
Payment of dividends	(206)	(191)	(170)
Issuance of senior notes	4	—	—
Debt issuance costs	(4)	—	—
Purchase of non-controlling interest	(4)	—	—
Proceeds from credit facility and short-term loan	805	483	400
Repayment of debt and credit facility	(702)	(693)	(290)
Net cash used in financing activities	(299)	(797)	(202)
Effect of exchange rate movements	2	(17)	8
Net increase (decrease) in cash, cash equivalents and restricted cash	(866)	(432)	391
Cash, cash equivalents and restricted cash at beginning of year	2,254	2,686	2,295
Cash, cash equivalents and restricted cash at end of year	$ 1,388	$ 2,254	$ 2,686
Supplemental cash flow information:			
Income tax payments, net	$ 159	$ 102	$ 63
Interest payments	$ 80	$ 80	$ 82
Non-cash change in investments in property, plant and equipment -increase (decrease).	$ (21)	$ (5)	$ 29

The accompanying notes are an integral part of these consolidated financial statements.

AGILENT TECHNOLOGIES, INC.

CONSOLIDATED STATEMENT OF EQUITY

	Common Stock			Treasury Stock						
	Number of Shares	Par Value	Additional Paid-in Capital	Number of Shares	Treasury Stock at Cost	Retained Earnings (Accumulated Deficit)	Accumulated Other Comprehensive Income/(Loss)	Total Stockholders' Equity	Non-Controlling Interest	Total Equity
	(in millions, except number of shares in thousands)									
Balance as of October 31, 2016	613,536	$ 6	$ 9,159	(290,075)	$ (10,508)	$ 6,089	$ (503)	$ 4,243	$ 3	$ 4,246
Components of comprehensive income, net of tax:										
Net income	—	—	—	—	—	684	—	684	—	684
Other comprehensive income		—	—	—	—	—	157	157	—	157
Total comprehensive income								841		841
Cash dividends declared ($0.528 per common share)	—	—	—	—	—	(170)	—	(170)	—	(170)
Change in non-controlling interest	—	—	—	—	—	—	—	—	1	1
Share-based awards issued	2,621	—	51	—	—	—	—	51	—	51
Repurchase of common stock	—	—	—	(4,107)	(194)	—	—	(194)	—	(194)
Retirement of treasury stock	(294,182)	(3)	(3,970)	294,182	10,702	(6,729)		—	—	—
Share-based compensation	—	—	60	—	—	—	—	60	—	60
Balance as of October 31, 2017	321,975	$ 3	$ 5,300	—	$ —	$ (126)	$ (346)	$ 4,831	$ 4	$ 4,835
Components of comprehensive income, net of tax:										
Net income	—	—	—	—	—	316	—	316	—	316
Other comprehensive loss		—	—	—	—	—	(62)	(62)	—	(62)
Total comprehensive income								254		254
Cash dividends declared ($0.596 per common share)	—	—	—	—	—	(191)	—	(191)	—	(191)
Share-based awards issued	2,176	—	25	—	—	—	—	25	—	25
Repurchase of common stock	—	—	—	(6,436)	(422)	—	—	(422)	—	(422)
Retirement of treasury stock	(6,436)	—	(87)	6,436	422	(335)	—	—	—	—
Share-based compensation	—	—	70	—	—	—	—	70	—	70
Balance as of October 31, 2018	317,715	$ 3	$ 5,308	—	$ —	$ (336)	$ (408)	$ 4,567	$ 4	$ 4,571
Effects of adoption of new accounting standards	—	$ —	$ —	—	$ —	$ 33	$ (7)	$ 26	$ —	$ 26
Components of comprehensive income, net of tax:										
Net income	—	—	—	—	—	1,071	—	1,071	—	1,071
Other comprehensive loss	—	—	—	—	—	—	(99)	(99)	—	(99)
Total comprehensive income								972		972
Purchase of non-controlling interest	—	—	—	—	—	—	—	—	(4)	(4)
Cash dividends declared ($0.656 per common share)	—	—	—	—	—	(206)	—	(206)	—	(206)
Share-based awards issued	1,792	—	40	—	—	—	—	40	—	40
Repurchase of common stock	—	—	—	(10,436)	(723)	—	—	(723)	—	(723)
Retirement of treasury stock	(10,436)	—	(143)	10,436	723	(580)	—	—	—	—
Share-based compensation	—	—	72	—	—	—	—	72	—	72
Balance as of October 31, 2019	309,071	$ 3	$ 5,277	—	$ —	$ (18)	$ (514)	$ 4,748	$ —	$ 4,748

The accompanying notes are an integral part of these consolidated financial statements.

1. OVERVIEW AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Overview. Agilent Technologies, Inc. ("we", "Agilent" or the "company"), incorporated in Delaware in May 1999, is a global leader in life sciences, diagnostics and applied chemical markets, providing application focused solutions that include instruments, software, services and consumables for the entire laboratory workflow.

Basis of Presentation. The accompanying consolidated financial statements have been prepared by us pursuant to the rules and regulations of the U.S. Securities and Exchange Commission ("SEC") and is in conformity with U.S. generally accepted accounting principles ("GAAP"). Our fiscal year end is October 31. Unless otherwise stated, all years and dates refer to our fiscal year.

Principles of Consolidation. The consolidated financial statements include the accounts of the company and our wholly- and majority-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated.

Use of Estimates. The preparation of financial statements in accordance with U.S. GAAP requires management to make estimates and assumptions that affect the amounts reported in our consolidated financial statements and accompanying notes. Management bases its estimates on historical experience and various other assumptions believed to be reasonable. Although these estimates are based on management's best knowledge of current events and actions that may impact the company in the future, actual results may be different from the estimates. Our critical accounting policies are those that affect our financial statements materially and involve difficult, subjective or complex judgments by management. Those policies are revenue recognition, valuation of goodwill and purchased intangible assets, inventory valuation, retirement and post-retirement plan assumptions and accounting for income taxes.

Retirement of Treasury Shares. Upon the formal retirement of treasury shares, we deduct the par value of the retired treasury shares from common stock and allocate the excess of cost over par as a deduction to additional paid-in capital, based on the pro-rata portion of additional paid-in-capital, and the remaining excess as a deduction to retained earnings. All retired treasury shares revert to the status of authorized but unissued shares.

Revenue Recognition. We enter into contracts to sell products, services or combinations of products and services. Products may include hardware or software and services may include one-time service events or services performed over time.

We derive revenue primarily from the sale of analytical and diagnostics products and services. A performance obligation is a promise in a contract to transfer a distinct product or service to a customer and is the unit of account under Accounting Standard Codification Topic 606, *Revenue from Contracts with Customers* (“ASC 606”). See also Note 2, "New Accounting Pronouncements" and Note 4, "Revenue" for additional information on revenue recognition.

Revenue is recognized when control of the promised products or services is transferred to our customers and the performance obligation is fulfilled in an amount that reflects the consideration that we expect to be entitled in exchange for those products or services, the transaction price. For equipment, consumables, and most software licenses, control transfers to the customer at a point in time. We use present right to payment, legal title, physical possession of the asset, and risks and rewards of ownership as indicators to determine the transfer of control to the customer. Where acceptance is not a formality, the customer must have documented their acceptance of the product or service. For products that include installation, if the installation meets the criteria to be considered a separate performance obligation, product revenue is recognized when control has passed to the customer, and recognition of installation revenue occurs once completed. Product revenue, including sales to resellers and distributors is reduced for provisions for warranties, returns, and other adjustments in the period the related sales are recorded.

Service revenue includes extended warranty, customer and software support including: Software as a Service, post contract support, consulting including companion diagnostics, and training and education. Instrument service contracts and software maintenance contracts are typically annual contracts, which are billed at the beginning of the contract or maintenance period. Revenue for these contracts is recognized on a straight-line basis to revenue over the service period, as a time-based measure of progress best reflects our performance in satisfying this obligation. There are no deferred costs associated with the service contract, as the cost of the service is recorded when the service is performed. Service calls not included in a support contract are recognized to revenue at the time a service is performed.

We have sales from standalone software. These arrangements typically include software licenses and maintenance contracts, both of which we have determined are distinct performance obligations. We determine the amount of the transaction price to allocate to the license and maintenance contract based on the relative standalone selling price of each performance obligation. Software license revenue is recognized at the point in time when control has been transferred to the customer. The revenue allocated to the software maintenance contract is recognized on a straight-line basis over the maintenance period, which is the contractual term of the contract, as a time-based measure of progress best reflects our performance in satisfying this obligation. Unspecified rights to software upgrades are typically sold as part of the maintenance contract on a when-and-if-available basis.

Our multiple-element arrangements are generally comprised of a combination of instruments, installation or other start-up services, and/or software, and/or support or services. Hardware and software elements are typically delivered at the same time and revenue is recognized when control passes to the customer. Service revenue is deferred and recognized over the contractual period or as services are rendered and accepted by the customer. Our arrangements generally do not include any provisions for cancellation, termination, or refunds that would significantly impact recognized revenue.

For contracts with multiple performance obligations, we allocate the consideration to which we expect to be entitled to each performance obligation based on relative standalone selling prices and recognize the related revenue when or as control of each individual performance obligation is transferred to customers. We estimate the standalone selling price by calculating the average historical selling price of our products and services per country for each performance obligation. Standalone selling prices are determined for each distinct good or service in the contract and then we allocate the transaction price in proportion to those standalone selling prices by performance obligations.

A portion of our revenue relates to lease arrangements. Standalone lease arrangements are outside the scope of ASC 606 and are therefore accounted for in accordance with ASC 840, Leases. Each of these contracts is evaluated as a lease arrangement, either as an operating lease or a sales-type capital lease using the current lease classification guidance.

Deferred Revenue. Contract liabilities (deferred revenue) primarily relate to multiple element arrangements for which billing has occurred but transfer of control of all elements (performance obligations) to the customer has either partially or not occurred at the balance sheet date. This includes cash received from customers for products and related installation and services in advance of the transfer of control. Contract liabilities are classified as either in current liabilities in deferred revenue or long-term in other long-term liabilities in the consolidated balance sheet based on the timing of when we expect to complete our performance obligation.

Accounts Receivable, net. Trade accounts receivable are recorded at the invoiced amount and do not bear interest. Such accounts receivable have been reduced by an allowance for doubtful accounts, which is our best estimate of the amount of probable credit losses in our existing accounts receivable. We determine the allowance based on customer specific experience and the aging of such receivables, among other factors. The allowance for doubtful accounts as of October 31, 2019 and 2018 was not material. We do not have any off-balance-sheet credit exposure related to our customers. Accounts receivable are also recorded net of estimated product returns which are not material.

Shipping and Handling Costs. Our shipping and handling costs charged to customers are included in net revenue, and the associated expense is recorded in cost of products for all periods presented.

Inventory. Inventory is valued at standard cost, which approximates actual cost computed on a first-in, first-out basis, not in excess of market value. We assess the valuation of our inventory on a periodic basis and make adjustments to the value for estimated excess and obsolete inventory based on estimates about future demand. The excess balance determined by this analysis becomes the basis for our excess inventory charge. Our excess inventory review process includes analysis of sales forecasts, managing product rollovers and working with manufacturing to maximize recovery of excess inventory.

Acquisitions. Agilent accounts for the acquisition of a business using the acquisition method of accounting and we allocate the fair value of the purchase price to the tangible assets acquired, liabilities assumed, and intangible assets acquired, including in-process research and development ("IPR&D"), based on their estimated fair values. The excess value of the cost of an acquired business over the fair value of the assets acquired and liabilities assumed is recognized as goodwill. The fair value of IPR&D is initially capitalized as an intangible asset with an indefinite life. When an IPR&D project is completed, the IPR&D is reclassified as an amortizable purchased intangible asset and amortized to costs of revenues over the asset's estimated useful life.

Our determination of the fair value of the intangible assets acquired involves the use of significant estimates and assumptions. Specifically, our determination of the fair value of the developed product technology and IPR&D acquired involve significant estimates and assumptions related to revenue growth rates and discount rates. Our determination of the fair value of customer relationships acquired involved significant estimates and assumptions related to revenue growth rates, discount rates,

and customer attrition rates. Our determination of the fair value of the tradename acquired involved the use of significant estimates and assumptions related to revenue growth rates, royalty rates and discount rates. The company believes that the fair value assigned to the assets acquired and liabilities assumed are based on reasonable assumptions and estimates that marketplace participants would use. Actual results could differ materially from these estimates.

Goodwill and Purchased Intangible Assets. Under the authoritative guidance we have the option to perform a qualitative assessment to determine whether further impairment testing is necessary. The accounting standard gives an entity the option to first assess qualitative factors to determine whether performing the two-step test is necessary. If an entity believes, as a result of its qualitative assessment, that it is more-likely-than-not (i.e. greater than 50% chance) that the fair value of a reporting unit is less than its carrying amount, the quantitative impairment test will be required. Otherwise, no further testing will be required.

The guidance includes examples of events and circumstances that might indicate that a reporting unit's fair value is less than its carrying amount. These include macro-economic conditions such as deterioration in the entity's operating environment or industry or market considerations; entity-specific events such as increasing costs, declining financial performance, or loss of key personnel; or other events such as an expectation that a reporting unit will be sold or a sustained decrease in the stock price on either an absolute basis or relative to peers.

If it is determined, as a result of the qualitative assessment, that it is more-likely-than-not that the fair value of a reporting unit is less than its carrying amount, the provisions of authoritative guidance require that we perform a two-step impairment test on goodwill. In the first step, we compare the fair value of each reporting unit to its carrying value. The second step (if necessary) measures the amount of impairment by applying fair-value-based tests to the individual assets and liabilities within each reporting unit. As defined in the authoritative guidance, a reporting unit is an operating segment, or one level below an operating segment. We aggregate components of an operating segment that have similar economic characteristics into our reporting units.

In fiscal year 2019, we assessed goodwill impairment for our three reporting units which consisted of three segments: life sciences and applied markets, diagnostics and genomics and Agilent CrossLab. We performed a qualitative test for goodwill impairment of the three reporting units, as of September 30, 2019, our annual impairment test date. Based on the results of our qualitative testing, we believe that it is more-likely-than-not that the fair value of each reporting unit is greater than its respective carrying value. Each quarter we review the events and circumstances to determine if goodwill impairment is indicated. There was no impairment of goodwill during the years ended October 31, 2019, 2018 and 2017.

Purchased intangible assets consist primarily of acquired developed technologies, proprietary know-how, trademarks, and customer relationships and are amortized using the best estimate of the asset's useful life that reflect the pattern in which the economic benefits are consumed or used up or a straight-line method ranging from 6 months to 15 years. IPR&D is initially capitalized at fair value as an intangible asset with an indefinite life and assessed for impairment thereafter. When the IPR&D project is complete, it is reclassified as an amortizable purchased intangible asset and is amortized over its estimated useful life. If an IPR&D project is abandoned, Agilent will record a charge for the value of the related intangible asset to Agilent's consolidated statement of operations in the period it is abandoned.

Agilent's indefinite-lived intangible assets are IPR&D intangible assets. The accounting guidance allows a qualitative approach for testing indefinite-lived intangible assets for impairment, similar to the issued impairment testing guidance for goodwill and allows the option to first assess qualitative factors (events and circumstances) that could have affected the significant inputs used in determining the fair value of the indefinite-lived intangible asset to determine whether it is more-likely-than-not (i.e. greater than 50% chance) that the indefinite-lived intangible asset is impaired. An organization may choose to bypass the qualitative assessment for any indefinite-lived intangible asset in any period and proceed directly to calculating its fair value. We performed a qualitative test for impairment of indefinite-lived intangible assets as of September 30, 2019. Based on the results of our qualitative testing, we believe that it is more-likely-than-not that the fair value of these indefinite-lived intangible assets is greater than their respective carrying values. Each quarter we review the events and circumstances to determine if impairment of indefinite-lived intangible asset is indicated. During the year ended October 31, 2019, 2018 and 2017 there were no impairments of indefinite-lived intangible assets.

Share-Based Compensation. For the years ended 2019, 2018 and 2017, we accounted for share-based awards made to our employees and directors including employee stock option awards, restricted stock units, employee stock purchases made under our Employee Stock Purchase Plan ("ESPP") and performance share awards under Agilent Technologies, Inc. Long-Term Performance Program ("LTPP") using the estimated grant date fair value method of accounting. Under the fair value method, we recorded compensation expense for all share-based awards of $72 million in 2019, $71 million in 2018 and $61 million in 2017. See Note 5, "Share-based Compensation" for additional information.

Retirement and Post-Retirement Plans. Substantially all of our employees are covered under various defined benefit and/or defined contribution retirement plans. Additionally, we sponsor post-retirement health care benefits for our eligible U.S. employees. Assumptions used to determine the benefit obligations and the expense for these plans are derived annually. See Note 14, “Retirement plans and post-retirement pension plans” for additional information.

Taxes on Income. Income tax expense or benefit is based on income or loss before taxes. Deferred tax assets and liabilities are recognized principally for the expected tax consequences of temporary differences between the tax bases of assets and liabilities and their reported amounts. See Note 6, "Income Taxes" for more information.

Warranty. Our standard warranty terms typically extend for one year from the date of delivery. We accrue for standard warranty costs based on historical trends in warranty charges as a percentage of net product revenue. The accrual is reviewed regularly and periodically adjusted to reflect changes in warranty cost estimates. Estimated warranty charges are recorded within cost of products at the time products are sold. See Note 15, "Guarantees".

Advertising. Advertising costs are generally expensed as incurred and amounted to $36 million in 2019, $41 million in 2018 and $38 million in 2017.

Research and Development. Costs related to research, design and development of our products are charged to research and development expense as they are incurred.

Sales Taxes. Sales taxes collected from customers and remitted to governmental authorities are not included in our revenue.

Net Income Per Share. Basic net income per share is computed by dividing net income - the numerator - by the weighted average number of common shares outstanding - the denominator - during the period excluding the dilutive effect of stock options and other employee stock plans. Diluted net income per share gives effect to all potential common shares outstanding during the period unless the effect is anti-dilutive. The dilutive effect of share-based awards is reflected in diluted net income per share by application of the treasury stock method, which includes consideration of unamortized share-based compensation expense and the dilutive effect of in-the-money options and non-vested restricted stock units. Under the treasury stock method, the amount the employee must pay for exercising stock options and unamortized share-based compensation expense are assumed proceeds to be used to repurchase hypothetical shares. See Note 7, "Net Income Per Share".

Cash, Cash Equivalents and Short-Term Investments. We classify investments as cash equivalents if their original or remaining maturity is three months or less at the date of purchase. Cash equivalents are stated at cost, which approximates fair value.

As of October 31, 2019, approximately $1,310 million of our cash and cash equivalents is held outside of the U.S. by our foreign subsidiaries. Our cash and cash equivalents mainly consist of short-term deposits held at major global financial institutions, institutional money market funds, and similar short duration instruments with original maturities of 90 days or less. We continuously monitor the creditworthiness of the financial institutions and institutional money market funds in which we invest our funds.

We classify investments as short-term investments if their original maturities are greater than three months and their remaining maturities are one year or less. Currently, we have no short-term investments.

Variable Interest Entities. We make a determination upon entering into an arrangement whether an entity in which we have made an investment is considered a Variable Interest Entity (“VIE”). The company evaluates its investments in privately held companies on an ongoing basis. We account for these investments under either the equity method or as equity investments without determinable fair value, depending on the circumstances. We periodically reassess whether we are the primary beneficiary of a VIE. The reassessment process considers whether we have acquired the power to direct the most significant activities of the VIE through changes in governing documents or other circumstances. We also reconsider whether entities previously determined not to be VIEs have become VIEs, based on changes in facts and circumstances including changes in contractual arrangements and capital structure.

During the year ended October 31, 2016, Agilent made a preferred stock investment in Lasergen, Inc. ("Lasergen") for $80 million. This investment in Lasergen was accounted for under the cost method. Agilent’s initial ownership stake was 48 percent and included an option to acquire the remaining shares until March 2018. During the year ended October 31, 2018, we exercised our option and acquired all of the remaining shares of Lasergen that we did not already own for an additional cash consideration of approximately $107 million. The fair value remeasurement of our previous investment immediately before the acquisition resulted in a net gain of $20 million and was recorded in other income. Lasergen was previously considered a VIE. As of October 31, 2019 and 2018, we have no material VIE's.

Investments. Equity investments without readily determinable fair value consist of non-marketable equity securities (typically investments in privately-held companies). These investments are accounted for using the measurement alternative at cost and we adjust for impairments and observable price changes (orderly transactions for the identical or a similar security from the same issuer) included in net income as and when it occurs. Equity investments with readily determinable fair value consist of shares we own in a special fund and are reported at fair value, with gains or losses resulting from changes in fair value included in net income. Prior to fiscal year 2019, both equity investments without determinable fair value and with determinable fair value were accounted for using cost method of accounting, measured at historical cost less other-than-temporary investment. Trading securities, which is comprised of mutual funds, bonds and other similar instruments, other investments and deferred compensation liability are reported at fair value, with gains or losses resulting from changes in fair value recognized currently in net income. Equity method investments are reported at the amount of the company's initial investment and adjusted each period for the company's share of the investee's income or loss and dividend paid. There are no equity method investments as of October 31, 2019 and 2018. The company assesses investments for impairment whenever events or changes in circumstances indicate that the carrying value of an investment may not be recoverable.

Fair Value of Financial Instruments. The carrying values of certain of our financial instruments including cash and cash equivalents, accounts receivable, accounts payable, accrued compensation and other accrued liabilities approximate fair value because of their short maturities. The fair value of long-term equity investments which are readily determinable, and which are not accounted under the equity method are reported at fair value using quoted market prices for those securities when available with gains and losses included in net income. The fair value of long-term equity investments which are not readily determinable, and which are not accounted under the equity method are reported at cost with adjustments for observable changes in prices or impairments included in net income. The fair value of our senior notes, calculated from quoted prices which are primarily Level 1 inputs under the accounting guidance fair value hierarchy exceeds the carrying value by approximately $62 million as of October 31, 2019 and is lower than the carrying value by approximately $15 million as of October 31, 2018. The change in the fair value over carrying value in the year ended October 31, 2019 is primarily due to fluctuations in market interest rates. The fair value of foreign currency contracts used for hedging purposes is estimated internally by using inputs tied to active markets. These inputs, for example, interest rate yield curves, foreign exchange rates, and forward and spot prices for currencies are observable in the market or can be corroborated by observable market data for substantially the full term of the assets or liabilities. See also Note 12, "Fair Value Measurements" for additional information on the fair value of financial instruments.

Concentration of Credit Risk. Financial instruments that potentially subject Agilent to significant concentration of credit risk include money market fund investments, time deposits and demand deposit balances. These investments are categorized as cash and cash equivalents. In addition, Agilent has credit risk from derivative financial instruments used in hedging activities and accounts receivable. We invest in a variety of financial instruments and limit the amount of credit exposure with any one financial institution. We have a comprehensive credit policy in place and credit exposure is monitored on an ongoing basis.

Credit risk with respect to our accounts receivable is diversified due to the large number of entities comprising our customer base and their dispersion across many different industries and geographies. Credit evaluations are performed on customers requiring credit over a certain amount and we sell the majority of our products through our direct sales force. Credit risk is mitigated through collateral such as letter of credit, bank guarantees or payment terms like cash in advance. No single customer accounted for more than 10 percent of accounts receivable as of October 31, 2019, or 2018.

Derivative Instruments. Agilent is exposed to global foreign currency exchange rate and interest rate risks in the normal course of business. We enter into foreign exchange hedging contracts, primarily forward contracts and purchased options, interest rate swaps and interest rate locks to manage financial exposures resulting from changes in foreign currency exchange rates and interest rates. In the vast majority of cases, these contracts are designated at inception as hedges of the related foreign currency or interest exposures. Foreign currency exposures include committed and anticipated revenue and expense transactions and assets and liabilities that are denominated in currencies other than the functional currency of the subsidiary. Interest rate exposures are associated with the company's fixed-rate debt. For option contracts, we exclude time value from the measurement of effectiveness. To qualify for hedge accounting, contracts must reduce the foreign currency exchange rate and interest rate risk otherwise inherent in the amount and duration of the hedged exposures and comply with established risk management policies. Foreign exchange hedging contracts generally mature within twelve months, interest rate swaps mature at the same time as the maturity of the debt and interest rate locks mature at the same time as the issuance of debt. In order to manage foreign currency exposures in a few limited jurisdictions we may enter into foreign exchange contracts that do not qualify for hedge accounting. In such circumstances, the local foreign currency exposure is offset by contracts owned by the parent company. We do not use derivative financial instruments for trading or speculative purposes.

All derivatives are recognized on the balance sheet at their fair values. For derivative instruments that are designated and qualify as a fair value hedge, changes in value of the derivative are recognized in the consolidated statement of operations in the current period, along with the offsetting gain or loss on the hedged item attributable to the hedged risk. For derivative instruments that are designated and qualify as a cash flow hedges, changes in the value of the effective portion of the derivative instrument is

recognized in comprehensive income (loss), a component of stockholders' equity. Amounts associated with cash flow hedges are reclassified and recognized in income when either the forecasted transaction occurs or it becomes probable the forecasted transaction will not occur. Derivatives not designated as hedging instruments are recorded on the balance sheet at their fair value and changes in the fair values are recorded in the income statement in the current period. Derivative instruments are subject to master netting arrangements and are disclosed gross in the balance sheet. Changes in the fair value of the ineffective portion of derivative instruments are recognized in earnings in the current period. Ineffectiveness in 2019, 2018 and 2017 was not material. Cash flows from derivative instruments are classified in the statement of cash flows in the same category as the cash flows from the hedged or economically hedged item, primarily in operating activities.

Property, Plant and Equipment. Property, plant and equipment are stated at cost less accumulated depreciation. Additions, improvements and major renewals are capitalized; maintenance, repairs and minor renewals are expensed as incurred. When assets are retired or disposed of, the assets and related accumulated depreciation and amortization are removed from our general ledger, and the resulting gain or loss is reflected in the consolidated statement of operations. Buildings and improvements are depreciated over the lesser of their useful lives or the remaining term of the lease and machinery and equipment over 3 years to 10 years. We use the straight-line method to depreciate assets.

Leases. We lease buildings, machinery and equipment under operating and capital leases for original terms ranging generally from less than 1 year to 30 years. Certain leases contain renewal options for periods up to 6 years. In addition, we lease equipment to customers in connection with our diagnostics business using both capital and operating leases. As of October 31, 2019 and 2018 our diagnostics and genomics segment has approximately $37 million and $32 million, respectively, of lease receivables related to capital leases and approximately $17 million and $20 million, respectively, of net assets for operating leases. We depreciate the assets related to the operating leases over their estimated useful lives, typically five years.

Capitalized Software. We capitalize certain internal and external costs incurred to acquire or create internal use software. Capitalized software is included in property, plant and equipment and is depreciated over 3 years to 5 years once development is complete.

Impairment of Long-Lived Assets. We continually monitor events and changes in circumstances that could indicate carrying amounts of long-lived assets, including intangible assets, may not be recoverable. When such events or changes in circumstances occur, we assess the recoverability of long-lived assets by determining whether the carrying value of such assets will be recovered through undiscounted expected future cash flows. If the total of the undiscounted future cash flows is less than the carrying amount of those assets, we recognize an impairment loss based on the excess of the carrying amount over the fair value of the assets. During 2019, there were no impairments of other assets or intangible assets. During 2018, we recorded an impairment charge of $21 million related to purchased intangible assets within the diagnostics and genomics segment that were deemed unrecoverable. During 2017, there were no impairments of other assets or intangible assets.

Employee Compensation and Benefits. Amounts owed to employees, such as accrued salary, bonuses and vacation benefits are accounted for within employee compensation and benefits. The total amount of accrued vacation benefit was $115 million and $107 million as of October 31, 2019, and 2018, respectively.

Foreign Currency Translation. We translate and remeasure balance sheet and income statement items into U.S. dollars. For those subsidiaries that operate in a local currency functional environment, all assets and liabilities are translated into U.S. dollars using current exchange rates at the balance sheet date; revenue and expenses are translated using monthly exchange rates which approximate to average exchange rates in effect during each period. Resulting translation adjustments are reported as a separate component of accumulated other comprehensive income (loss) in stockholders' equity.

For those subsidiaries that operate in a U.S. dollar functional environment, foreign currency assets and liabilities are remeasured into U.S. dollars at current exchange rates except for non-monetary assets and capital accounts which are remeasured at historical exchange rates. Revenue and expenses are generally remeasured at monthly exchange rates which approximate average exchange rates in effect during each period. Gains or losses from foreign currency remeasurement are included in consolidated net income. Net gains or losses resulting from foreign currency transactions, including hedging gains and losses, are reported in other income (expense), net and were $7 million loss for 2019, $3 million loss for 2018 and $2 million loss for 2017.

2. NEW ACCOUNTING PRONOUNCEMENTS

Recently Adopted Accounting Pronouncements

In May 2014, the FASB issued new revenue recognition guidance, ASC Topic 606, which provides a single comprehensive model for entities to use in accounting for revenue arising from contracts with customers and will supersede most current revenue

recognition guidance. The objective of the new revenue standard is to significantly enhance comparability and clarify principles of revenue recognition practices across entities, industries, jurisdictions and capital markets. Under the new guidance, there are specific criteria to determine if a performance obligation should be recognized over time or at a point in time.

On November 1, 2018, we adopted ASC 606 using the modified retrospective approach only to contracts not completed as of this date. Results for reporting periods after November 1, 2018 are presented under ASC 606, while prior period amounts were not adjusted and continue to be reported in accordance with ASC Topic 605, *Revenue Recognition*.

We recorded a net increase to beginning retained earnings of $23 million as of November 1, 2018 due to the cumulative impact of adopting ASC 606. The impact to beginning retained earnings is primarily due to an increase in contract assets (unbilled accounts receivable), a reduction in inventory and a reduction in contract liabilities (deferred revenue). The net increase in retained earnings and resulting changes in assets and liabilities was mainly driven by the change in timing of the recognition of revenue from the fulfillment of separate performance obligations as control transfers to the customer.

Had we continued to use the revenue recognition guidance in effect prior to fiscal year 2019, no material changes would have resulted to the consolidated statements of income, comprehensive income, or cash flows for the year ended October 31, 2019. As a result, comparisons of revenue and operating profit performance between periods are not materially affected by the adoption of this standard. Refer to Note 1, "Overview and Summary of Significant Accounting Policies"for a description of the company’s revenue recognition policies and Note 4, "Revenue" for the disclosures required by the standard.

As of November 1, 2018, we elected to early adopt new accounting guidance which amends reporting comprehensive income to allow a reclassification from accumulated other comprehensive income ("AOCI") to retained earnings for the deferred taxes previously recorded in AOCI that exceed the current federal tax rate of 21 percent resulting from the enacted corporate tax rate in the U.S. Tax Cuts and Jobs Act ("the Tax Act"). The adoption of this guidance resulted in a reclassification of $7 million from AOCI to beginning retained earnings on our consolidated balance sheet.

As of November 1, 2018, we adopted new accounting guidance which eliminates the exception in ASC 740, *Income Taxes* against immediate recognition of income tax consequences of intra-entity transfers of assets other than inventory. The amendment in this update should be applied on a modified retrospective basis through a cumulative-effect adjustment directly to retained earnings as of the beginning of period of adoption. We recorded a net decrease in beginning retained earnings of $2 million as of November 1, 2018 due to removing unamortized tax expense previously deferred.

As of November 1, 2018, we adopted new accounting guidance which addresses certain aspects of recognition, measurement, presentation and disclosure of financial instruments and also the related guidance which addresses technical corrections and improvements to this guidance. The guidance requires entities to measure equity investments that do not result in consolidation and are not accounted for under the equity method at fair value and recognize any changes in fair value in net income. The total impact of adoption to our consolidated balance sheet was an increase of $7 million to long-term investments and a net increase of $5 million to beginning retained earnings.

The following table summarizes the impacts of recently adopted accounting pronouncements on our consolidated balance sheet as of November 1, 2018:

	October 31, 2018	Impact of Adopting New				November 1, 2018
	As Reported	Revenue Recognition Guidance	Tax Effects on Items in AOCI Guidance	Intra-Entity Tax Guidance	Investments Valuation Guidance	As Adopted
			(in millions)			
ASSETS						
Current assets:						
Cash and cash equivalents	$ 2,247	$ —	$ —	$ —	$ —	$ 2,247
Accounts receivable, net	776	24	—	—	—	800
Inventory	638	(10)	—	—	—	628
Other current assets	187	3	—	—	—	190
Total current assets	3,848	17	—	—	—	3,865
Property, plant and equipment, net	822	—	—	—	—	822
Goodwill	2,973	—	—	—	—	2,973
Other intangible assets, net	491	—	—	—	—	491
Long-term investments	68	—	—	—	7	75
Other assets	339	(3)	—	(2)	(2)	332
Total assets	$ 8,541	$ 14	$ —	$ (2)	$ 5	$ 8,558
LIABILITIES AND EQUITY						
Current liabilities:						
Accounts payable	$ 340	$ —	$ —	$ —	$ —	$ 340
Employee compensation and benefits	304	—	—	—	—	304
Deferred revenue	324	(11)	—	—	—	313
Other accrued liabilities	203	—	—	—	—	203
Total current liabilities	1,171	(11)	—	—	—	1,160
Long-term debt	1,799	—	—	—	—	1,799
Retirement and post-retirement benefits	239	—	—	—	—	239
Other long-term liabilities	761	2	—	—	—	763
Total liabilities	3,970	(9)	—	—	—	3,961
Total equity:						
Stockholders' equity:						
Preferred stock; $0.01 par value; 125 million shares authorized; none issued and outstanding	—	—	—	—	—	—
Common stock; $0.01 par value; 2 billion shares authorized; 318 million shares at October 31, 2018 issued	3	—	—	—	—	3
Additional paid-in-capital	5,308	—	—	—	—	5,308
Accumulated deficit	(336)	23	7	(2)	5	(303)
Accumulated other comprehensive loss	(408)	—	(7)	—	—	(415)
Total stockholders' equity	4,567	23	—	(2)	5	4,593
Non-controlling interest	4	—	—	—	—	4
Total equity	4,571	23	—	(2)	5	4,597
Total liabilities and equity	$ 8,541	$ 14	$ —	$ (2)	$ 5	$ 8,558

As of November 1, 2018, we adopted new accounting guidance which requires amounts generally described as restricted cash and restricted cash equivalents to be included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts shown on the statement of cash flows. A reconciliation of cash, cash equivalents and restricted cash to the consolidated balance sheet follows:

	October 31		
	2019	2018	2017
	(in millions)		
Cash and cash equivalents	$ 1,382	$ 2,247	$ 2,678
Restricted cash included in other assets	6	7	8
Total cash, cash equivalents and restricted cash	$ 1,388	$ 2,254	$ 2,686

As of November 1, 2018, we adopted new accounting guidance which requires employers that present a measure of operating income in their statements of operations to include only the service cost component of net periodic postretirement benefit cost in operating expenses. The service cost component of net periodic pension and postretirement benefit cost should be presented in the same operating expense line items as other employee compensation costs arising from services rendered during the period. The other components of net periodic pension and postretirement benefit costs, including interest costs, expected return on assets, amortization of prior service cost/credit and actuarial gains/losses, and settlement and curtailment effects, are to be included separately and outside of any subtotal of operating income. The adoption of this guidance resulted in a reclassification of income from our income from operations to other income (expense), net on our consolidated statement of operations of approximately $10 million, $24 million and $34 million in the year ended October 31, 2019, 2018 and 2017, respectively. As adoption is required to be on a retrospective basis, we have recast our historical consolidated statements of operations and segment information to conform to current year presentation.

New Accounting Pronouncements Not Yet Adopted

In February 2016, the FASB issued guidance which amends the existing accounting standards for leases. Consistent with existing guidance, the recognition, measurement, and presentation of expenses and cash flows arising from a lease by a lessee primarily will depend on its classification. Under the new guidance, a lessee will be required to recognize right-of-use assets ("ROU") and lease liabilities on the balance sheet. On November 1, 2019, we adopted the lease accounting guidance using the modified retrospective method for all lease arrangements at the beginning of the period of adoption. Results for reporting periods beginning November 1, 2019 will be presented under the new accounting guidance, while prior period amounts will not be adjusted. As of November 1, 2019, the new accounting guidance had a material impact on our consolidated balance sheet but is expected to have an insignificant impact on the consolidated net income and cash flows. The most significant impact was the recognition of ROU assets and lease liabilities for operating leases, while the accounting for capital leases remained substantially unchanged. For leases that commenced before the effective date of adoption of the new accounting guidance, we elected the permitted practical expedients to not reassess the following: (i) whether any expired or existing contracts contain leases; (ii) the lease classification for any expired or existing leases; and (iii) capitalization of initial direct costs for any existing leases.

As a result of the cumulative impact of adopting the new accounting guidance we will record operating lease ROU assets around $195 million and operating lease liabilities of the same amounts, primarily related to real estate and automobile leases.

The accounting applied to lease arrangements in which we are the lessor is largely unchanged from that applied under the prior standard and will not have a significant impact to our consolidated balance sheet, net income or cash flows

In January 2017, the FASB issued an amendment to modify the concept of impairment from the condition that exists when the carrying amount of goodwill exceeds its implied fair value to the condition that exists when the carrying amount of a reporting unit exceeds its fair value. The amendment also simplifies the subsequent measurement of goodwill by eliminating Step 2 from the goodwill impairment test. The amendments are effective for us beginning November 1, 2020. Early adoption is permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017. We do not expect to early adopt nor do we expect this guidance to have a material impact on our consolidated financial statements and disclosures.

In August 2018, the FASB issued updates to improve the disclosure requirements on fair value measurements in Topic 820, Fair Value Measurement which eliminates certain disclosure requirements and modifies others. These amendments are effective for us beginning November 1, 2020, and for interim periods within that year with early adoption permitted. We currently do not expect this guidance to have a material impact on our consolidated financial statements and disclosures.

In August 2018, the FASB issued updates to improve the effectiveness of disclosures for defined benefit plans under Accounting Standard Codification Topic 715-20. The amendments in this guidance remove disclosures that no longer are considered cost beneficial, clarify the specific requirements of disclosures, and add disclosure requirements identified as relevant. These amendments are effective for us beginning November 1, 2021, with early adoption permitted. We currently do not expect this guidance to have a material impact on our consolidated financial statements and disclosures.

Other amendments to GAAP in the U.S. that have been issued by the FASB or other standards-setting bodies that do not require adoption until a future date are not expected to have a material impact on our consolidated financial statements upon adoption.

3. ACQUISITIONS

Acquisition of BioTek and ACEA

On August 23, 2019 we completed the acquisition of privately-owned Lionheart Technologies LLC ("BioTek"), a leader in the design, manufacture and distribution of innovative life science instrumentation for $1.17 billion, under the merger agreement. As a result of the acquisition, BioTek has become a wholly-owned subsidiary of Agilent. Accordingly, the results of BioTek are included in Agilent's consolidated financial statements from the acquisition date. For the period from August 24, 2019 to October 31, 2019, BioTek’s net revenue was $35 million and net loss was $12 million. The acquisition of BioTek and its portfolio is another step to expand our position in the cell analysis market.

The consideration paid was $1.17 billion. Agilent funded the acquisition using existing cash of $470 million and debt of $700 million.

The BioTek acquisition was accounted for in accordance with the authoritative accounting guidance. The acquired assets and assumed liabilities were recorded by Agilent at their estimated fair values. Agilent determined the estimated fair values with the assistance of appraisals or valuations performed by third party specialists, discounted cash flow analyses, and estimates made by management. We expect to realize revenue synergies, leverage and expand the existing sales channels and product development resources, and utilize the assembled workforce. These factors, among others, contributed to a purchase price in excess of the estimated fair value of BioTek’s net identifiable assets acquired (see summary of net assets below), and, as a result, we have recorded goodwill in connection with this transaction.

Goodwill acquired was allocated to our operating segments and reporting units as a part of the purchase price allocation. All goodwill was allocated to the life sciences and applied markets reporting unit.

Agilent’s acquisition of BioTek is treated as an asset purchase for tax purposes. The tax basis of the acquired assets equals the fair market value on acquisition date.

The following table summarizes the allocation of the purchase price to the estimated fair values of the assets acquired and liabilities assumed on the closing date of August 23, 2019 (in millions):

Cash and cash equivalents	$ 10
Accounts receivable	28
Inventories	21
Other current assets	2
Property, plant and equipment	8
Intangible assets	641
Goodwill	483
Total assets acquired	1,193
Accounts payable	(4)
Deferred revenue	(5)
Employee compensation and benefits	(7)
Other accrued liabilities	(2)
Long-term debt	(4)
Net assets acquired	$ 1,171

The fair value of cash and cash equivalents, accounts receivable, other current assets, accounts payable and other accrued liabilities were generally determined using historical carrying values given the short-term nature of these assets and liabilities.

The fair values for acquired intangible assets and deferred revenue were determined with the input from third party valuation specialists.

The fair values of certain other assets, inventory, property, plant and equipment, investments, long-term debt, and certain other long-term liabilities were determined internally using historical carrying values and estimates made by management.

Valuations of intangible assets acquired

The components of intangible assets acquired in connection with the BioTek acquisition were as follows (in millions):

	Fair Value	Estimated Useful Life
Developed product technology	$ 387	5-13 years
Customer relationships	202	3-8 years
Backlog	5	2 months
Tradenames and trademarks	43	10 years
Total intangible assets subject to amortization	637	
In-process research and development	4	
Total intangible assets	$ 641	

As noted above, the intangible assets, including in-process research and development, were valued with input from valuation specialists. Agilent used variations of the income approach in determining the fair value of intangible assets acquired in the BioTek acquisition. Specifically, the developed product technology and in-process research and development were valued using the multi-period excess earnings method under the income approach by discounting forecasted cash flows directly related to the products expecting to result from the projects, net of returns on contributory assets. The Company utilized the incremental cash flow method for determining the fair value of the customer relationships acquired, and the relief from royalty method to determine the fair value of the tradename. Order backlog was valued on a direct cash flow basis.

The primary in-process research and development project acquired relates to a next version of a product which will be released in 2020. Total costs to complete for all BioTek in-process research and development were estimated at approximately $2 million as of the close date.

Acquisition and integration costs directly related to the BioTek acquisition totaled $4 million for the year ended October 31, 2019 and were recorded in selling, general and administrative expenses. Such costs are expensed in accordance with the authoritative accounting guidance.

On November 14, 2018, we acquired 100 percent of the stock of ACEA Biosciences ("ACEA"), a developer of cell analysis tools, for $250 million. The financial results of ACEA have been included in our financial results from the acquisition date.

The following represents the unaudited proforma operating results as if BioTek and ACEA had been included in the company's consolidated statements of operations as of the beginning of fiscal 2018 (in millions, except per share amounts):

	2019	2018
Net revenue	$ 5.308	$ 5.112
Net income	$ 1,012	$ 210
Net income per share — basic	$ 3.22	$ 0.65
Net income per share — diluted	$ 3.18	$ 0.65

The unaudited proforma financial information assumes that the companies were combined as of November 1, 2017 and include business combination accounting effects from the acquisition including amortization charges from acquired intangible assets, the impact on cost of sales due to the respective estimated fair value adjustments to inventory, changes to interest income for cash used in the acquisition, interest expense and currency losses associated with debt paid in connection with the acquisition and acquisition related transaction costs and tax related effects. The proforma information as presented above is for informational purposes only and is not indicative of the results of operations that would have been achieved if the acquisition had taken place at the beginning of fiscal 2018.

The unaudited proforma financial information for the year ended October 31, 2019 combines the historical results of Agilent for the year ended October 31, 2019 (which includes BioTek and ACEA after the acquisition date) and for BioTek for the ten months ended August 23, 2019.

The unaudited proforma financial information for the year ended October 31, 2018 combines the historical results of Agilent and ACEA for the year ended October 31, 2018 and BioTek for the year ended December 31, 2018 (due to differences in reporting periods).

4. REVENUE

The following table presents the company's total revenue and segment revenue disaggregated by geographical region:

	Year Ended October 31, 2019			
	Life Sciences and Applied Markets	Diagnostics and Genomics	Agilent CrossLab	Total
	(in millions)			
Revenue by Region				
Americas	$ 692	$ 505	$ 664	$ 1,861
Europe	551	368	522	1,441
Asia Pacific	1,059	148	654	1,861
Total	$ 2,302	$ 1,021	$ 1,840	$ 5,163

The following table presents the company's total revenue disaggregated by end markets and by revenue type:

	Year Ended October 31, 2019
	(in millions)
Revenue by End Markets	
Pharmaceutical and Biopharmaceutical	$ 1,604
Chemical and Energy	1,199
Diagnostics and Clinical	785
Food	486
Academia and Government	474
Environmental and Forensics	615
Total	$ 5,163
Revenue by Type	
Instrumentation	$ 2,150
Non-instrumentation and other	3,013
Total	$ 5,163

Revenue by region is based on the ship to location of the customer. Revenue by end market is determined by the market indicator of the customer and by customer type. Instrumentation revenue includes sales from instruments, remarketed instruments and third-party products. Non-instrumentation and other revenue includes sales from contract and per incident services, our companion diagnostics and our nucleic acid solutions businesses as well as sales from spare parts, consumables, reagents, vacuum pumps, subscriptions, software licenses and associated services.

Contract Balances

Contract Assets

Contract assets (unbilled accounts receivable) primarily relate to the company's right to consideration for work completed but not billed at the reporting date. The unbilled receivables are reclassified to trade receivables when billed to customers. Contract assets are generally classified as current assets and are included in "Accounts receivable, net" in the consolidated balance sheet.

The balance of contract assets as of October 31, 2019 and as of November 1, 2018, the date of adoption of ASC 606, were $110 million and $57 million, respectively. The increase in unbilled receivables during the year ended October 31, 2019 is a result of recognition of revenue upon the transfer of the control to the customer. In some instances, transfer of control is prior to invoicing the customers and excluding amounts transferred to trade receivables during the period amounted to $53 million.

Contract Liabilities

The following table provides information about contract liabilities (deferred revenue) and the significant changes in the balances during the year ended October 31, 2019:

	Contract Liabilities
	(in millions)
Ending balance as of October 31, 2018	$ 367
Impact of adoption of new revenue recognition guidance	(11)
Net revenue deferred in the period	303
Revenue recognized that was included in the contract liability balance at the beginning of the period	(287)
Change in deferrals from customer cash advances, net of revenue recognized	5
Contract liabilities acquired in business combinations	9
Currency translation and other adjustments	—
Ending balance as of October 31, 2019	$ 386

Contract liabilities primarily relate to multiple element arrangements for which billing has occurred but transfer of control of all elements to the customer has either partially or not occurred at the balance sheet date. This includes cash received from customers for products and related installation and services in advance of the transfer of control. Contract liabilities are classified as either current in deferred revenue or long-term in other long-term liabilities in the consolidated balance sheet based on the timing of when we expect to complete our performance obligation.

Contract Costs

Incremental costs of obtaining a contract with a customer are recognized as an asset if it expects the benefit of those costs to be longer than one year. We have determined that certain sales incentive programs meet the requirements to be capitalized. The change in total capitalized costs to obtain a contract was immaterial during the year ended October 31, 2019 and are included in other current and long-term assets on the consolidated balance sheet. We have applied the practical expedient to expense costs as incurred for costs to obtain a contract with a customer when the amortization period would have been one year or less. These costs include the company's internal sales force compensation program, as we have determined that annual compensation is commensurate with annual sales activities.

Transaction Price Allocated to the Remaining Performance Obligations

We have applied the practical expedient in ASC 606-10-50-14 and have not disclosed information about transaction price allocated to remaining performance obligations that have original expected durations of one year or less.

The estimated revenue expected to be recognized for remaining performance obligations that have an original term of more than one year, as of October 31, 2019, was $207 million, the majority of which is expected to be recognized over the next 12 months. Remaining performance obligations primarily include extended warranty, customer manufacturing contracts, and software maintenance contracts and revenue associated with lease arrangements.

5. SHARE-BASED COMPENSATION

Agilent accounts for share-based awards in accordance with the provisions of the accounting guidance which requires the measurement and recognition of compensation expense for all share-based payment awards made to our employees and directors including employee stock option awards, restricted stock units, employee stock purchases made under our ESPP and performance share awards granted to selected members of our senior management under the LTPP based on estimated fair values.

Description of Share-Based Plans

Employee Stock Purchase Plan. Effective November 1, 2000, we adopted the ESPP. The ESPP allows eligible employees to contribute up to ten percent of their base compensation to purchase shares of our common stock at 85 percent of the closing market price at purchase date. Currently, there are 75 million shares authorized for issuance in connection with the ESPP.

Under our ESPP, employees purchased 603,488 shares for $37 million in 2019, 558,116 shares for $32 million in 2018 and 618,270 shares for $26 million in 2017. As of October 31, 2019, the number of shares of common stock authorized and available for issuance under our ESPP was 26,055,571. This excludes the number of shares of common stock to be issued to participants in consideration of the aggregate participant contributions totaling $20 million as of October 31, 2019.

Incentive Compensation Plans. On November 15, 2017 and March 21, 2018, the Board of Directors and the stockholders, respectively, approved the Agilent Technologies, Inc. 2018 Stock Plan (the "2018 Plan") which amends, including renaming and extending the term of, the Agilent Technologies, Inc. 2009 Stock Plan (the "2009 Plan"). The 2009 plan replaced the Agilent Technologies, Inc. Amended and Restated 1999 Stock Plan and 1999 Non-Employee Director Stock Plan. The 2018 Plan provides for the grant of awards in the form of stock options, stock appreciation rights ("SARs"), restricted stock, restricted stock units ("RSUs"), performance shares and performance units with performance-based conditions on vesting or exercisability, and cash awards. The 2018 Plan has a term of ten years. As of October 31, 2019, 28,676,526 shares were available for future awards under the 2018 Stock Plan.

Stock options under the 2018 Stock Plan may be either "incentive stock options", as defined in Section 422 of the Internal Revenue Code, or non-statutory. Options were granted prior to November 1, 2015 and generally vest at a rate of 25 percent per year over a period of four years from the date of grant with a maximum contractual term of ten years. The exercise price for stock options is generally not less than 100 percent of the fair market value of our common stock on the date the stock award is granted. Agilent issues new shares of common stock when employee stock options are exercised.

Effective November 1, 2003, the Compensation Committee of the Board of Directors approved the LTPP, which is a performance stock award program administered under the 2018 Stock Plan, for the company's executive officers and other key employees. Participants in this program are entitled to receive unrestricted shares of the company's stock after the end of a three-year period, if specified performance targets are met. Certain LTPP awards are generally designed to meet the criteria of a performance award with the performance metrics and peer group comparison based on the Total Stockholders' Return ("TSR") set at the beginning of the performance period. Effective November 1, 2015, the Compensation Committee of the Board of Directors approved another type of performance stock award, for the company's executive officers and other key employees. Participants in this program are also entitled to receive unrestricted shares of the company's stock after the end of a three-year period, if specified performance targets over the three-year period are met. The performance target for grants made in 2016 were based on Operating Margin ("OM") and the performance grants made in 2017, 2018 and 2019 were based on Earnings Per Share ("EPS"). In the case of LTPP-OM, the performance targets for all the three years of performance period were set at the time of grant. The performance targets for LTPP-EPS grants for year 2 and year 3 of the performance period are set in the first quarter of year 2 and year 3, respectively. All LTPP awards granted after November 1, 2015, are subject to a one-year post-vest holding period.

Based on the performance metrics the final LTPP award may vary from zero to 200 percent of the target award. The maximum contractual term for awards under the LTPP program is three years and the maximum award value for awards granted in 2017 and 2016 cannot exceed 300 percent of the grant date target value. We consider the dilutive impact of these programs in our diluted net income per share calculation only to the extent that the performance conditions are expected to be met.

We also issue restricted stock units under our share-based plans. The estimated fair value of the restricted stock unit awards granted under the Stock Plans is determined based on the market price of Agilent's common stock on the date of grant adjusted for expected dividend yield. Restricted stock units generally vest, with some exceptions, at a rate of 25 percent per year over a period of four years from the date of grant. All restricted stock units granted to our executives after November 1, 2015, are subject to a one-year post-vest holding period.

Impact of Share-based Compensation Awards

We have recognized compensation expense based on the estimated grant date fair value method under the authoritative guidance. For all share-based awards we have recognized compensation expense using a straight-line amortization method. As the guidance requires that share-based compensation expense be based on awards that are ultimately expected to vest, estimated share-based compensation has been reduced for estimated forfeitures.

The impact on our results for share-based compensation was as follows:

	Years Ended October 31,		
	2019	2018	2017
	(in millions)		
Cost of products and services	$ 18	$ 16	$ 15
Research and development	7	7	6
Selling, general and administrative	47	48	40
Total share-based compensation expense	$ 72	$ 71	$ 61

At October 31, 2019 and 2018 there was no share-based compensation capitalized within inventory.

Valuation Assumptions

For all periods presented, shares granted under the LTPP (TSR) were valued using a Monte Carlo simulation. The ESPP allows eligible employees to purchase shares of our common stock at 85 percent of the fair market value at the purchase date.

The estimated fair value of restricted stock unit awards, LTPP (OM) and LTPP (EPS) was determined based on the market price of Agilent's common stock on the date of grant adjusted for expected dividend yield and as appropriate, a discount related to the one-year post vesting. The compensation cost for LTPP (OM) and LTPP (EPS) awards reflect the cost of awards that are probable to vest at the end of the performance period.

The following assumptions were used to estimate the fair value of awards granted.

	Years Ended October 31,		
	2019	2018	2017
LTPP:			
Volatility of Agilent shares	22%	21%	23%
Volatility of selected peer-company shares	15%-66%	14%-66%	15%-63%
Pair-wise correlation with selected peers	30%	32%	36%
Post-vest restriction discount for all executive awards	5.0%	4.8%	5.3%

Shares granted under the LTPP (TSR) were valued using a Monte Carlo simulation model. The Monte Carlo simulation fair value model requires the use of highly subjective and complex assumptions, including the price volatility of the underlying stock. For LTPP (TSR) grants in 2017 and thereafter, we used our own historical stock price volatility.

All LTPP awards granted to our executives have a one-year post-vest holding restriction. The estimated discount associated with post-vest holding restrictions is calculated using the Finnerty model. The model calculates the potential lost value if the employee were able to sell the shares during the lack of marketability period, instead of being required to hold the shares.

Share-Based Payment Award Activity

Employee Stock Options

The following table summarizes employee stock option award activity of our employees and directors for 2019.

	Options Outstanding	Weighted Average Exercise Price
	(in thousands)	
Outstanding at October 31, 2018	1,997	$ 35
Exercised	(552)	$ 33
Forfeited	—	$ —
Outstanding at October 31, 2019	1,445	$ 36

The options outstanding and exercisable for equity share-based payment awards at October 31, 2019 were as follows:

	Options Outstanding				Options Exercisable			
Range of Exercise Prices	Number Outstanding	Weighted Average Remaining Contractual Life	Weighted Average Exercise Price	Aggregate Intrinsic Value	Number Exercisable	Weighted Average Remaining Contractual Life	Weighted Average Exercise Price	Aggregate Intrinsic Value
	(in thousands)	(in years)		(in thousands)	(in thousands)	(in years)		(in thousands)
$25.01 – 30	483	2.5	$ 26	23,769	483	2.5	$ 26	23,769
$30.01 – 40	296	4.1	$ 39	10,845	296	4.1	$ 39	10,845
$40.01 – over	666	5.0	$ 41	23,211	666	5.0	$ 41	23,211
	1,445	4.0	$ 36	$ 57,825	1,445	4.0	$ 36	$ 57,825

The aggregate intrinsic value in the table above represents the total pre-tax intrinsic value, based on the company's closing stock price of $75.75 at October 31, 2019, which would have been received by award holders had all award holders exercised their awards that were in-the-money as of that date. The total number of in-the-money awards exercisable at October 31, 2019 was approximately 1.4 million.

The following table summarizes the aggregate intrinsic value of options exercised in 2019, 2018 and 2017:

	Aggregate Intrinsic Value	Weighted Average Exercise Price
	(in thousands)	
Options exercised in fiscal 2017	$ 36,175	$ 30
Options exercised in fiscal 2018	$ 28,417	$ 32
Options exercised in fiscal 2019	$ 24,409	$ 33

As of October 31, 2019, the unrecognized share-based compensation costs for outstanding stock option awards, net of expected forfeitures, was zero. The amount of cash received from the exercise of share-based awards granted was $54 million in 2019, $56 million in 2018 and $66 million in 2017.

Non-Vested Awards

The following table summarizes non-vested award activity in 2019 primarily for our LTPP and restricted stock unit awards.

	Shares	Weighted Average Grant Price
	(in thousands)	
Non-vested at October 31, 2018	3,181	$ 57
Granted	1,309	$ 68
Vested	(1,530)	$ 45
Forfeited	(78)	$ 60
Change in LTPP shares in the year due to exceeding performance targets	291	$ —
Non-vested at October 31, 2019	3,173	$ 60

As of October 31, 2019, the unrecognized share-based compensation costs for non-vested restricted stock awards, net of expected forfeitures, was approximately $94 million which is expected to be amortized over a weighted average period of 2.2 years. The total fair value of restricted stock awards vested was $69 million for 2019, $58 million for 2018 and $42 million for 2017.

6. INCOME TAXES

The domestic and foreign components of income before taxes are:

	Years Ended October 31,		
	2019	2018	2017
	(in millions)		
U.S. operations	$ 189	$ 169	$ 116
Non-U.S. operations	730	777	687
Total income before taxes	$ 919	$ 946	$ 803

The provision for income taxes is comprised of:

	Years Ended October 31,		
	2019	2018	2017
	(in millions)		
U.S. federal taxes:			
Current	$ (191)	$ 520	$ 15
Deferred	—	51	110
Non-U.S. taxes:			
Current	290	95	1
Deferred	(267)	(22)	(7)
State taxes, net of federal benefit:			
Current	4	1	1
Deferred	12	(15)	(1)
Total provision (benefit)	$ (152)	$ 630	$ 119

The differences between the U.S. federal statutory income tax rate and our effective tax rate are:

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Profit before tax times statutory rate	$ 193	$ 221	$ 281
Non-U.S. income taxed at different rates	(8)	(93)	(43)
Change in unrecognized tax benefits	(13)	(17)	(110)
Impact of the Tax Act	—	552	—
Extension of the tax incentive in Singapore	(299)	—	—
Other, net	(25)	(33)	(9)
Provision (benefit) for income	$ (152)	$ 630	$ 119
Effective tax rate	(16.5)%	66.6%	14.8%

For 2019, the company's income tax benefit was $152 million with an effective tax rate of (16.5) percent. For the year ended October 31, 2019, our effective tax rate and the resulting provision for income taxes were significantly impacted by the discrete benefit of $299 million related to the extension of the company's tax incentive in Singapore.

As part of the business integration of some of our prior acquisitions, we undertook corporate restructurings in the fourth quarter of fiscal year 2019 that involved on-shoring certain intangible properties held by our foreign subsidiaries to the United States. These restructurings resulted in a cash tax liability of $231 million. These taxes generate tax attributes that will offset our transition tax liability which is included in other long-term liabilities in our consolidated balance sheet.

For 2018, the company's income tax expense was $630 million with an effective tax rate of 66.6 percent. For the year ended October 31, 2018, our effective tax rate and the resulting provision for income taxes were significantly impacted by the discrete charge of $552 million related to the enactment of the U.S. Tax Cuts and Jobs Act (the "Tax Act") as discussed below.

For 2017, the company's income tax expense was $119 million with an effective tax rate of 14.8 percent. Our effective tax rate is impacted by earnings realized in foreign jurisdictions with statutory tax rates lower than the federal statutory tax rate. During the year, the company determined a portion of current year foreign earnings from its low tax jurisdictions would not be considered as indefinitely reinvested. As such, a deferred tax liability for that portion of unremitted foreign earnings was accrued causing an increase in the annual tax expense. Our annual effective tax rate also included tax benefits due to the settlement of an audit in Germany for the years 2005 through 2008 and the lapse of U.S. statute of limitation for the fiscal years 2012 and 2013. This benefit was offset by a deferred tax liability required for the tax expected upon repatriation of related unremitted foreign earnings that were not asserted as indefinitely invested outside the U.S.

The company has negotiated tax holidays in several different jurisdictions, most significantly in Singapore. The tax holidays provide lower rates of taxation on certain classes of income and require various thresholds of investments and employment or specific types of income in those jurisdictions. In December 2018, the tax holiday in Singapore was renegotiated and extended through 2027. Other tax holidays are due for renewal in 2020. As a result of the incentives, the impact of the tax holidays decreased income taxes by $368 million, $87 million, and $93 million in 2019, 2018, and 2017, respectively. The benefit of the tax holidays on net income per share (diluted) was approximately $1.16, $0.27, and $0.29 in 2019, 2018 and 2017, respectively. The increase in the benefit from 2018 to 2019 is primarily due to the Singapore restructuring and tax incentive modifications completed in 2019 in response to Singapore tax law changes. Of the $1.16 benefit of the tax incentives on net income per share (diluted) in 2019, $0.94 of the benefit relates to one-time items from the Singapore restructuring.

2017 U.S. Tax Reform - Tax Cuts and Jobs Act

On December 22, 2017, the Tax Act was enacted into law. The Tax Act enacted significant changes affecting our fiscal year 2018, including, but not limited to, (1) reducing the U.S. federal corporate tax rate and (2) imposing a one-time transition tax on certain unrepatriated earnings of foreign subsidiaries that had not been previously taxed in the U.S.

The Tax Act also established new tax provisions affecting our fiscal year 2019, including, but not limited to, (1) creating a new provision designed to tax global intangible low-tax income ("GILTI"); (2) generally eliminating U.S. federal taxes on

dividends from foreign subsidiaries; (3) eliminating the corporate alternative minimum tax (“AMT”); (4) creating the base erosion anti-abuse tax (“BEAT”); (5) establishing a deduction for foreign derived intangible income ("FDII"); (6) repealing domestic production activity deduction; and (7) establishing new limitations on deductible interest expense and certain executive compensation.

ASC 740, Income Taxes, requires companies to recognize the effect of the tax law changes in the period of enactment. However, the SEC staff issued Staff Accounting Bulletin 118 ("SAB 118") which allowed companies to record provisional amounts during a measurement period not extending beyond one year from the Tax Act enactment date. For the year ended October 31, 2018, the company recognized income tax expense related to the Tax Act of $552 million which includes (1) an expense of $499 million of U.S. transition tax and correlative items on deemed repatriated earnings of non-U.S. subsidiaries and (2) an expense of $53 million associated with the impact on deferred taxes resulting from the decreased U.S. corporate tax rate as described below.

Deemed Repatriation Transition Tax (Transition Tax): The Transition Tax is based on the company’s total unrepatriated post-1986 earnings and profits ("E&P") of its foreign subsidiaries and the amount of non-U.S. taxes paid (Tax Pools) on such earnings. Historically, the company permanently reinvested a significant portion of these post-1986 E&P outside the U.S. For the remaining portion, the company previously accrued deferred taxes. Since the Tax Act required all foreign earnings to be taxed currently, the company recorded an income tax expense of $651 million for its one-time transition U.S. federal tax and a benefit of $152 million for the reversal of related deferred tax liabilities. The resulting $499 million net transition tax, reduced by existing tax credits, will be paid over 8 years in accordance with the election available under the Tax Act. We have completed our accounting for charges related to the Transition Tax.

Reduction of U.S. Federal Corporate Tax Rate: The reduction of the corporate income tax rate requires companies to remeasure their deferred tax assets and liabilities as of the date of enactment. The amount recorded for the year ended October31, 2018 for the remeasurement due to tax rate change is $53 million. We have completed our accounting for the measurement of deferred taxes.

GILTI: The Tax Act subjects a U.S. corporation to tax on its GILTI. U.S. GAAP allows companies to make an accounting policy election to either (1) treat taxes due on future GILTI inclusions in the U.S. taxable income as a current-period expense when incurred (“period cost method”) or (2) factoring such amounts into a company’s measurement of its deferred taxes (“deferred method”). We have completed our analysis and elected to treat GILTI as a “current period cost”.

Indefinite Reinvestment Assertion: Prior to the enactment of the Tax Act, the company had indefinite investment assertion on a significant portion of its undistributed earnings from foreign subsidiaries. As a result of the enactment of the Tax Act, we have reevaluated our historic assertion and no longer consider these earnings to be indefinitely reinvested in our foreign subsidiaries. The company has recorded a deferred tax liability of $10 million for foreign withholding taxes on repatriation of remaining undistributed earnings.

The significant components of deferred tax assets and deferred tax liabilities included on the consolidated balance sheet are:

	Years Ended October 31,	
	2019	2018
	(in millions)	
Deferred Tax Assets		
Intangibles	$ 131	$ —
Property, plant and equipment	—	8
Pension benefits and retiree medical benefits	71	49
Employee benefits, other than retirement	34	34
Net operating loss, capital loss, and credit carryforwards	195	185
Share-based compensation	32	31
Deferred revenue	38	38
Other	35	19
Deferred tax assets	$ 536	$ 364
Tax valuation allowance	(134)	(135)
Deferred tax assets, net of valuation allowance	$ 402	$ 229
Deferred Tax Liabilities		
Intangibles	$ —	$ (112)
Property, plant and equipment	(16)	—
Other	(7)	(21)
Deferred tax liabilities	$ (23)	$ (133)
Net deferred tax assets (liabilities)	$ 379	$ 96

The increase in 2019 as compared to 2018 for the deferred tax asset and liabilities was primarily due to the benefit of $299 million related to the extension of the company's tax incentive in Singapore.

Valuation allowances require an assessment of both positive and negative evidence when determining whether it is more likely than not that deferred tax assets are recoverable. Such assessment is required on a jurisdiction by jurisdiction basis. As of October 31, 2019, we continued to maintain a valuation allowance of $134 million until sufficient positive evidence exists to support reversal. The valuation allowance is primarily related to deferred tax assets for the states of California and Colorado, along with the net operating losses in the Netherlands and capital losses in the U.S. and Australia.

At October 31, 2019, we had federal, state and foreign net operating loss carryforwards of approximately $48 million, $571 million and $577 million, respectively. The federal and state net operating loss carryforwards are subject to various limitations under Section 382 of the Internal Revenue Code and applicable state tax laws. If not utilized, the federal and state net operating loss carryforwards will begin to expire in 2020. If not utilized, $155 million of the foreign net operating loss carryforwards will begin to expire in 2020. The remaining $422 million of the foreign net operating losses carry forward indefinitely. At October 31, 2019, we had federal and foreign capital loss carryforwards of $48 million and $116 million, respectively. If not utilized, the federal capital loss carryforwards will expire in 2022. The foreign capital losses carry forward indefinitely. At October 31, 2019, we had state tax credit carryforwards of approximately $78 million. The state tax credits carry forward indefinitely.

The breakdown between long-term deferred tax assets and deferred tax liabilities was as follows:

	October 31,	
	2019	2018
	(in millions)	
Long-term deferred tax assets (included within other assets)	$ 410	$ 165
Long-term deferred tax liabilities (included within other long-term liabilities)	(31)	(69)
Total	$ 379	$ 96

The breakdown between current and long-term income tax assets and liabilities, excluding deferred tax assets and liabilities, was as follows:

	October 31,	
	2019	2018
	(in millions)	
Current income tax assets (included within other current assets)	$ 68	$ 59
Long-term income tax assets (included within other assets)	4	19
Current income tax liabilities (included within other accrued liabilities)	(292)	(71)
Long-term income tax liabilities (included within other long-term liabilities)	(328)	(607)
Total	$ (548)	$ (600)

Uncertain Tax Positions

The aggregate changes in the balances of our gross unrecognized tax benefits including all federal, state and foreign tax jurisdictions are as follows:

	2019	2018	2017
		(in millions)	
Balance, beginning of year	$ 214	$ 224	$ 293
Additions for tax positions related to the current year	7	27	32
Additions for tax positions from prior years	12	2	1
Reductions for tax positions from prior years	(2)	(13)	(3)
Settlements with taxing authorities	—	—	(52)
Statute of limitations expirations	(25)	(26)	(47)
Balance, end of year	$ 206	$ 214	$ 224

As of October 31, 2019, we had $227 million of unrecognized tax benefits, including interest and penalties of which $204 million, if recognized, would affect our effective tax rate. However, approximately $23 million of the unrecognized tax benefits were related to state income tax positions that, if recognized, would be in the form of a deferred tax asset that would likely not affect our effective tax rate due to a valuation allowance.

We recognized a tax expense of $9 million, a tax expense of $11 million and a tax benefit of $9 million of interest and penalties related to unrecognized tax benefits in 2019, 2018 and 2017, respectively. Interest and penalties accrued as of October 31, 2019 and 2018 were $36 million and $27 million, respectively.

In the U.S., tax years remain open back to the year 2016 for federal income tax purposes and the year 2015 for significant states. In other major jurisdictions where the company conducts business, the tax years generally remain open back to the year 2009.

With these jurisdictions and the U.S., it is reasonably possible that there could be significant changes to our unrecognized tax benefits in the next twelve months due to either the expiration of a statute of limitation or a tax audit settlement which will be partially offset by an anticipated tax liability related to unremitted foreign earnings, where applicable. Given the number of years and numerous matters that remain subject to examination in various tax jurisdictions, management is unable to estimate the range of possible changes to the balance of our unrecognized tax benefits.

7. NET INCOME PER SHARE

The following is a reconciliation of the numerators and denominators of the basic and diluted net income per share computations for the periods presented below.

	Years Ended October 31,		
	2019	2018	2017
	(in millions)		
Numerator:			
Net income	$ 1,071	$ 316	$ 684
Denominators:			
Basic weighted average shares	314	321	$ 322
Potential common shares — stock options and other employee stock plans	4	4	4
Diluted weighted average shares	318	325	326

The dilutive effect of share-based awards is reflected in diluted net income per share by application of the treasury stock method, which includes consideration of unamortized share-based compensation expense and the dilutive effect of in-the-money options and non-vested restricted stock units. Under the treasury stock method, the amount the employee must pay for exercising stock options and unamortized share-based compensation expense collectively are assumed proceeds to be used to repurchase hypothetical shares. An increase in the fair market value of the company's common stock can result in a greater dilutive effect from potentially dilutive awards.

We exclude stock options with exercise prices greater than the average market price of our common stock from the calculation of diluted earnings per share because their effect would be anti-dilutive. In addition, we exclude from the calculation of diluted earnings per share, stock options, ESPP, LTPP and restricted stock awards whose combined exercise price and unamortized fair value collectively were greater than the average market price of our common stock because their effect would also be anti-dilutive.

In 2019, 2018 and 2017, we issued approximately 2 million, 2 million and 3 million, of share-based awards, respectively. For the years ended 2019, 2018 and 2017, the impact of the anti-dilutive potential common shares that were excluded from the calculation of diluted earnings per share was not material.

8. INVENTORY

	October 31,	
	2019	2018
	(in millions)	
Finished goods	$ 416	$ 386
Purchased parts and fabricated assemblies	263	252
Inventory	$ 679	$ 638

Inventory-related excess and obsolescence charges of $19 million were recorded in cost of products in 2019, $26 million in 2018 and $24 million in 2017. We record excess and obsolete inventory charges for both inventory on our site as well as inventory at our contract manufacturers and suppliers where we have non-cancelable purchase commitments.

9. PROPERTY, PLANT AND EQUIPMENT, NET

	October 31,	
	2019	2018
	(in millions)	
Land	$ 57	$ 55
Buildings and leasehold improvements	1,012	952
Machinery and equipment	546	512
Software	160	141
Total property, plant and equipment	1,775	1,660
Accumulated depreciation and amortization	(925)	(838)
Property, plant and equipment, net	$ 850	$ 822

There were no asset impairments in 2019 and 2017 and less than $1 million asset impairments in 2018. Depreciation expenses were $111 million in 2019, $102 million in 2018 and $94 million in 2017. In 2019 we retired approximately $23 million of fully depreciated assets that were no longer in use.

10. GOODWILL AND OTHER INTANGIBLE ASSETS

The following table presents goodwill balances and the movements for each of our reportable segments during the years ended October 31, 2018 and 2019:

	Life Sciences and Applied Markets	Diagnostics and Genomics	Agilent CrossLab	Total
	(in millions)			
Goodwill as of October 31, 2017	$ 773	$ 1,330	$ 504	$ 2,607
Foreign currency translation impact	(7)	(4)	(4)	(15)
Goodwill arising from acquisitions	37	281	63	381
Goodwill as of October 31, 2018	$ 803	$ 1,607	$ 563	$ 2,973
Foreign currency translation impact	(1)	(2)	(2)	(5)
Goodwill arising from acquisitions and adjustments	636	(11)	—	625
Goodwill as of October 31, 2019	$ 1,438	$ 1,594	$ 561	$ 3,593

As of September 30, 2019, our annual impairment test date, we assessed goodwill impairment for our reporting units and no impairment was indicated.

The component parts of other intangible assets at October 31, 2018 and 2019 are shown in the table below:

	Other Intangible Assets		
	Gross Carrying Amount	Accumulated Amortization and Impairments	Net Book Value
		(in millions)	
As of October 31, 2018:			
Purchased technology	$ 947	$ 683	$ 264
Trademark/Tradename	151	88	63
Customer relationships	107	63	44
Third-party technology and licenses	$ 28	$ 19	$ 9
Total amortizable intangible assets	$ 1,233	$ 853	$ 380
In-Process R&D	111	—	111
Total	$ 1,344	$ 853	$ 491
As of October 31, 2019:			
Purchased technology	$ 1,413	$ 763	$ 650
Backlog	5	5	—
Trademark/Tradename	196	102	94
Customer relationships	329	87	242
Third-party technology and licenses	$ 28	$ 22	$ 6
Total amortizable intangible assets	$ 1,971	$ 979	$ 992
In-Process R&D	115	—	115
Total	$ 2,086	$ 979	$ 1,107

In 2019, we acquired two businesses, BioTek and ACEA, for a combined purchase price of approximately $1.4 billion. See Note 3, "Acquisitions", for additional information.

During fiscal year 2019, we recorded additions to goodwill of $636 million and to other intangible assets of $744 million related to the acquisition of ACEA and BioTek. In the second quarter of fiscal year 2019, we recorded a measurement period adjustment to goodwill of $11 million for deferred tax assets related to pre-acquisition net operating losses of Advanced Analytical Technologies, Inc. The increase to other intangible assets due to foreign currency translation was not material in 2019.

During fiscal year 2018, we recorded additions to goodwill of $381 million and to intangible assets of $262 million related to the acquisition of seven businesses. During the year other intangible assets decreased $1 million, due to the impact of foreign exchange translation.

In general, for United States federal tax purposes, goodwill from asset purchases is amortizable however any goodwill created as part of a stock acquisition is not deductible.

In 2019, there were no impairments of other intangible assets recorded. During 2018, we recorded an impairment charge of $21 million related to purchased intangible assets within the diagnostics and genomics segment that were deemed unrecoverable. In 2017, there were no impairments of other intangible assets recorded.

Amortization expense of intangible assets was $128 million in 2019, $110 million in 2018, and $120 million in 2017.

Future amortization expense related to existing finite-lived purchased intangible assets associated with business combinations for the next five fiscal years and thereafter is estimated below:

Estimated future amortization expense:	(in millions)
2020	$ 186
2021	$ 172
2022	$ 150
2023	$ 107
2024	$ 86
Thereafter	$ 291

11. INVESTMENTS

The following table summarizes the company's equity investments as of October 31, 2019 and 2018 (net book value):

	October 31,	
	2019	2018
	(in millions)	
Long-Term		
Equity investments - without readily determinable fair value	$ 47	$ 23
Equity investments - with readily determinable fair value	25	15
Trading securities	30	30
Total	$ 102	$ 68

Equity investments without readily determinable fair value (RDFV) consist of non-marketable equity securities issued by private companies. These investments are accounted for using the measurement alternative at cost adjusting for impairments and observable price changes (orderly transactions for the identical or a similar security from the same issuer). The adjustments are included in net income in the period in which they occur. Equity investments with RDFV consist of shares we own in a special fund and are reported at fair value, with gains or losses resulting from changes in fair value included in net income. Prior to fiscal year 2019, both equity investments without RDFV and with RDFV were accounted for using cost method of accounting, measured at historical cost less other-than-temporary impairment. Trading securities are reported at fair value, with gains or losses resulting from changes in fair value recognized currently in earnings.

During 2018, we acquired all of the remaining shares of Lasergen, Inc. (Lasergen), for an additional cash consideration of approximately $107 million, an investment that was accounted for under the cost method in 2017 for approximately $80 million. The fair value remeasurement of our previous investment immediately before the acquisition resulted in a net gain of $20 million and was recorded in other income.

Our investments without RDFV, are subject to periodic impairment review. The impairment analysis requires significant judgment to identify events or circumstances that would likely have significant adverse effect on the future value of the investment.

Net unrealized gains on our equity securities with RDFV were $3 million in 2019. Net unrealized gains on our equity securities without RDFV were not material in 2019. Upon adoption of new accounting guidance relating to financial instruments beginning fiscal year 2019, the gains and losses on such securities are recognized in other income (expense) and therefore not applicable in prior periods. As of November 1, 2019, total impact of adoption of said accounting guidance to our consolidated balance sheet was an increase of $7 million to equity securities with RDFV (included within long-term investments) and a net increase of$5 million to beginning retained earnings.

Net unrealized gains on our trading securities portfolio were $3 million in 2019, $1 million in 2018 and $4 million in 2017.

12. FAIR VALUE MEASUREMENTS

The authoritative guidance defines fair value as the price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. When determining the fair value measurements for assets and liabilities required or permitted to be recorded at fair value, we consider the principal or most advantageous market and assumptions that market participants would use when pricing the asset or liability.

Fair Value Hierarchy

The guidance establishes a fair value hierarchy that prioritizes the use of inputs used in valuation techniques into three levels. A financial instrument's categorization within the fair value hierarchy is based upon the lowest level of input that is significant to the fair value measurement. There are three levels of inputs that may be used to measure fair value:

Level 1 — applies to assets or liabilities for which there are quoted prices in active markets for identical assets or liabilities.

Level 2 — applies to assets or liabilities for which there are inputs other than quoted prices included within level 1 that are observable, either directly or indirectly, for the asset or liability such as: quoted prices for similar assets or liabilities in active markets; quoted prices for identical or similar assets or liabilities in less active markets; or other inputs that can be derived principally from, or corroborated by, observable market data.

Level 3 — applies to assets or liabilities for which there are unobservable inputs to the valuation methodology that are significant to the measurement of the fair value of the assets or liabilities.

Financial Assets and Liabilities Measured at Fair Value on a Recurring Basis

Financial assets and liabilities measured at fair value on a recurring basis as of October 31, 2019 were as follows:

		Fair Value Measurement at October 31, 2019 Using		
	October 31, 2019	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
		(in millions)		
Assets:				
Short-term				
Cash equivalents (money market funds)	$ 784	$ 784	$ —	$ —
Derivative instruments (foreign exchange contracts)	12	—	12	—
Long-term				
Trading securities	30	30	—	—
Other investments	25	—	25	—
Total assets measured at fair value	$ 851	$ 814	$ 37	$ —
Liabilities:				
Short-term				
Derivative instruments (foreign exchange contracts)	$ 6	$ —	$ 6	$ —
Long-term				
Deferred compensation liability	30	—	30	—
Total liabilities measured at fair value	$ 36	$ —	$ 36	$ —

Financial assets and liabilities measured at fair value on a recurring basis as of October 31, 2018 were as follows:

	October 31, 2018	Fair Value Measurement at October 31, 2018 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Assets:				
Short-term				
Cash equivalents (money market funds)	$ 1,355	$ 1,355	$ —	$ —
Derivative instruments (foreign exchange contracts)	16	—	16	—
Long-term				
Trading securities	30	30	—	—
Total assets measured at fair value	$ 1,401	$ 1,385	$ 16	$ —
Liabilities:				
Short-term				
Derivative instruments (foreign exchange contracts)	$ 5	$ —	$ 5	$ —
Long-term				
Deferred compensation liability	30	—	30	—
Total liabilities measured at fair value	$ 35	$ —	$ 35	$ —

Our money market funds and trading securities are generally valued using quoted market prices and therefore are classified within level 1 of the fair value hierarchy. Our derivative financial instruments are classified within level 2, as there is not an active market for each hedge contract, but the inputs used to calculate the value of the instruments are tied to active markets. Our deferred compensation liability is classified as level 2 because, although the values are not directly based on quoted market prices, the inputs used in the calculations are observable. Other investments represent shares we own in a special fund that targets underlying investments of approximately 40 percent in debt securities and 60 percent in equity securities. It has been classified as level 2 because, although the shares of the fund are not traded on any active stock exchange, each of the individual underlying securities are and hence we have a readily determinable value for the underlying securities, from which we are able to determine the fair market value for the special fund itself.

Trading securities, which is comprised of mutual funds, bonds and other similar instruments, other investments and deferred compensation liability are reported at fair value, with gains or losses resulting from changes in fair value recognized currently in net income. Certain derivative instruments are reported at fair value, with unrealized gains and losses, net of tax, included in accumulated other comprehensive loss within stockholders' equity. Realized gains and losses from the sale of these instruments are recorded in net income.

Assets and Liabilities Measured at Fair Value on a Non-Recurring Basis

Long-Lived Assets

For assets measured at fair value on a non-recurring basis, the following table summarizes the impairments included in net income for the years ended October 31, 2019, 2018 and 2017:

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Long-lived assets held and used	$ —	$ 21	$ —
Long-lived assets held for sale	$ —	$ —	$ —

There were no impairments of long-lived assets held and used in 2019 and 2017. For 2018, long lived assets held and used with a carrying amount of $21 million were written down to their fair value of zero, resulting in an impairment charge of $21 million, which relates to purchased intangible assets within the diagnostics and genomics segment that were deemed unrecoverable and was included in net income.

There were no impairments of long-lived assets held for sale in 2019, 2018 and 2017.

Fair values for the impaired long-lived assets during 2018 were measured using level 3 inputs. To determine the fair value of long-lived assets in 2018, we used the income approach based on projected discounted cash flows expected to be generated by the long-lived assets over the remaining useful life.

For 2019, there were no impairments or material changes in non-marketable securities without readily determinable fair value. As of October 31, 2019 and October 31, 2018, the carrying amount of non-marketable equity securities without readily determinable fair values was $47 million and $23 million, respectively.

Fair values for the non-marketable securities included in long-term investments on the consolidated balance sheet were measured using Level 3 inputs because they are primarily equity stock issued by private companies without quoted market prices. To estimate the fair value of our non-marketable securities, we use the measurement alternative to record these investments at cost and to adjust for impairments and observable price changes (orderly transactions for the identical or a similar security from the same issuer) as and when it occurs.

13. DERIVATIVES

We are exposed to foreign currency exchange rate fluctuations and interest rate changes in the normal course of our business. As part of our risk management strategy, we use derivative instruments, primarily forward contracts purchased options to hedge economic and/or accounting exposures resulting from changes in foreign currency exchange rates.

Fair Value Hedges

We are exposed to interest rate risk due to the mismatch between the interest expense we pay on our loans at fixed rates and the variable rates of interest we receive from cash, cash equivalents and other short-term investments. We have issued long-term debt in U.S. dollars at fixed interest rates based on the market conditions at the time of financing. The fair value of our fixed rate debt changes when the underlying market rates of interest change, and, in the past, we have used interest rate swaps to change our fixed interest rate payments to U.S. dollar LIBOR-based variable interest expense to match the floating interest income from our cash, cash equivalents and other short-term investments. As of October 31, 2019, all interest rate swap contracts had either been terminated or had expired.

On August 9, 2011, we terminated five interest rate swap contracts related to our 2020 senior notes that represented the notional amount of $500 million. On September 17, 2019, the 2020 senior notes were redeemed, and the remaining gain associated with the terminated interest rate swap contracts was realized.

Cash Flow Hedges

We enter into foreign exchange contracts to hedge our forecasted operational cash flow exposures resulting from changes in foreign currency exchange rates. These foreign exchange contracts, carried at fair value, have maturities between one and twelve months. These derivative instruments are designated and qualify as cash flow hedges under the criteria prescribed in the authoritative guidance and are assessed for effectiveness against the underlying exposure every reporting period. For open contracts as of October 31, 2019 and entered into on or after November 1, 2018, changes in the time value of the foreign exchange contract are excluded from the assessment of hedge effectiveness and are recognized in cost of sales over the life of the foreign exchange contract. The changes in fair value of the effective portion of the derivative instrument are recognized in accumulated other comprehensive income (loss). Amounts associated with cash flow hedges are reclassified to cost of sales in the consolidated statement of operations when the forecasted transaction occurs. If it becomes probable that the forecasted transaction will not occur, the hedge relationship will be de-designated and amounts accumulated in other comprehensive income (loss) will be reclassified to other income (expense), net in the current period. Changes in the fair value of the ineffective portion of derivative instruments are recognized in other income (expense), net in the consolidated statement of operations in the current period. We record the premium paid (time value) of an option on the date of purchase as an asset. For options designated as cash flow hedges, changes in the time value are excluded from the assessment of hedge effectiveness and are recognized in cost of sales over the life of the option contract. For the years ended October 31, 2019, 2018 and 2017, ineffectiveness and gains and losses recognized in other income (expense),net due to de-designation of cash flow hedge contracts were not significant.

In July 2012, Agilent executed treasury lock agreements for $400 million in connection with future interest payments to be made on our 2022 senior notes issued on September 10, 2012. We designated the treasury lock as a cash flow hedge. The treasury lock contracts were terminated on September 10, 2012 and we recognized a deferred gain in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2022 senior notes. The remaining gain to be amortized related to the treasury lock agreements at October 31, 2019 was $1 million.

In February 2016, Agilent executed three forward-starting pay fixed/receive variable interest rate swaps for the notional amount of $300 million in connection with future interest payments to be made on our 2026 senior notes issued on September 15, 2016. These derivative instruments were designated and qualified as cash flow hedges under the criteria prescribed in the authoritative guidance. The swap arrangements were terminated on September 15, 2016 with a payment of $10 million and we recognized this as a deferred loss in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2026 senior notes. The remaining loss to be amortized related to the interest rate swap agreements at October 31, 2019 was $7 million.

In August 2019, Agilent executed treasury lock agreements for $250 million in connection with future interest payments to be made on our 2029 senior notes issued on September 5, 2019. We designated the treasury lock as a cash flow hedge. The treasury lock contracts were terminated on September 6, 2019 and we recognized a deferred loss of $6 million in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2029 senior notes. The remaining loss to be amortized related to the treasury lock agreements at October 31, 2019 was $6 million.

Other Hedges

Additionally, we enter into foreign exchange contracts to hedge monetary assets and liabilities that are denominated in currencies other than the functional currency of our subsidiaries. These foreign exchange contracts are carried at fair value and do not qualify for hedge accounting treatment and are not designated as hedging instruments. Changes in value of the derivative instruments are recognized in other income (expense),net in the consolidated statement of operations, in the current period, along with the offsetting foreign currency gain or loss on the underlying assets or liabilities.

Our use of derivative instruments exposes us to credit risk to the extent that the counterparties may be unable to meet the terms of the agreement. We do, however, seek to mitigate such risks by limiting our counterparties to major financial institutions which are selected based on their credit ratings and other factors. We have established policies and procedures for mitigating credit risk that include establishing counterparty credit limits, monitoring credit exposures, and continually assessing the creditworthiness of counterparties.

A number of our derivative agreements contain threshold limits to the net liability position with counterparties and are dependent on our corporate credit rating determined by the major credit rating agencies. The counterparties to the derivative instruments may request collateralization, in accordance with derivative agreements, on derivative instruments in net liability positions.

The aggregate fair value of all derivative instruments with credit-risk-related contingent features that were in a net liability position as of October 31, 2019, was $2 million. The credit-risk-related contingent features underlying these agreements had not been triggered as of October 31, 2019.

There were 261 foreign exchange forward contracts open as of October 31, 2019 and designated as cash flow hedges. There were 205 foreign exchange forward contracts open as of October 31, 2019 not designated as hedging instruments. The aggregated notional amounts by currency and designation as of October 31, 2019 were as follows:

	Derivatives Designated as Cash Flow Hedges	Derivatives Not Designated as Hedging Instruments
	Forward Contracts USD	Forward Contracts USD
Currency	Buy/(Sell)	Buy/(Sell)
	(in millions)	
Euro	$ (40)	$ 141
British Pound	(45)	1
Canadian Dollar	(38)	25
Australian Dollar	4	—
Malaysian Ringgit	—	11
Japanese Yen	(82)	(7)
Danish Krone	—	237
Korean Won	(59)	(32)
Singapore Dollar	14	28
Swiss Franc	—	(2)
Chinese Yuan Renminbi	(59)	(70)
Swedish Krona	—	(8)
Other	—	(23)
	$ (305)	$ 301

Derivative instruments are subject to master netting arrangements and are disclosed gross in the balance sheet in accordance with the authoritative guidance. The gross fair values and balance sheet location of derivative instruments held in the consolidated balance sheet as of October 31, 2019 and 2018 were as follows:

Fair Values of Derivative Instruments

Asset Derivatives			Liability Derivatives		
	Fair Value			Fair Value	
Balance Sheet Location	October 31, 2019	October 31, 2018	Balance Sheet Location	October 31, 2019	October 31, 2018
		(in millions)			
Derivatives designated as hedging instruments:					
Cash flow hedges					
Foreign exchange contracts					
Other current assets	$ 3	$ 11	Other accrued liabilities	$ 2	$ 1
Derivatives not designated as hedging instruments:					
Foreign exchange contracts					
Other current assets	$ 9	$ 5	Other accrued liabilities	$ 4	$ 4
Total derivatives	$ 12	$ 16		$ 6	$ 5

The effect of derivative instruments for foreign exchange contracts designated as hedging instruments and not designated as hedging instruments in our consolidated statement of operations were as follows:

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Derivatives designated as hedging instruments:			
Cash flow hedges			
Loss on interest rate swaps recognized in other comprehensive income (loss)	$ (6)	$ —	$ —
Loss reclassified from accumulated other comprehensive income into interest expense	$ (1)	$ (1)	$ —
Gain (loss) recognized in accumulated other comprehensive income (loss)	$ —	$ 7	$ —
Gain (loss) reclassified from accumulated other comprehensive income (loss) into cost of sales	$ 9	$ (3)	$ 1
Gain (loss) on time value of forward contracts recorded in cost of sales	$ 2	$ —	$ —
Derivatives not designated as hedging instruments:			
Gain (loss) recognized in other income (expense), net	$ 2	$ (2)	$ 5

At October 31, 2019 the estimated amount of existing net gain that is expected to be reclassified from accumulated other comprehensive income to cost of sales within the next twelve months is $4 million.

14. RETIREMENT PLANS AND POST RETIREMENT PENSION PLANS

General. Substantially all of our employees are covered under various defined benefit and/or defined contribution retirement plans. Additionally, we sponsor post-retirement health care benefits for our eligible U.S. employees.

Agilent provides defined benefits to U.S. employees, who meet eligibility criteria under the Agilent Technologies, Inc. Retirement Plan (the "RP").

For eligible service through October 31, 1993, the benefit payable under the Agilent Retirement Plan is reduced by any amounts due to the eligible employee under the Agilent defined contribution Deferred Profit-Sharing Plan (the "DPSP"), which was closed to new participants as of November 1993.

As of October 31, 2019 and 2018, the fair value of plan assets of the DPSP was $132 million and $141 million, respectively. Note that the projected benefit obligation for the DPSP equals the fair value of plan assets.

Effective November 1, 2014, Agilent's U.S. defined benefit retirement plan was closed to new entrants including new employees, new transfers to the U.S. payroll and rehires. As of April 30, 2016, benefits under the RP were frozen. Any pension benefit earned in the U.S. Plans through April 30, 2016 remained fully vested, and there are no additional benefit accruals after April 30, 2016.

Agilent also maintains a Supplemental Benefits Retirement Plan ("SBRP") in the U.S., which is a supplemental unfunded non-qualified defined benefit plan to provide benefits that would be provided under the RP but for limitations imposed by the Internal Revenue Code. The RP and the SBRP comprise the "U.S. Plans" in the tables below.

Eligible employees outside the U.S. generally receive retirement benefits under various retirement plans based upon factors such as years of service and/or employee compensation levels. Eligibility is generally determined in accordance with local statutory requirements.

Post-Retirement Medical Benefit Plans. In addition to receiving retirement benefits, Agilent U.S. employees who meet eligibility requirements as of their termination date may participate in the Agilent Technologies, Inc. Health Plan for Retirees.

- Eligible retirees who were less than age 50 as of January 1, 2005 and who retire after age 55 with 15 or more years of service are eligible for a fixed amount which can be utilized to pay for either sponsored plans and/or individual Medicare plans.
- Effective January 1, 2012, employees who were at least age 50 as of January 1, 2005 and who retire after age 55 with 15 or more years of service are eligible for fixed dollar subsidies and stipends. Grandfathered retirees receive a fixed monthly subsidy toward pre-65 premium costs (subsidy capped at 2011 levels) and a fixed monthly stipend post-65. The subsidy amounts will not increase.
- Any new employee hired on or after November 1, 2014, will not be eligible to participate in the retiree medical plans upon retiring.
- As of April 30, 2016, benefits under this plan were changed for Active employees who have not met the eligibility requirement - 55 years old with at least 15 years of Agilent service, as of April 30, 2016 - for the Retiree Medical Account (RMA) under the U.S. Post Retirement Benefit Plan These employees will only be eligible for 50 percent of the current RMA reimbursement amount upon retirement.

401(k) Defined Contribution Plan. Eligible Agilent U.S. employees may participate in the Agilent Technologies, Inc. 401(k) Plan. Effective April 30, 2016, we began matching contributions to employees up to a maximum of 6 percent of an employee's annual eligible compensation. Effective May 1, 2016 until April 30, 2022, we will provide an additional transitional company contribution for certain eligible employees equal to 3 percent, 4 percent or 5 percent of an employee's annual eligible compensation due to the RP benefits being frozen. The maximum contribution to the 401(k) Plan is 50 percent of an employee's annual eligible compensation, subject to regulatory limitations. The 401(k) Plan employer expense included in income from operations was $39 million in 2019, $37 million in 2018 and $33 million in 2017.

Japanese Welfare Pension Insurance Law. In Japan, Agilent has employees' pension fund plans, which are defined benefit pension plans established under the Japanese Welfare Pension Insurance Law (JWPIL). The plans are composed of (a) a substitutional portion based on the pay-related part of the old-age pension benefits prescribed by JWPIL (similar to social security benefits in the United States) and (b) a corporate portion based on a contributory defined benefit pension arrangement established at the discretion of the company. During the year ended October 31, 2017, Agilent received government approval and returned

the substitutional portion of Japan's pension plan to the Japanese government, as allowed by the JWPIL. The initial transfer resulted in a net gain of $32 million recorded in other income (expense), net in the consolidated statement of operations. The net gain consisted of two parts - a gain of $41 million, representing the difference between the fair values of the Accumulated Benefit Obligation (ABO) settled of $65 million and the assets transferred from the pension trust to the government of Japan of $24 million, offset by a settlement loss of $9 million related to the recognition of previously unrecognized actuarial losses included in accumulated other comprehensive income. In the first quarter of fiscal year 2018, after the Japanese government's final review of our initial payment, we received a refund of $5 million which was recorded as a settlement gain.

Components of Net periodic cost. The service cost component is recorded in cost of sales and operating expenses in the consolidated statement of operations. All other cost components are recorded in other income (expense), net in the consolidated statement of operations. The company uses alternate methods of amortization as allowed by the authoritative guidance which amortizes the actuarial gains and losses on a consistent basis for the years presented. For U.S. Plans, gains and losses are amortized over the average future lifetime of participants using the corridor method. For most Non-U.S. Plans and U.S. Post-Retirement Benefit Plans, gains and losses are amortized using a separate layer for each year's gains and losses.

For the years ended October 31, 2019, 2018 and 2017, components of net periodic benefit cost and other amounts recognized in other comprehensive income were comprised of:

	Pensions						U.S. Post-Retirement Benefit Plans		
	U.S. Plans			Non-U.S. Plans					
	2019	2018	2017	2019	2018	2017	2019	2018	2017
	(in millions)								
Net periodic benefit cost (benefit)									
Service cost — benefits earned during the period	$ —	$ —	$ —	$ 20	$ 20	$ 19	$ —	$ 1	$ 1
Interest cost on benefit obligation	18	16	15	14	13	12	4	3	3
Expected return on plan assets	(27)	(28)	(25)	(43)	(46)	(41)	(7)	(7)	(7)
Amortization of net actuarial loss	1	1	3	34	29	36	4	8	11
Amortization of prior service benefit	—	—	—	—	—	—	(8)	(8)	(9)
Total periodic benefit cost (benefit)	$ (8)	$ (11)	$ (7)	$ 25	$ 16	$ 26	$ (7)	$ (3)	$ (1)
Curtailments and settlements	$ —	$ —	$ —	$ —	$ (5)	$ (32)	$ —	$ —	$ —
Other changes in plan assets and benefit obligations recognized in other comprehensive (income) loss									
Net actuarial (gain) loss	$ 51	$ 2	$ (19)	$ 104	$ 49	$ (128)	$ 5	$ (2)	$ (9)
Amortization of net actuarial loss	(1)	(1)	(3)	(34)	(29)	(36)	(4)	(8)	(11)
Prior service cost (benefit)	—	—	—	—	—	—	—	—	—
Amortization of prior service benefit	—	—	—	—	—	—	8	8	9
Gain due to settlement	—	—	—	—	—	32	—	—	—
Foreign currency	—	—	—	(3)	1	2	—	—	—
Total recognized in other comprehensive (income) loss	$ 50	$ 1	$ (22)	$ 67	$ 21	$ (130)	$ 9	$ (2)	$ (11)
Total recognized in net periodic benefit cost (benefit) and other comprehensive (income) loss	$ 42	$ (10)	$ (29)	$ 92	$ 32	$ (136)	$ 2	$ (5)	$ (12)

Funded Status. As of October 31, 2019 and 2018, the funded status of the defined benefit and post-retirement benefit plans was:

	U.S. Defined Benefit Plans		Non-U.S. Defined Benefit Plans		U.S. Post-Retirement Benefit Plans	
	2019	2018	2019	2018	2019	2018
			(in millions)			
Change in fair value of plan assets:						
Fair value — beginning of year	$ 401	$ 414	$ 825	$ 855	$ 90	$ 95
Actual return on plan assets	50	8	85	(9)	11	1
Employer contributions	—	—	21	21	—	—
Participants' contributions	—	—	1	—	—	—
Benefits paid	(19)	(21)	(29)	(26)	(6)	(6)
Settlements	—	—	—	5	—	—
Currency impact	—	—	8	(21)	—	—
Fair value — end of year	$ 432	$ 401	$ 911	$ 825	$ 95	$ 90
Change in benefit obligation:						
Benefit obligation — beginning of year	$ 420	$ 445	$ 913	$ 935	$ 87	$ 97
Service cost	—	—	20	20	—	1
Interest cost	18	16	14	13	4	3
Participants' contributions	—	—	1	—	—	—
Plan amendment	—	—	—	1	—	—
Actuarial (gain) loss	74	(19)	143	(6)	9	(7)
Benefits paid	(21)	(22)	(29)	(27)	(6)	(7)
Currency impact	—	—	5	(23)	—	—
Benefit obligation — end of year	$ 491	$ 420	$ 1,067	$ 913	$ 94	$ 87
Overfunded (underfunded) status of PBO	$ (59)	$ (19)	$ (156)	$ (88)	$ 1	$ 3
Amounts recognized in the consolidated balance sheet consist of:						
Other assets	$ —	$ —	$ 106	$ 95	$ 1	$ 3
Employee compensation and benefits	(1)	(1)	—	—	—	—
Retirement and post-retirement benefits	(58)	(18)	(262)	(183)	—	—
Total net asset (liability)	$ (59)	$ (19)	$ (156)	$ (88)	$ 1	$ 3
Amounts Recognized in Accumulated Other Comprehensive Income (loss):						
Actuarial (gains) losses	$ 115	$ 65	$ 330	$ 263	$ 10	$ 10
Prior service costs (benefits)	—	—	—	—	(12)	(20)
Total	$ 115	$ 65	$ 330	$ 263	$ (2)	$ (10)

The amounts in accumulated other comprehensive income expected to be recognized by Agilent as components of net expense during 2020 are as follows:

	U.S. Defined Benefit Plans	Non-U.S. Defined Benefit Plans	U.S. Post-Retirement Benefit Plans
		(in millions)	
Amortization of net prior service cost (benefit)	$ —	$ —	$ (7)
Amortization of actuarial net loss (gain)	$ 3	$ 48	$ 4

Investment Policies and Strategies as of October 31, 2019 and 2018. In the U.S., target asset allocations for our retirement and post-retirement benefit plans are approximately 80 percent to equities and approximately 20 percent to fixed income investments. Our DPSP target asset allocation is approximately 60 percent to equities and approximately 40 percent to fixed income investments. Approximately 3 percent of our U.S. equity portfolio consists of limited partnerships. The general investment objective for all our plan assets is to obtain the optimum rate of investment return on the total investment portfolio consistent with the assumption of a reasonable level of risk. Specific investment objectives for the plans' portfolios are to: maintain and enhance the purchasing power of the plans' assets; achieve investment returns consistent with the level of risk being taken; and earn performance rates of return in accordance with the benchmarks adopted for each asset class. Outside the U.S., our target asset allocation ranges from 31 to 60 percent to equities, from 38 to 61 percent to fixed income investments, and from zero to 25 percent to real estate, depending on the plan. All plans' assets are broadly diversified. Due to fluctuations in equity markets, our actual allocations of plan assets at October 31, 2019 and 2018 differ from the target allocation. Our policy is to bring the actual allocation in line with the target allocation.

Equity securities include exchange-traded common stock and preferred stock of companies from broadly diversified industries. Fixed income securities include a global portfolio of corporate bonds of companies from diversified industries, government securities, mortgage-backed securities, asset-backed securities, derivative instruments and other. Other investments include a group trust consisting primarily of private equity partnerships. Portions of the cash and cash equivalent, equity, and fixed income investments are held in commingled funds that are valued using Net Asset Value ("NAV") as the practical expedient. In addition, some of the investments valued using NAV as the practical expedient may have limits on their redemption to weekly or monthly and/or may require prior written notice specified by each fund.

Fair Value. The measurement of the fair value of pension and post-retirement plan assets uses the valuation methodologies and the inputs as described in Note 12, "Fair Value Measurements".

Cash and Cash Equivalents - Cash and cash equivalents consist of short-term investment funds. The funds also invest in short-term domestic fixed income securities and other securities with debt-like characteristics emphasizing short-term maturities and quality. Some of our cash and cash equivalents are held in commingled funds. Other cash and cash equivalents are classified as Level 1 investments.

Equity - Some equity securities consisting of common and preferred stock that are not traded on an active market are valued at quoted prices reported by investment dealers based on the underlying terms of the security and comparison to similar securities traded on an active market; these are classified as Level 2 investments. Securities which have quoted prices in active markets are classified as Level 1 investments.

Fixed Income - Some of the fixed income securities are not actively traded and are valued at quoted prices based on the terms of the security and comparison to similar securities traded on an active market; these are classified as Level 2 investments. Securities which have quoted prices in active markets are classified as Level 1 investments.

Other Investments - Other investments also includes partnership investments where, due to their private nature, pricing inputs are not readily observable. Asset valuations are developed by the general partners that manage the partnerships. These valuations are based on proprietary appraisals, application of public market multiples to private company cash flows, utilization of market transactions that provide valuation information for comparable companies and other methods. Holdings of limited partnerships are classified as Level 3.

Agilent has adopted the accounting guidance related to the presentation of certain investments using the NAV practical expedient. The accounting guidance exempts investments using this practical expedient from categorization within the fair value hierarchy.

The following tables present the fair value of U.S. Defined Benefit Plans assets classified under the appropriate level of the fair value hierarchy as of October 31, 2019 and 2018.

	October 31, 2019	Fair Value Measurement at October 31, 2019 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 1	$ —	$ —	$ —	$ 1
Equity	336	78	—	—	258
Fixed Income	91	46	—	—	45
Other Investments	4	—	—	4	—
Total assets measured at fair value	$ 432	$ 124	$ —	$ 4	$ 304

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

	October 31, 2018	Fair Value Measurement at October 31, 2018 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 4	$ —	$ —	$ —	$ 4
Equity	308	69	—	—	239
Fixed Income	83	36	5	—	42
Other Investments	6	—	—	6	—
Total assets measured at fair value	$ 401	$ 105	$ 5	$ 6	$ 285

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

For U.S. Defined Benefit Plans assets measured at fair value using significant unobservable inputs (level 3), the following table summarizes the change in balances during 2019 and 2018:

	Years Ended October 31. 2019	2018
Balance, beginning of year	$ 6	$ 7
Realized gains/(losses)	(1)	—
Unrealized gains/(losses)	1	1
Purchases, sales, issuances, and settlements	(2)	(2)
Transfers in (out)	—	—
Balance, end of year	$ 4	$ 6

The following tables present the fair value of U.S. Post-Retirement Benefit Plans assets classified under the appropriate level of the fair value hierarchy as of October 31, 2019 and 2018.

	October 31, 2019	Fair Value Measurement at October 31, 2019 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 3	$ —	$ —	$ —	$ 3
Equity	69	18	—	—	51
Fixed Income	21	11	—	—	10
Other Investments	2	—	—	2	—
Total assets measured at fair value	$ 95	$ 29	$ —	$ 2	$ 64

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

	October 31, 2018	Fair Value Measurement at October 31, 2018 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 3	$ —	$ —	$ —	$ 3
Equity	65	15	—	—	50
Fixed Income	18	9	—	—	9
Other Investments	4	—	—	4	—
Total assets measured at fair value	$ 90	$ 24	$ —	$ 4	$ 62

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

For U.S. Post-Retirement Benefit Plans assets measured at fair value using significant unobservable inputs (level 3), the following table summarizes the change in balances during 2019 and 2018:

	Years Ended October 31, 2019	2018
Balance, beginning of year	$ 4	$ 4
Realized gains/(losses)	(1)	—
Unrealized gains/(losses)	—	1
Purchases, sales, issuances, and settlements	(1)	(1)
Transfers in (out)	—	—
Balance, end of year	$ 2	$ 4

The following tables present the fair value of non-U.S. Defined Benefit Plans assets classified under the appropriate level of the fair value hierarchy as of October 31, 2019 and 2018:

	October 31, 2019	Fair Value Measurement at October 31, 2019 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 1	$ —	$ 1	$ —	$ —
Equity	512	318	61	—	133
Fixed Income	398	98	213	—	87
Other Investments	—	—	—	—	—
Total assets measured at fair value	$ 911	$ 416	$ 275	$ —	$ 220

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

	October 31, 2018	Fair Value Measurement at October 31, 2018 Using: Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Not Subject to Leveling [1]
			(in millions)		
Cash and Cash Equivalents	$ 2	$ —	$ 2	$ —	$ —
Equity	489	298	60	—	131
Fixed Income	334	76	228	—	30
Other Investments	—	—	—	—	—
Total assets measured at fair value	$ 825	$ 374	$ 290	$ —	$ 161

(1) Investments measured at the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

The table below presents the combined projected benefit obligation ("PBO"), accumulated benefit obligation ("ABO") and fair value of plan assets, grouping plans using comparisons of the PBO and ABO relative to the plan assets as of October 31, 2019 or 2018.

	2019		2018	
	Benefit Obligation PBO	Fair Value of Plan Assets	Benefit Obligation PBO	Fair Value of Plan Assets
	(in millions)			
U.S. defined benefit plans where PBO exceeds the fair value of plan assets	$ 491	$ 432	$ 420	$ 401
U.S. defined benefit plans where fair value of plan assets exceeds PBO	—	—	—	—
Total	$ 491	$ 432	$ 420	$ 401
Non-U.S. defined benefit plans where PBO exceeds or is equal to the fair value of plan assets	$ 752	$ 490	$ 563	$ 380
Non-U.S. defined benefit plans where fair value of plan assets exceeds PBO	315	421	350	445
Total	$ 1,067	$ 911	$ 913	$ 825
	ABO		ABO	
U.S. defined benefit plans where ABO exceeds the fair value of plan assets	$ 491	$ 432	$ 420	$ 401
U.S. defined benefit plans where the fair value of plan assets exceeds ABO	—	—	—	—
Total	$ 491	$ 432	$ 420	$ 401
Non-U.S. defined benefit plans where ABO exceeds or is equal to the fair value of plan assets	$ 651	$ 418	$ 543	$ 380
Non-U.S. defined benefit plans where fair value of plan assets exceeds ABO	381	493	343	445
Total	$ 1,032	$ 911	$ 886	$ 825

Contributions and Estimated Future Benefit Payments. During fiscal year 2020, we do not expect to contribute to the U.S. defined benefit plans and the Post-Retirement Medical Plans. We expect to contribute $24 million to plans outside the U.S. The following table presents expected future benefit payments for the next 10 years:

	U.S. Defined Benefit Plans	Non-U.S. Defined Benefit Plans	U.S. Post-Retirement Benefit Plans
		(in millions)	
2020	$ 35	$ 25	$ 8
2021	$ 36	$ 27	$ 8
2022	$ 33	$ 29	$ 7
2023	$ 35	$ 32	$ 7
2024	$ 37	$ 32	$ 7
2025 – 2029	$ 146	$ 170	$ 35

Assumptions. The assumptions used to determine the benefit obligations and expense for our defined benefit and post-retirement benefit plans are presented in the tables below. The expected long-term return on assets below represents an estimate of long-term returns on investment portfolios consisting of a mixture of equities, fixed income and alternative investments in proportion to the asset allocations of each of our plans. We consider long-term rates of return, which are weighted based on the asset classes (both historical and forecasted) in which we expect our pension and post-retirement funds to be invested. Discount rates reflect the current rate at which pension and post-retirement obligations could be settled based on the measurement dates of the plans - October 31. The U.S. discount rates at October 31, 2019 and 2018, were determined based on the results of matching expected plan benefit payments with cash flows from a hypothetically constructed bond portfolio. The non-U.S. rates were

generally based on published rates for high-quality corporate bonds. The range of assumptions that were used for the non-U.S. defined benefit plans reflects the different economic environments within various countries.

Assumptions used to calculate the net periodic cost in each year were as follows:

	For years ended October 31,		
	2019	2018	2017
U.S. defined benefit plans:			
Discount rate	4.50%	3.75%	3.75%
Expected long-term return on assets	7.00%	7.00%	7.25%
Non-U.S. defined benefit plans:			
Discount rate	0.83-2.68%	0.67-2.52%	0.22-2.66%
Average increase in compensation levels	2.25-3.25%	2.00-3.25%	2.00-4.25%
Expected long-term return on assets	4.00-5.75%	4.00-6.00%	4.00-6.25%
U.S. post-retirement benefits plans:			
Discount rate	4.25%	3.50%	3.50%
Expected long-term return on assets	7.00%	7.00%	7.25%
Current medical cost trend rate	6.00%	6.00%	6.00%
Ultimate medical cost trend rate	3.50%	3.50%	3.50%
Medical cost trend rate decreases to ultimate rate in year	2029	2029	2029

Assumptions used to calculate the benefit obligation were as follows:

	As of the Years Ending October 31,	
	2019	2018
U.S. defined benefit plans:		
Discount rate	3.25%	4.50%
Non-U.S. defined benefit plans:		
Discount rate	0.22-1.81%	0.83-2.68%
Average increase in compensation levels	2.25-3.00%	2.25-3.25%
U.S. post-retirement benefits plans:		
Discount rate	3.00%	4.25%
Current medical cost trend rate	6.25%	6.00%
Ultimate medical cost trend rate	4.50%	3.50%
Medical cost trend rate decreases to ultimate rate in year	2029	2029

Health care trend rates do not have a significant effect on the total service and interest cost components or on the post-retirement benefit obligation amounts reported for the U.S. Post-Retirement Benefit Plan for the year ended October 31, 2019.

15. GUARANTEES

Standard Warranty

We accrue for standard warranty costs based on historical trends in warranty charges as a percentage of net product shipments. The accrual is reviewed regularly and periodically adjusted to reflect changes in warranty cost estimates. Estimated warranty charges are recorded within cost of products at the time products are sold. The standard warranty accrual balances are held in other accrued and other long-term liabilities on our consolidated balance sheet. Our standard warranty terms typically extend to one years from the date of delivery, depending on the product.

A summary of the standard warranty accrual activity is shown in the table below. The standard warranty accrual balances are recorded in other accrued liabilities.

	October 31,	
	2019	2018
	(in millions)	
Balance as of October 31, 2018 and 2017	$ 35	$ 34
Accruals for warranties including change in estimates	54	53
Settlements made during the period	(57)	(52)
Balance as of October 31, 2019 and 2018	$ 32	$ 35
Accruals for warranties due within one year	32	35

Bank Guarantees

Guarantees consist primarily of outstanding standby letters of credit and bank guarantees and were approximately $40 million as of October 31, 2019. A standby letter of credit is a guarantee of payment issued by a bank on behalf of us that is used as payment of last resort should we fail to fulfill a contractual commitment with a third party. A bank guarantee is a promise from a bank or other lending institution that if we default on a loan, the bank will cover the loss.

Indemnifications in Connection with Transactions

In connection with various divestitures, acquisitions, spin-offs and other transactions, we have agreed to indemnify certain parties, their affiliates and/or other related parties against certain damages and expenses that might occur in the future. These indemnifications may cover a variety of liabilities, including, but not limited to, employee, tax, environmental, intellectual property, litigation and other liabilities related to the business conducted prior to the date of the transaction. In our opinion, the fair value of these indemnification obligations was not material as of October 31, 2019.

Indemnifications to Officers and Directors

Our corporate bylaws require that we indemnify our officers and directors, as well as those who act as directors and officers of other entities at our request, against expenses, judgments, fines, settlements and other amounts actually and reasonably incurred in connection with any proceedings arising out of their services to Agilent and such other entities, including service with respect to employee benefit plans. In addition, we have entered into separate indemnification agreements with each director and each board-appointed officer of Agilent which provide for indemnification of these directors and officers under similar circumstances and under additional circumstances. The indemnification obligations are more fully described in the bylaws and the indemnification agreements. We purchase standard insurance to cover claims or a portion of the claims made against our directors and officers. Since a maximum obligation is not explicitly stated in our bylaws or in our indemnification agreements and will depend on the facts and circumstances that arise out of any future claims, the overall maximum amount of the obligations cannot be reasonably estimated. Historically, we have not made payments related to these obligations, and the fair value for these indemnification obligations was not material as of October 31, 2019.

Other Indemnifications

As is customary in our industry and as provided for in local law in the U.S. and other jurisdictions, many of our standard contracts provide remedies to our customers and others with whom we enter into contracts, such as defense, settlement, or payment of judgment for intellectual property claims related to the use of our products. From time to time, we indemnify customers, as well as our suppliers, contractors, lessors, lessees, companies that purchase our businesses or assets and others with whom we enter into contracts, against combinations of loss, expense, or liability arising from various triggering events related to the sale and the use of our products and services, the use of their goods and services, the use of facilities and state of our owned facilities, the state of the assets and businesses that we sell and other matters covered by such contracts, usually up to a specified maximum amount. In addition, from time to time we also provide protection to these parties against claims related to undiscovered liabilities, additional product liability or environmental obligations. In our experience, claims made under such indemnifications are rare and the associated estimated fair value of the liability was not material as of October 31, 2019.

In connection with the sale of several of our businesses, we have agreed to indemnify the buyers of such business, their respective affiliates and other related parties against certain damages that they might incur in the future. The continuing indemnifications primarily cover damages relating to liabilities of the businesses that Agilent retained and did not transfer to the buyers, as well as other specified items. In our opinion, the fair value of these indemnification obligations was not material as of October 31, 2019.

16. COMMITMENTS AND CONTINGENCIES

Operating Lease Commitments: We lease certain real and personal property from unrelated third parties under non-cancelable operating leases. Certain leases require us to pay property taxes, insurance and routine maintenance, and include escalation clauses. Total rent expense was $75 million in 2019, $64 million in 2018 and $57 million in 2017.

Future non-cancelable minimum lease payments and future minimum lease income under operating leases at October 31, 2019:

	Future Minimum Lease Payments	Future Minimum Lease Income
	(in millions)	
2020	$ 52	$ 8
2021	$ 41	$ 6
2022	$ 29	$ 5
2023	$ 21	$ —
2024	$ 14	$ —
Thereafter	$ 56	$ —

Other Purchase Commitments. Typically, we can cancel contracts with professional services suppliers without penalties. For those contracts that are not cancelable without penalties, the termination fees and costs or commitments for continued spending that we are obligated to pay to a supplier under each contact's termination period before such contract can be cancelled were approximately $77 million. Approximately $25 million of the penalties for the new contracts will reduce over the next 14 years.

Contingencies: We are involved in lawsuits, claims, investigations and proceedings, including, but not limited to, intellectual property, commercial, real estate, environmental and employment matters, which arise in the ordinary course of business. There are no matters pending that we currently believe are reasonably possible of having a material impact to our business, consolidated financial condition, results of operations or cash flows.

17. SHORT-TERM DEBT

Credit Facilities

On March 13, 2019, Agilent entered into a credit agreement with a group of financial institutions which provides for a $1 billion five-year unsecured credit facility that will expire on March 13, 2024. The credit facility replaces the existing credit facility which terminated on the closing date of the new facility. For the year ended October 31, 2019, we borrowed $305 million and repaid $190 million under the credit facility. As of October 31, 2019, the company had borrowings of $115 million outstanding under the credit facility. We were in compliance with the covenants for the credit facility during the year ended October 31, 2019. On August 7, 2019, we entered into an amendment to the credit agreement, which provides for a $500 million short-term loan facility that was used in full to complete the BioTek acquisition and which is outstanding at October 31, 2019. On October 21, 2019, we entered into a second amendment to the credit agreement, which refreshed the amount available for additional incremental term loan facilities under the credit agreement to permit additional incremental facilities of up to $500 million. We had no borrowings under the additional incremental facilities as of October 31, 2019.

Capital Leases

The company leases certain property and equipment under capital leases. As of October 31, 2019, the current portion of the company's capital lease obligations had an aggregate carrying value of $1 million.

2020 Senior Notes

On July 13, 2010, the company issued an aggregate principal amount of $500 million in senior notes ("2020 senior notes"). The 2020 senior notes were issued at 99.54% of their principal amount. The notes were scheduled to mature on July 15, 2020, and bear interest at a fixed rate of 5.00% per annum.

On August 9, 2011, we terminated our interest rate swap contracts related to our 2020 senior notes that represented the notional amount of $500 million. The asset value, including interest receivable, upon termination for these contracts was approximately $34 million. The gain was deferred and amortized to interest expense over the remaining life of the 2020 senior notes.

On September 17, 2019, we repaid the $500 million outstanding aggregate principal amount of our 2020 senior notes due July 15, 2020 that were called for redemption on August 16, 2019. The redemption price of approximately $512 million included a $12 million prepayment penalty. The redemption price was computed in accordance with the terms of the 2020 senior notes as the present value of the remaining scheduled payments of principal and unpaid interest related to the redemption. The prepayment penalty plus amortization of the previously deferred interest swap gain of $4 million and amortization of previously deferred debt issuance costs and discount of $1 million was recorded in other income (expense), net in the consolidated statement of operations. We also paid accrued and unpaid interest of $4 million on the 2020 senior notes up to but not including the redemption date.

2017 Senior Notes

On October 24, 2007, the company issued an aggregate principal amount of $600 million in senior notes ("2017 senior notes"). On October 20, 2014, we settled the redemption of $500 million of the $600 million outstanding aggregate principal amount of our 2017 senior notes. The 2017 senior notes were repayable within one year as of October 31, 2017 and were reclassified to short-term debt. The remaining $100 million in 2017 senior notes matured and were paid in full on November 1, 2017.

18. LONG-TERM DEBT

Senior Notes

The following table summarizes the company's long-term senior notes and the related interest rate swaps:

	October 31, 2019			October 31, 2018		
	Amortized Principal	Swap	Total	Amortized Principal	Swap	Total
	(in millions)					
2020 Senior Notes	$ —	$ —	$ —	$ 499	$ 7	$ 506
2022 Senior Notes	399	—	399	399	—	399
2023 Senior Notes	597	—	597	597	—	597
2026 Senior Notes	298	—	298	297	—	297
2029 Senior Notes	492	—	492	—	—	—
Total	$ 1,786	$ —	$ 1,786	$ 1,792	$ 7	$ 1,799

2020 Senior Notes

The 2020 senior notes were repaid in 2019, see Note 17, "Short-Term Debt".

2022 Senior Notes

On September 10, 2012, the company issued an aggregate principal amount of $400 million in senior notes ("2022 senior notes"). The 2022 senior notes were issued at 99.80% of their principal amount. The notes will mature on October 1, 2022, and bear interest at a fixed rate of 3.20% per annum. The interest is payable semi-annually on April 1st and October 1st of each year and payments commenced on April 1, 2013.

In July 2012, Agilent executed treasury lock agreements for $400 million in connection with future interest payments to be made on our 2022 senior notes issued on September 10, 2012. The treasury lock contracts were terminated on September 10, 2012 and we recognized a deferred gain in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2022 senior notes. The remaining gain to be amortized related to the treasury lock agreements at October 31, 2019 was $1 million.

2023 Senior Notes

On June 18, 2013, the company issued aggregate principal amount of $600 million in senior notes ("2023 senior notes"). The 2023 senior notes were issued at 99.544% of their principal amount. The notes will mature on July 15, 2023 and bear interest at a fixed rate of 3.875% per annum. The interest is payable semi-annually on January 15th and July 15th of each year and payments commenced January 15, 2014.

2026 Senior Notes

On September 15, 2016, the company issued aggregate principal amount of $300 million in senior notes ("2026 senior notes"). The 2026 senior notes were issued at 99.624% of their principal amount. The notes will mature on September 22, 2026 and bear interest at a fixed rate of 3.05% per annum. The interest is payable semi-annually on March 22nd and September 22nd of each year and payments commenced March 22, 2017.

In February 2016, Agilent executed three forward-starting pay fixed/receive variable interest rate swaps for the notional amount of $300 million in connection with future interest payments to be made on our 2026 senior notes issued on September 15, 2016. The swap arrangements were terminated on September 15, 2016 with a payment of $10 million and we recognized this as a deferred loss in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2026 senior notes.The remaining loss to be amortized related to the interest rate swap agreements at October 31, 2019 was $7 million.

2029 Senior Notes

On September 5, 2019, the company issued an aggregate principal amount of $500 million in senior notes ("2029 senior notes"). The 2029 senior notes were issued at 99.316% of their principal amount. The notes will mature on September 15, 2029, and bear interest at a fixed rate of 2.75% per annum. The interest is payable semi-annually on March 15th and September 15th of each year and payments commence on March 15, 2020.

In August 2019, Agilent executed treasury lock agreements for $250 million in connection with future interest payments to be made on our 2029 senior notes issued on September 5, 2019. We designated the treasury lock as a cash flow hedge. The treasury lock contracts were terminated on September 6, 2019 and we recognized a deferred loss of $6 million in accumulated other comprehensive income which is being amortized to interest expense over the life of the 2029 senior notes. The remaining loss to be amortized related to the treasury lock agreements at October 31, 2019 was $6 million.

Capital Leases

The company leases certain property and equipment under capital leases. As of October 31, 2019, the non-current portion of the company’s capital lease obligations had an aggregate carrying value of $5 million to be paid over 12 years.

19. STOCKHOLDERS' EQUITY

Stock Repurchase Program

On May 28, 2015 we announced that our board of directors had approved a share repurchase program (the "2015 repurchase program"). The 2015 share repurchase program authorizes the purchase of up to $1.14 billion of our common stock at the company's discretion through and including November 1, 2018. The 2015 repurchase program did not require the company to acquire a specific number of shares and could have been suspended or discontinued at any time. During the year ended October 31, 2017, we repurchased and retired approximately 4.1 million shares for $194 million under this authorization. During the year ended October 31, 2018, we repurchased and retired approximately 6.4 million shares for $422 million under this authorization. As of October 31, 2018, we had remaining authorization to repurchase up to $188 million of our common stock under this program which expired on November 1, 2018.

On November 19, 2018 we announced that our board of directors had approved a new share repurchase program (the "2019 repurchase program") designed, among other things, to reduce or eliminate dilution resulting from issuance of stock under the company's employee equity incentive programs. The 2019 share repurchase program authorizes the purchase of up to $1.75 billion of our common stock at the company's discretion and has no fixed termination date. The 2019 repurchase program does not require the company to acquire a specific number of shares and may be suspended, amended or discontinued at any time. During the year ended October 31, 2019, we repurchased and retired approximately 10.4 million shares for $723 million under this authorization. As of October 31, 2019, we had remaining authorization to repurchase up to $1.03 billion of our common stock under this program.

Cash Dividends on Shares of Common Stock

During the year ended October 31, 2019, cash dividends of 0.656 per share, or $206 million were declared and paid on the company's outstanding common stock. During the year ended October 31, 2018, cash dividends of 0.596 per share, or $191 million were declared and paid on the company's outstanding common stock. During the year ended October 31, 2017, cash dividends of 0.528 per share, or $170 million were declared and paid on the company's outstanding common stock.

On November 20, 2019 we declared a quarterly dividend of $0.18 per share of common stock, or approximately $56 million which will be paid on January 22, 2020 to shareholders of record as of the close of business on December 31, 2019. The timing and amounts of any future dividends are subject to determination and approval by our board of directors.

Accumulated Other Comprehensive Income (Loss)

The following table summarizes the components of our accumulated other comprehensive income (loss) as of October 31, 2019 and 2018, net of tax effect:

	October 31,	
	2019	2018
	(in millions)	
Foreign currency translation, net of tax expense of $(5) and $(15) for 2019 and 2018, respectively	$ (204)	(214)
Unrealized losses (including prior service benefit) on defined benefit plans, net of tax benefit of $153 and $132 for 2019 and 2018, respectively	(306)	(201)
Unrealized gains (losses) on derivative instruments, net of tax benefit of $3 and $0 for 2019 and 2018, respectively	(4)	7
Total accumulated other comprehensive loss	$ (514)	$ (408)

Changes in accumulated other comprehensive income (loss) by component and related tax effects for the years ended October 31, 2019 and 2018 were as follows (in millions):

		Net defined benefit pension cost and post retirement plan costs			
	Foreign currency translation	Prior service credits	Actuarial Losses	Unrealized gains (losses) on derivatives	Total
			(in millions)		
As of October 31, 2017	$ (156)	$ 140	$ (328)	$ (2)	$ (346)
Other comprehensive income (loss) before reclassifications	(51)	—	(49)	7	(93)
Amounts reclassified out of accumulated other comprehensive income (loss)	—	(8)	39	4	35
Tax (expense) benefit	(7)	2	3	(2)	(4)
Other comprehensive income (loss)	(58)	(6)	(7)	9	(62)
As of October 31, 2018	$ (214)	$ 134	$ (335)	$ 7	$ (408)
Impact of adoption of new guidance on tax effects in accumulated other comprehensive income (loss)	—	3	(9)	(1)	(7)
As of November 1, 2018	(214)	137	(344)	6	(415)
Other comprehensive loss before reclassifications	—	—	(157)	(6)	(163)
Amounts reclassified out of accumulated other comprehensive income	—	(8)	39	(8)	23
Tax benefit	10	2	25	4	41
Other comprehensive income (loss)	10	(6)	(93)	(10)	(99)
As of October 31, 2019	$ (204)	$ 131	$ (437)	$ (4)	$ (514)

Reclassifications out of accumulated other comprehensive income (loss) for the years ended October 31, 2019 and 2018 were as follows (in millions):

Details about Accumulated Other Comprehensive Income components	Amounts Reclassified from Other Comprehensive Income		Affected line item in statement of operations
	2019	2018	
Unrealized gains and (losses) on derivatives	$ 8	$ (4)	Cost of products and interest expense
	8	(4)	Total before income tax
	(2)	1	(Provision)/benefit for income tax
	6	(3)	Total net of income tax
Net defined benefit pension cost and post retirement plan costs:			
Actuarial net loss	(39)	(39)	Other (income) expense
Prior service benefit	8	8	Other (income) expense
	(31)	(31)	Total before income tax
	12	10	Benefit for income tax
	(19)	(21)	Total net of income tax
Total reclassifications for the period	$ (13)	$ (24)	

Amounts in parentheses indicate reductions to income and increases to other comprehensive income.

Reclassifications of prior service benefit and actuarial net loss in respect of retirement plans and post retirement pension plans are included in the computation of net periodic cost (see Note 14, "Retirement Plans and Post Retirement Pension Plans").

20. SEGMENT INFORMATION

Description of Segments. We are a global leader in life sciences, diagnostics and applied chemical markets, providing application focused solutions that include instruments, software, services and consumables for the entire laboratory workflow.

Agilent has three business segments comprised of the life sciences and applied markets business, diagnostics and genomics business and the Agilent CrossLab business each of which comprises a reportable segment. The three operating segments were determined based primarily on how the chief operating decision maker views and evaluates our operations. Operating results are regularly reviewed by the chief operating decision maker to make decisions about resources to be allocated to the segment and to assess its performance. Other factors, including market separation and customer specific applications, go-to-market channels, products and services and manufacturing are considered in determining the formation of these operating segments.

In 2019, we adopted new guidance related to the presentation of the net periodic pension and postretirement benefit cost. See Note 2, "New Accounting Pronouncements" for more information. As a result, we have recast our historical segment results to conform to this new presentation required under this guidance.

A description of our three reportable segments is as follows:

Our life sciences and applied markets business provides application-focused solutions that include instruments and software that enable customers to identify, quantify and analyze the physical and biological properties of substances and products, as well as enable customers in the clinical and life sciences research areas to interrogate samples at the molecular and cellular level. Key product categories include: liquid chromatography ("LC") systems and components; liquid chromatography mass spectrometry ("LCMS") systems; gas chromatography ("GC") systems and components; gas chromatography mass spectrometry ("GCMS") systems; inductively coupled plasma mass spectrometry ("ICP-MS") instruments; atomic absorption ("AA") instruments; microwave plasma-atomic emission spectrometry ("MP-AES") instruments; inductively coupled plasma optical emission spectrometry ("ICP-OES") instruments; raman spectroscopy; cell analysis plate based assays; flow cytometer; real-time cell analyzer; cell imaging systems; microplate reader; laboratory software for sample tracking; information management and analytics; laboratory automation and robotic systems; dissolution testing; vacuum pumps and measurement technologies.

Our diagnostics and genomics business is comprised of six areas of activity providing active pharmaceutical ingredients ("APIs") for oligo-based therapeutics as well as solutions that include reagents, instruments, software and consumables, which enable customers in the clinical and life sciences research areas to interrogate samples at the cellular and molecular level. First, our genomics business includes arrays for DNA mutation detection, genotyping, gene copy number determination, identification of gene rearrangements, DNA methylation profiling, gene expression profiling, as well as next generation sequencing ("NGS") target enrichment and genetic data management and interpretation support software. This business also includes solutions that enable clinical labs to identify DNA variants associated with genetic disease and help direct cancer therapy. Second, our nucleic acid solutions business provides equipment and expertise focused on production of synthesized oligonucleotides under pharmaceutical good manufacturing practices ("GMP") conditions for use as API in an emerging class of drugs that utilize nucleic acid molecules for disease therapy. Third, our pathology solutions business is focused on product offerings for cancer diagnostics and anatomic pathology workflows. The broad portfolio of offerings includes immunohistochemistry ("IHC"), in situ hybridization ("ISH"), hematoxylin and eosin ("H&E") staining and special staining. Fourth, we also collaborate with a number of major pharmaceutical companies to develop new potential pharmacodiagnostics, also known as companion diagnostics, which may be used to identify patients most likely to benefit from a specific targeted therapy. Fifth, the reagent partnership business is a provider of reagents used for turbidimetry and flow cytometry. Finally, our biomolecular analysis business provides complete workflow solutions, including instruments, consumables and software, for quality control analysis of nucleic acid samples. Samples are analyzed using quantitative and qualitative techniques to ensure accuracy in further genomics analysis techniques utilized in clinical and life science research applications.

The Agilent CrossLab business spans the entire lab with its extensive consumables and services portfolio, which is designed to improve customer outcomes. Most of the portfolio is vendor neutral, meaning Agilent can serve and supply customers regardless of their instrument purchase choices. Solutions range from chemistries and supplies to services and software helping to connect the entire lab. Key product categories in consumables include GC and LC columns, sample preparation products, custom chemistries, and a large selection of laboratory instrument supplies. Services include startup, operational, training and compliance support, software as a service, as well as asset management and consultative services that help increase customer productivity. Custom service and consumable bundles are tailored to meet the specific application needs of various industries and to keep instruments fully operational and compliant with the respective industry requirements.

A significant portion of the segments' expenses arise from shared services and infrastructure that we have historically provided to the segments in order to realize economies of scale and to efficiently use resources. These expenses, collectively called corporate charges, include legal, accounting, tax, real estate, insurance services, information technology services, treasury, order administration, other corporate infrastructure expenses and costs of centralized research and development. Charges are allocated to the segments, and the allocations have been determined on a basis that we consider to be a reasonable reflection of the utilization of services provided to or benefits received by the segments. In addition, we do not allocate amortization and impairment of acquisition-related intangible assets, pension curtailment or settlement gains, restructuring and transformational initiatives expenses, acquisition and integration costs, business exit and divestiture costs, special compliance costs, some nucleic acid solutions division ("NASD") site costs and certain other charges to the operating margin for each segment because management does not include this information in its measurement of the performance of the operating segments.Transformational initiatives include expenses associated with targeted cost reduction activities such as manufacturing transfers, site consolidations, legal entity and other business reorganizations, in-sourcing or outsourcing of activities.

The following tables reflect the results of our reportable segments under our management reporting system. The performance of each segment is measured based on several metrics, including segment income from operations. These results are used, in part, by the chief operating decision maker in evaluating the performance of, and in allocating resources to, each of the segments.

The profitability of each of the segments is measured after excluding restructuring and asset impairment charges, transformational initiatives, investment gains and losses, interest income, interest expense, acquisition and integration costs, non-cash amortization and other items as noted in the reconciliations below.

	Life Sciences and Applied Markets	Diagnostics and Genomics	Agilent CrossLab	Total Segments
		(in millions)		
Year Ended October 31, 2019:				
Total net revenue	$ 2,302	$ 1,021	$ 1,840	$ 5,163
Income from operations	$ 542	$ 185	$ 475	$ 1,202
Depreciation expense	$ 41	$ 35	$ 35	$ 111
Share-based compensation expense	$ 33	$ 14	$ 25	$ 72
Year Ended October 31, 2018:				
Total net revenue	$ 2,270	$ 943	$ 1,701	$ 4,914
Income from operations	$ 543	$ 173	$ 388	$ 1,104
Depreciation expense	$ 38	$ 33	$ 31	$ 102
Share-based compensation expense	$ 33	$ 14	$ 24	$ 71
Year Ended October 31, 2017:				
Total net revenue	$ 2,081	$ 860	$ 1,531	$ 4,472
Income from operations	$ 470	$ 167	$ 336	$ 973
Depreciation expense	$ 35	$ 30	$ 29	$ 94
Share-based compensation expense	$ 30	$ 10	$ 21	$ 61

The following table reconciles reportable segments' income from operations to Agilent's total enterprise income before taxes:

	Years Ended October 31,		
	2019	2018	2017
		(in millions)	
Total reportable segments' income from operations	$ 1,202	$ 1,104	$ 973
Amortization of intangible assets related to business combinations	(125)	(105)	(117)
Acquisition and integration costs	(48)	(23)	(30)
Transformational initiatives	(44)	(25)	(12)
Asset impairments	—	(21)	—
Business exit and divestiture costs (primarily our NMR business)	—	(9)	—
NASD site costs	(12)	(8)	—
Special compliance costs	(2)	(4)	—
Other[(1)]	(30)	(5)	(7)
Interest Income	36	38	22
Interest Expense	(74)	(75)	(79)
Other income (expense), net	16	79	53
Income before taxes, as reported	$ 919	$ 946	$ 803

(1) The other category primarily includes legal costs related to our pursuing our claim against a third party in addition to other miscellaneous adjustments and settlements.

Major Customers. No customer represented 10 percent or more of our total net revenue in 2019, 2018 or 2017.

The following table reflects segment assets and capital expenditures under our management reporting system. Segment assets include allocations of corporate assets, goodwill, net other intangibles and other assets. Unallocated assets primarily consist of cash, cash equivalents, the valuation allowance relating to deferred tax assets and other assets.

	Life Sciences and Applied Markets	Diagnostics and Genomics	Agilent CrossLab	Total Segments
		(in millions)		
As of and for the Year Ended October 31, 2019:				
Assets	$ 3,202	$ 2,620	$ 1,331	$ 7,153
Capital expenditures	$ 59	$ 48	$ 48	$ 155
As of and for the Year Ended October 31, 2018:				
Assets	$ 1,744	$ 2,679	$ 1,267	$ 5,690
Capital expenditures	$ 47	$ 92	$ 38	$ 177

The following table reconciles segment assets to Agilent's total assets:

	October 31,	
	2019	2018
	(in millions)	
Total reportable segments' assets	$ 7,153	$ 5,690
Cash, cash equivalents	1,382	2,247
Prepaid expenses	94	80
Investments	102	68
Long-term and other receivables	100	102
Other	621	354
Total assets	$ 9,452	$ 8,541

The other category primarily includes deferred tax assets and overfunded pension assets which are not allocated to the segments.

The following table presents summarized information for net revenue by geographic region. Revenues from external customers are generally attributed to countries based upon the customer's location.

	United States	China[1]	Rest of the World	Total
		(in millions)		
Net revenue:				
Year Ended October 31, 2019	$ 1,619	$ 1,019	$ 2,525	$ 5,163
Year Ended October 31, 2018	$ 1,414	$ 1,015	$ 2,485	$ 4,914
Year Ended October 31, 2017	$ 1,314	$ 900	$ 2,258	$ 4,472

1. China also includes Hong Kong net revenue.

The following table presents summarized information for long-lived assets by geographic region. Long lived assets consist of property, plant, and equipment, long-term receivables and other long-term assets excluding intangible assets. The rest of the world primarily consists of Asia and the rest of Europe.

	United States	Germany	Rest of the World	Total
		(in millions)		
Long-lived assets:				
October 31, 2019	$ 621	$ 122	$ 404	$ 1,147
October 31, 2018	$ 565	$ 117	$ 362	$ 1,044

QUARTERLY SUMMARY

(Unaudited)

	Three Months Ended			
	January 31,	April 30,	July 31,	October 31,
	(in millions, except per share data)			
2019				
Net revenue	$ 1,284	$ 1,238	$ 1,274	$ 1,367
Gross profit	707	669	692	737
Income from operations	250	216	225	250
Net income	504	182	191	194
Net income per share — Basic	$ 1.58	$ 0.57	$ 0.61	$ 0.63
Net income per share — Diluted	$ 1.57	$ 0.57	$ 0.60	$ 0.62
Weighted average shares used in computing net income per share:				
Basic	318	317	312	309
Diluted	322	321	316	313
Cash dividends per common share	$ 0.164	$ 0.164	$ 0.164	$ 0.164
2018				
Net revenue	$ 1,211	$ 1,206	$ 1,203	$ 1,294
Gross profit[(1)]	670	643	659	708
Income from operations[(1)]	229	210	221	244
Net income (loss)	(320)	205	236	195
Net income (loss) per share — Basic	$ (0.99)	$ 0.64	$ 0.74	$ 0.61
Net income (loss) per share — Diluted	$ (0.99)	$ 0.63	$ 0.73	$ 0.61
Weighted average shares used in computing net income per share:				
Basic	323	322	320	319
Diluted	323	326	324	322
Cash dividends per common share	$ 0.149	$ 0.149	$ 0.149	$ 0.149

(1) In 2019, we adopted new guidance related to the presentation of the net periodic pension and postretirement benefit cost. See Note 2, "New Accounting Pronouncements" for more information. As a result, we have recast our 2018 quarterly gross profit and income from operations to reflect this new guidance.

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 has evaluated, under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, the effectiveness of our disclosure controls and procedures as of October 31, 2019, pursuant to and as required by Rule 13a-15(b) under the Securities Exchange Act of 1934 ("Exchange Act"). Based on that evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as of October 31, 2019, the company's disclosure controls and procedures, as defined by Rule 13a-15(e) under the Exchange Act, were effective and designed to ensure that (i) information required to be disclosed in the company's reports filed under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and (ii) information is accumulated and communicated to management, including the Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosures.

Management's Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we assessed the effectiveness of our internal control over financial reporting based on the framework in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). As a result of that assessment, management concluded that our internal control over financial reporting was effective as of October 31, 2019 based on criteria in *Internal Control - Integrated Framework* (2013) issued by the COSO.

SEC staff guidance discusses the exclusion of an acquired business's internal controls from management's annual assessment of the internal controls over financial reporting when it is not possible to conduct assessments for the acquired business in the period between the acquisition date and the date of management's assessment. The company completed the acquisitions of Lionheart Technologies LLC ("BioTek") on August 23, 2019 and ACEA Biosciences ("ACEA") on November 14, 2018. Management excluded both BioTek and ACEA from its assessment of the effectiveness of the company's internal control over financial reporting as of October 31, 2019. BioTek and ACEA combined constituted approximately 2 percent of total assets and less than 2 percent of total revenue as of and for the year ended October 31, 2019.

The effectiveness of our internal control over financial reporting as of October 31, 2019 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which appears in Item 8 of this Annual Report on Form 10-K.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting that occurred during Agilent's last 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 regarding our directors appears under "Proposal No. 1 - Election of Directors" in our Proxy Statement for the Annual Meeting of Stockholders ("Proxy Statement"), to be held March 18, 2020. That portion of the Proxy Statement is incorporated by reference into this report. Information regarding our executive officers appears in Item 1 of this report under "Executive Officers of the Registrant." Information regarding our Audit and Finance Committee and our Audit and Finance Committee's financial expert appears under "Audit and Finance Committee Report" and "Corporate Governance" in our Proxy Statement. That portion of the Proxy Statement is incorporated by reference into this report.

Other than an amendment and restatement of our bylaws to implement "proxy access" starting in our 2021 annual meeting, which was previously disclosed in our Current Report on Form 8-K filed on September 18, 2019, there were no material changes to the procedures by which security holders may recommend nominees to our Board of Directors. Information regarding our code of ethics (the company's Standards of Business Conduct) applicable to our principal executive officer, our principal financial officer, our controller and other senior financial officers appears in Item 1 of this report under "Investor Information." We will post amendments to or waivers from a provision of the Standards of Business Conduct with respect to those persons on our website at www.investor.agilent.com.

Compliance with Section 16(a) of the Exchange Act

Information about compliance with Section 16(a) of the Exchange Act appears under "Section 16(a) Beneficial Ownership Reporting Compliance" in the Proxy Statement. That portion of the Proxy Statement is incorporated by reference into this report.

Item 11. ***Executive Compensation***

Information about compensation of our named executive officers appears under "Executive Compensation" in the Proxy Statement. Information about compensation of our directors appears under "Compensation of Non-Employee Directors" and "Compensation Committee Report" in the Proxy Statement. Those portions of the Proxy Statement are incorporated by reference into this report.

Item 12. ***Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters***

Information about security ownership of certain beneficial owners and management appears under "Beneficial Ownership" in the Proxy Statement. That portion of the Proxy Statement is incorporated by reference into this report.

EQUITY COMPENSATION PLAN INFORMATION

The following table summarizes information about our equity compensation plans as of October 31, 2019. All outstanding awards relate to our common stock.

Plan Category	Number of Securities to be Issued upon Exercise of Outstanding Options, Warrants and Rights	Weighted-average Exercise Price of Outstanding Options, Warrants and Rights	Number of Securities Remaining Available for Future Issuance under Equity Compensation Plans (Excluding Securities Reflected in Column (a))
	(a)	(b)	(c)
Equity compensation plans approved by security holders (1)(2)(3)	4,617,581	$ 36	54,732,097
Equity compensation plans not approved by security holders	—	—	—
Total	4,617,581	$ 36	54,732,097

(1) The number of securities remaining available for future issuance in column (c) includes 26,055,571 shares of common stock authorized and available for issuance under our current Employee Stock Purchase Plan ("ESPP"). The number of shares authorized for issuance under the ESPP is subject to an automatic annual increase of the lesser of one percent of the outstanding common stock of Agilent or an amount determined by the Compensation Committee of our Board of Directors. Under the terms of the ESPP, in no event shall the aggregate number of shares issued under the ESPP exceed 75 million shares.

(2) We issue securities under our equity compensation plans in forms other than options, warrants or rights. On November 15, 2017 and March 21, 2018, the Board and the stockholders, respectively, approved the Agilent Technologies, Inc. 2018 Stock Plan (the "2018 Plan"), which was an amendment and restatement of the company's 2009 Stock Plan, approved by the Board and the stockholders, respectively, on November 19, 2008 and March 11, 2009. The 2018 Plan provides for awards of stock-based incentive compensation to our employees (including officers), directors and consultants. The 2018 Plan provides for the grant of awards in the form of stock options, stock appreciation rights, restricted stock, restricted stock units, performance shares and performance units with performance-based conditions to vesting or exercisability, and cash awards. The 2018 Plan has a term of ten years.

(3) We issue securities under our equity compensation plans in forms which do not require a payment by the recipient to us at the time of exercise or vesting, including restricted stock, restricted stock units and performance units. Accordingly, the weighted-average exercise price in column (b) does not take these awards into account.

Item 13. ***Certain Relationships and Related Transactions, and Director Independence***

Information about certain relationships and related transactions appears under "Related Person Transactions Policy and Procedures" in the Proxy Statement. Information about director independence appears under the heading "Corporate Governance — Director Independence" in the Proxy Statement. Each of those portions of the Proxy Statement is incorporated by reference into this report.

Item 14. ***Principal Accounting Fees and Services***

Information about principal accountant fees and services as well as related pre-approval policies appears under "Fees Paid to PricewaterhouseCoopers LLP" and "Policy on Preapproval of Audit and Permissible Non-Audit Services of Independent Registered Public Accounting Firm" in the Proxy Statement. Those portions of the Proxy Statement are incorporated by reference into this report.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) The following documents are filed as part of this report:

1. **Financial Statements.**

   See Index to Consolidated Financial Statements under Item 8 on Page 52 of this report.

2. **Financial Statement Schedule.**

The following additional financial statement schedule should be considered in conjunction with our consolidated financial statements. All other schedules have been omitted because the required information is either not applicable or not sufficiently material to require submission of the schedule:

SCHEDULE II

SCHEDULE II
VALUATION AND QUALIFYING ACCOUNTS

Column A	Column B	Column C	Column D	Column E
Description	Balance at Beginning of Period	Additions Charged to Expenses or Other Accounts*	Deductions Credited to Expenses or Other Accounts**	Balance at End of Period
		(in millions)		
2019				
Tax valuation allowance	$ 135	$ 9	$ (10)	$ 134
2018				
Tax valuation allowance	$ 138	$ 4	$ (7)	$ 135
2017				
Tax valuation allowance	$ 129	$ 14	$ (5)	$ 138

* Additions include current year additions charged to expenses and current year build due to increases in net deferred tax assets, return to provision true-ups, other adjustments and other comprehensive income impact to deferred taxes.

** Deductions include current year releases credited to expenses and current year reductions due to decreases in net deferred tax assets, return to provision true-ups, other adjustments and other comprehensive income impact to deferred taxes.

3. **Exhibits.**

Exhibits are incorporated herein by reference or are filed with this report as indicated below (numbered in accordance with Item 601 of Regulation S-K):

Exhibit Number	Description	Incorporation by Reference			Filed Herewith
		Form	Date	Exhibit Number	
2.1	Separation and Distribution Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc. (pursuant to Item 601(b)(2) of Regulation S-K, schedules to the Separation and Distribution Agreement have been omitted; they will be supplementally provided to the SEC upon request)	8-K	8/5/2014	2.1	
3.1	Amended and Restated Certificate of Incorporation.	S-1	8/16/1999	3.1	
3.2	Amended and Restated Bylaws.				X
4.1	Registration Rights Agreement between Agilent Technologies, Inc. and Credit Suisse First Boston Corporation, J.P. Morgan Securities, Inc. and Salomon Smith Barney Inc dated November 27 2001	8-K	11/27/2001	99.3	
4.2	Indenture, dated October 24, 2007, between Agilent Technologies, Inc. and the trustee for the debt securities.	S-3ASR	10/24/2007	4.01	
4.3	Sixth Supplemental Indenture, dated as of September 13, 2012, between the Company and U.S. Bank National Association	8-K	9/13/2012	4.01	
4.4	Seventh Supplemental Indenture, dated as of June 21, 2013, between the Company and U.S. Bank National Association and Form of Global Note for the Company's 3 875% Senior Notes due 2023	8-K	6/21/2013	4.01	
4.5	Eighth Supplemental Indenture, dated as of September 22, 2016, between the Company and U.S. Bank National Association and Form of Global Note for the Company's 3.050% Senior Note due 2026	8-K	9/22/2016	4.01	
4.6	Indenture, dated as of September 16, 2019, between the Company and U.S. Bank National Association	8-K	9/16/2019	4.1	
4.7	First Supplemental Indenture, dated as of September 16, 2019, between the Company and U.S. Bank National Association and Form of 2.750% Senior Note due 2029	8-K	9/16/2019	4.2	
4.8	Description of Securities				X
10.1	Agilent Technologies, Inc. 1999 Stock Plan (Amendment and Restatement Effective November 14, 2006).*	10-K	12/22/2006	10.8	
10.2	Form of Award Agreement (U.S.) for grants under the Agilent Technologies, Inc. 1999 Stock Plan.*	8-K	11/12/2004	10.1	
10.3	Form of Award Agreement (Non-U.S.) for grants under the Agilent Technologies, Inc. 1999 Stock Plan.*	8-K	11/12/2004	10.2	
10.4	Agilent Technologies, Inc. Employee Stock Purchase Plan (Amended and Restated, effective November 1, 2008).*	10-Q	9/5/2008	10.1	
10.5	Agilent Technologies, Inc. 2009 Stock Plan.*	DEF14A	1/27/2009	Appendix A	
10.6	Form of Stock Option Award Agreement under the 2009 Stock Plan for U.S. Employees (for awards made after October 31, 2010).*	10-K	12/20/2010	10.17	

Exhibit Number	Description	Incorporation by Reference			Filed Herewith
		Form	Date	Exhibit Number	
10.7	Form of Stock Option Award Agreement under the 2009 Stock Plan for U.S. Employees.*	10-K	12/21/2009	10.31	
10.8	Form of Stock Option Award Agreement under the 2009 Stock Plan for non-U.S. Employees (for awards made after October 31 2010) *	10-K	12/20/2010	10.19	
10.9	Form of Stock Option Award Agreement under the 2009 Stock Plan for non-U.S. Employees.*	10-K	12/21/2009	10.32	
10.10	Form of Stock Award Agreement for Standard Awards granted to Employees (for awards made after October 31, 2010) *	10-K	12/20/2010	10.21	
10.11	Form of Stock Award Agreement under the 2009 Stock Plan for Standard Awards granted to Employees (for awards made after November 17 2015) *	10-K	12/21/2015	10.26	
10.12	Form of Stock Award Agreement under the 2009 Stock Plan for Long-Term Performance Program Awards (for awards made after November 17 2015) *	10-K	12/21/2015	10.28	
10.13	Form of Stock Award Agreement under the 2009 Stock Plan for New Executives (for awards made after November 17 2015) *	10-K	12/21/2015	10.29	
10.14	Agilent Technologies, Inc. 2018 Stock Plan.*	DEF14A	2/7/2019	Appendix B	
10.15	Form of Stock Award Agreement under the 2018 Stock Plan for Standard Awards granted to Employees. *	10-Q	5/31/2018	10.1	
10.16	Form of Stock Award Agreement under the 2018 Stock Plan for Long-Term Performance Program Awards. *	10-Q	5/31/2018	10.2	
10.17	Form of Stock Award Agreement under the 2018 Plan for Standard Awards granted to Employees (for awards made after November 13, 2018). *	10-K	12/20/2018	10.17	
10.18	Form of Stock Award Agreement under the 2018 Stock Plan for Long-Term Performance Program Awards (for awards made after November 13, 2018). *	10-K	12/20/2018	10.18	
10.19	Agilent Technologies, Inc. Supplemental Benefit Retirement Plan (Amended and Restated Effective May 20 2014) *	10-K	12/21/2017	10.17	
10.20	Agilent Technologies, Inc. Long-Term Performance Program (Amended and Restated through November 1, 2005).*	10-Q	3/9/2006	10.63	
10.21	Agilent Technologies, Inc. 2005 Deferred Compensation Plan for Non-Employee Directors (Amended and Restated Effective November 18, 2009).*	10-K	12/21/2009	10.39	
10.22	Agilent Technologies, Inc. 2005 Deferred Compensation Plan (Amended and Restated Effective May 20, 2014).*	10-K	12/21/2017	10.20	
10.23	Agilent Technologies, Inc. 2010 Performance-Based Compensation Plan for Covered Employees. (as adopted on November 19. 2014)	DEF14A	2/6/2015	Annex A	
10.24	Form of Amended and Restated Indemnification Agreement between Agilent Technologies, Inc. and Directors of the Company, Section 16 Officers and Board-elected Officers of the Company.*	8-K	4/10/2008	10.1	

Exhibit Number	Description	Incorporation by Reference			Filed Herewith
		Form	Date	Exhibit Number	
10.25	Form of Tier I Change of Control Severance Agreement between Agilent Technologies, Inc. and the Chief Executive Officer*	10-K	12/22/2014	10.35	
10.26	Form of Amended and Restated Change of Control Severance Agreement between Agilent Technologies, Inc. and Section 16 Officers (other than the Company's Chief Executive Officer) *	8-K	4/10/2008	10.3	
10.27	Form of Tier II Change of Control Severance Agreement between Agilent Technologies, Inc. and Section 16 Officers (other than the Company's Chief Executive Offier)*	10-K	12/22/2014	10.37	
10.28	Form of New Executive Officer Change of Control Severance Agreement between Agilent Technologies, Inc. and specified executives of the Company (for executives hired elected or promoted after July 14 2009) *	10-K	12/21/2009	10.50	
10.29	Form of Tier III Change of Control Severance Agreement between Agilent Technologies, Inc. and specified executives of the Company*	10-K	12/22/2014	10.39	
10.30	Tax Matters Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc.	8-K	8/5/2014	10.1	
10.31	Employee Matters Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc.	8-K	8/5/2014	10.2	
10.32	Intellectual Property Matters Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc.	8-K	8/5/2014	10.3	
10.33	Trademark License Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc.	8-K	8/5/2014	10.4	
10.34	Real Estate Matters Agreement, dated August 1, 2014, by and between Agilent Technologies, Inc. and Keysight Technologies, Inc.	8-K	8/5/2014	10.5	
10.35	Credit Agreement, dated March 13, 2019, by and among the Company, the Lenders party thereto and BNP Paribas, as Administrative Agent.	8-K	3/13/2019	10.1	
10.36	Amendment No. 1 to Credit Agreement, dated August 7, 2019, by and among the Company, the Lenders party thereto and BNP Paribas, as Administrative Agent	8-K	8/8/2019	10.1	
10.37	Amendment No. 2 to Credit Agreement, dated October 21, 2019, by and among the Company, the Lenders party thereto and BNP Paribas, as Administrative Agent	8-K	10/22/2019	10.1	
10.38	Letter of Terms and Conditions International Long Term Assignment, by and among Jacob Thaysen and the Company*	10-K	12/22/2014	10.62	
10.39	Letter of Terms and Conditions Localization Program by and among Jacob Thaysen and the Company *	10-K	12/21/2015	10.70	
10.40	Letter of Terms and Conditions of U.S. Indefinite Relocation and U.S. Domestic Relocation Agreement, each by and among Michael R. McMullen and the Company*	10-Q	3/8/2016	10.1	

Exhibit Number	Description	Incorporation by Reference			Filed Herewith
		Form	Date	Exhibit Number	
10.41	Letter of Terms and Conditions of U.S. Indefinite Relocation and U.S. Domestic Relocation Agreement, each by and among Robert McMahon and the Company*	10-K	12/20/2018	10.41	
10.42	Agilent Technologies, Inc. Excess Benefit Retirement Plan (Amended and Restated Effective May 20, 2014)*	10-K	12/21/2017	10.40	
21.1	Significant subsidiaries of Agilent Technologies, Inc. as of October 31, 2019.				X
23.1	Consent of Independent Registered Public Accounting Firm.				X
24.1	Powers of Attorney. Contained in the signature page of this Annual Report on Form 10-K.				X
31.1	Certification of Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.				X
31.2	Certification of Chief Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.				X
32.1	Certification of Chief Executive Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.				X
32.2	Certification of Chief Financial Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.				X
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.				X
101.SCH	XBRL Taxonomy Extension Schema Document.				X
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.				X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.				X
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.				X
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.				X

* Indicates management contract or compensatory plan, contract or arrangement.

SIGNATURES

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

AGILENT TECHNOLOGIES, INC.

BY /s/ MICHAEL TANG

Michael Tang
Senior Vice President,
General Counsel and Secretary

Date: December 19, 2019

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Michael Tang and P. Diana Chiu, or either of them, his or her attorneys-in-fact, for such person in any and all capacities, to sign any amendments to this report and to file the same, with exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, hereby ratifying and confirming all that any of said attorneys-in-fact, or substitute or substitutes, may do or cause to be done by virtue hereof. Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ MICHAEL R. MCMULLEN	Director, President and Chief Executive Officer	December 19, 2019
Michael R. McMullen	(Principal Executive Officer)	
/s/ ROBERT W. MCMAHON	Senior Vice President and Chief Financial Officer	December 19, 2019
Robert W. McMahon	(Principal Financial Officer)	
/s/ RODNEY GONSALVES	Vice President, Corporate Controllership	December 19, 2019
Rodney Gonsalves	(Principal Accounting Officer)	
/s/ KOH BOON HWEE	Chairman of the Board of Directors	December 19, 2019
Koh Boon Hwee		
/s/ MALA ANAD	Director	December 19, 2019
Mala Anad		
/s/ HANS E. BISHOP	Director	December 19, 2019
Hans E. Bishop		
/s/ PAUL N. CLARK	Director	December 19, 2019
Paul N. Clark		
/s/ HEIDI KUNZ	Director	December 19, 2019
Heidi Kunz		
/s/ DANIEL K. PODOLSKY, M.D.	Director	December 19, 2019
Daniel K. Podolsky, M.D.		
/s/ SUE H. RATAJ	Director	December 19, 2019
Sue H. Rataj		
/s/ GEORGE A. SCANGOS, Ph D	Director	December 19, 2019
George A. Scangos, Ph D.		
/s/ DOW R. WILSON	Director	December 19, 2019
Dow R. Wilson		
/s/ TADATAKA YAMADA, M.D.	Director	December 19, 2019
Tadataka Yamada, M.D.		

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