BIO-RAD LABORATORIES, INC.
Form 10-K
April 01, 2019
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

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

For the year ended December 31, 2018

OR

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

For the transition period from _____ to _____

Commission file number 1-7928

BIO-RAD LABORATORIES, INC.

(Exact name of registrant as specified in its charter)

Delaware	94-1381833
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

1000 Alfred Nobel Drive, Hercules, California (Address of principal executive offices)	94547 (Zip Code)

Registrant's telephone number, including area code	(510) 724-7000

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

Title of Each Class	Name of Each Exchange on Which Registered
Class A Common Stock Par Value $0.0001 per share	New York Stock Exchange
Class B Common Stock Par Value $0.0001 per share	New York Stock Exchange

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

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

¨ Yes ý 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 ý 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.

ý Yes ¨ No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

ý Yes ¨ No

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, 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	ý	Accelerated filer ¨
Non-accelerated file	¨	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 x No

As of June 30, 2018, the last business day of the registrant's most recently completed second fiscal quarter, the aggregate market value of the Registrant's Class A Common Stock held by non-affiliates was approximately $6,113,695,454 and the aggregate market value of the registrant's Class B Common Stock held by non-affiliates was approximately $67,665,886.

As of March 26, 2019, there were 24,707,868 shares of Class A Common Stock and 5,092,404 shares of Class B Common Stock outstanding.

Documents Incorporated by Reference

	Document	Form 10-K Parts
(1)	Definitive Proxy Statement to be mailed to stockholders in connection with the registrant's 2019 Annual Meeting of Stockholders (specified portions)	III

BIO-RAD LABORATORIES, INC.

FORM 10-K DECEMBER 31, 2018

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INFORMATION RELATING TO FORWARD-LOOKING STATEMENTS

Other than statements of historical fact, statements made in this Annual Report include forward-looking statements, such as statements with respect to our future financial performance, operating results, plans and objectives that involve risk and uncertainties. Forward-looking statements generally can be identified by the use of forward-looking terminology, such as “believe,” “expect,” “may,” “will,” “intend,” “estimate,” “continue,” or similar expressions or the negativ those terms or expressions. Such statements involve risks and uncertainties, which could cause actual results to vary materially from those expressed in or indicated by the forward-looking statements. We have based these forward-looking statements on our current expectations and projections about future events. However, actual results may differ materially from those currently anticipated depending on a variety of risk factors including but not limited to those identified under “Item 1A, Risk Factors” of this Annual Report. We caution you not to place undue reliance on forward-looking statements, which reflect an analysis only and speak only as of the date hereof. We undertake no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events, or otherwise, except as required by law.

PART I.

ITEM 1. BUSINESS

General

Founded in 1952 and incorporated in 1957, Bio-Rad Laboratories, Inc. (referred to in this report as “Bio-Rad,” “we,” “us,” and “our”) was initially engaged in the development and production of specialty chemicals used in biochemical, pharmaceutical and other life science research applications. We entered the field of clinical diagnostics with the development of our first test kit based on separation techniques and materials developed for life science research. Through internal research and development efforts and acquisitions we have expanded into various markets. Today, Bio-Rad manufactures and supplies the life science research, healthcare, analytical chemistry and other markets with a broad range of products and systems used to separate complex chemical and biological materials and to identify, analyze and purify their components.

As we broadened our product lines, we also expanded our geographical market. We have direct distribution channels in over 35 countries outside the United States through subsidiaries whose focus is sales, customer service and product distribution. In some locations outside and inside these 35 countries, sales efforts are supplemented by distributors and agents.

Description of Business

Business Segments

Today, Bio-Rad operates in two industry segments designated as Life Science and Clinical Diagnostics. Both segments operate worldwide. Our Life Science segment and our Clinical Diagnostics segment generated 37% and 62%, respectively, of our net sales for the year ended December 31, 2018. We generated approximately 38% of our consolidated net sales for the year ended December 31, 2018 from U.S. sales and approximately 62% from sales in our remaining worldwide markets.

For a description of business and financial information on industry and geographic segments, see Note 14 of Item 8 of Part II of this report.

Life Science Segment

Our Life Science segment is at the forefront of discovery, creating advanced tools to answer complex biological questions. We are a leader in the life sciences market and develop, manufacture and market approximately 6,000 reagents, apparatus and laboratory instruments that serve a global customer base. Many of our products are used in established research techniques, biopharmaceutical production processes and food testing regimes. These techniques are typically used to separate, purify and identify biological materials such as proteins, nucleic acids and bacteria within a laboratory or production setting. We focus on selected segments of the life sciences market in proteomics (the study of proteins), genomics (the study of genes), biopharmaceutical production, cellular biology and food safety. We estimate that the worldwide market that our portfolios can address for products in these selected segments of our addressable markets is approximately $9 billion. Our principal life science customers include universities and medical schools, industrial research organizations, government agencies, pharmaceutical manufacturers, biotechnology researchers, food producers and food testing laboratories.

Clinical Diagnostics Segment

Our Clinical Diagnostics segment designs, manufactures, sells and supports test systems, informatics systems, test kits and specialized quality controls that serve clinical laboratories in the global diagnostics market. Our products currently address specific niches within the in vitro diagnostics (IVD) test market, and we seek to focus on the higher margin, higher growth segments of this market.

We supply more than 3,000 different products that cover more than 300 clinical diagnostic tests to the IVD test market. We estimate that the worldwide sales for products in the markets we serve were approximately $12 billion. IVD tests are conducted outside the human body and are used to identify and measure substances in a patient's tissue, blood or urine. Our products consist of reagents, instruments and software, typically provided to our customers as an integrated package to allow them to generate reproducible test results. Revenue in this business is highly recurring, as laboratories typically standardize test methodologies, which are dependent on a particular supplier's equipment, reagents and consumable products. An installed base of diagnostic test systems therefore typically creates an ongoing source of revenue through the sale of test kits for each sample analyzed on an installed system. Our principal clinical diagnostic customers include hospital laboratories, reference laboratories, transfusion laboratories and physician office laboratories.

Raw Materials and Components

We utilize a wide variety of chemicals, biological materials, electronic components, machined metal parts, optical parts, computing and peripheral devices. Most of these materials and components are available from numerous sources, and generally we have not experienced difficulty in securing adequate supplies. However, in certain instances we acquire components and materials from a sole supplier. Due to the regulatory environment in which we operate, we may be unable to quickly establish additional or replacement sources for some components or materials.

Patents, Trademarks and Licenses

We own over 2,000 U.S. and international patents and numerous trademarks. We also hold licenses under U.S. and foreign patents owned by third parties and pay royalties on the sales of certain products under the licenses. We view these patents, trademarks and license agreements as valuable assets; however, we believe that our ability to develop and manufacture our products depends primarily on our knowledge, technology and special skills rather than our patent, trademark and licensing positions.

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Seasonal Operations and Backlog

Our business is not inherently seasonal. However, the European custom of concentrating vacation during the summer months usually tempers third quarter sales volume and operating income.

For the most part, we operate in markets characterized by short lead times and the absence of significant backlogs. Management has concluded that backlog information is not material to our business as a whole.

Sales and Marketing

We conduct our worldwide operations through an extensive direct sales force, employing approximately 940 direct sales and sales management personnel around the world. Our sales force typically consists of experienced industry professionals with scientific training, and we maintain a separate specialist sales force for each of our segments. We believe that this direct sales approach allows us to sell a broader range of our products that creates more brand awareness and long-term relationships with our customers.

We also use a range of sales and marketing intermediaries (SMIs) in our international markets. The types of SMIs we utilize are distributors, agents, brokers and resellers. We have programs and policies in place with our SMIs that require compliance with all applicable laws, including adhering to our anti-corruption standards to ensure a transparent sale to our customers.

Our customer base is broad and diversified. Our worldwide customer base includes (1) prominent university and research institutions; (2) hospital, public health and commercial laboratories; (3) other leading diagnostic manufacturers; and (4) leading companies in the biotechnology, pharmaceutical, chemical and food industries. There has been no single customer that accounted for more than three percent of our total net sales. Our sales are affected by a number of external factors. For example, a number of our customers, particularly in the Life Science segment, are substantially dependent on government grants and research contracts for their funding.

Most of our international sales are generated by our wholly-owned international subsidiaries and their branch offices. Certain of these subsidiaries also have manufacturing facilities. Bio-Rad’s international operations are subject to certain risks common to foreign operations in general, such as changes in governmental regulations, import restrictions and foreign exchange fluctuations.

Competition

The markets served by our product groups are highly competitive. Our competitors range in size from start-ups to large multinational corporations with significant resources and reach. We seek to compete primarily in market segments where our products and technology offer customers specific advantages over the competition.

Because of the breadth of its product lines, our Life Science segment does not face the same competitors for all of its products. Major competitors in this market include Becton Dickinson, GE Biosciences, Merck Millipore and Thermo Fisher Scientific. We compete primarily based on meeting performance specifications and offering complete solutions.

Major competitors of our Clinical Diagnostics segment include Roche, Abbott Laboratories, Siemens, Danaher, Thermo Fisher, Becton Dickinson, bioMérieux, Ortho Clinical Diagnostics, Tosoh, Immucor and DiaSorin. We compete in our customer segments by providing high quality products, broad product portfolios and outstanding customer support.

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Research and Development

We conduct extensive research and development activities in all areas of our business, employing approximately 800 employees worldwide in these activities, including degreed scientists and technical support staff. Research and development has played a major role in Bio-Rad's growth and is expected to continue to do so in the future. Our research teams are continuously developing new products and new applications for existing products. In our development of new products and applications, we interact with scientific and medical professionals at universities, hospitals and medical schools, and within our industry.

Regulatory Matters

The development, testing, manufacturing, marketing, post-market surveillance, distribution, advertising and labeling of certain of our products (primarily diagnostic products) are subject to regulation in the United States by the Center for Devices and Radiological Health of the U.S. Food and Drug Administration (FDA) and in other jurisdictions by state and foreign government authorities. FDA regulations require that some new products have pre-marketing clearance or approval by the FDA and require certain products to be manufactured in accordance with FDA's "good manufacturing practice" regulations, to be extensively tested and to be properly labeled to disclose test results and performance claims and limitations. After a product that is subject to FDA regulation is placed on the market, numerous regulatory requirements apply, including, for example, the requirement that we comply with recordkeeping and reporting requirements, such as the FDA's medical device reporting regulations and reporting of corrections and removals. The FDA enforces these requirements by inspection and market surveillance. The FDA has authority to take various administrative and legal actions against us for our, or our products', failure to comply with relevant legal or regulatory requirements, including issuing warning letters, initiating product seizures, requesting or requiring product recalls or withdrawals, and other civil or criminal sanctions, among other things.

We are also subject to additional healthcare regulation and enforcement by the federal government and by authorities in the states and foreign jurisdictions in which we conduct our business. Such laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, privacy and security and physician sunshine laws and regulations. If our operations are found to be in violation of any of such laws or any other governmental regulations that apply to us, we may be subject to penalties, including, without limitation, civil and criminal penalties, damages, fines, the curtailment or restructuring of our operations, exclusion from participation in federal and state healthcare programs and imprisonment.

Sales of our products will depend, in part, on the extent to which our products or diagnostic tests using our products will be covered by third-party payors, such as government health care programs, commercial insurance and managed healthcare organizations. These third-party payors are increasingly reducing reimbursements for certain medical products and services. In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost containment programs, including price controls and restrictions on reimbursement. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. Decreases in third-party reimbursement for our products or diagnostic tests using our products, or a decision by a third-party payor to not cover our products could reduce or eliminate utilization of our products and have a material adverse effect on our sales, results of operations and financial condition. In addition, healthcare reform measures have been and will be adopted in the future, any of which could limit the amounts that governments will pay for healthcare products and services, which could result in reduced demand for our products or additional pricing pressures.

As a multinational manufacturer and distributor of sophisticated instrumentation, we must meet a wide array of electromagnetic compatibility and safety compliance requirements to satisfy regulations in the United States, the European Union and other jurisdictions.

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Our operations are subject to federal, state, local and foreign environmental laws and regulations that govern such activities as transportation of goods, emissions to air and discharges to water, as well as handling and disposal practices for solid, hazardous and medical wastes. In addition to environmental laws that regulate our operations, we are also subject to environmental laws and regulations that create liabilities and clean-up responsibility for spills, disposals or other releases of hazardous substances into the environment as a result of our operations or otherwise impacting real property that we own or operate. The environmental laws and regulations could also subject us to claims by third parties for damages resulting from any spills, disposals or releases resulting from our operations or at any of our properties.

These regulatory requirements vary widely among countries.

Employees

At December 31, 2018, Bio-Rad had approximately 8,260 employees. Approximately eight percent of our approximately 3,265 U.S. employees are covered by a collective bargaining agreement, which will expire on November 7, 2019. Many of our non-U.S. full-time employees, especially in France, are covered by collective bargaining agreements. We consider our employee relations to be generally good.

Available Information

Bio-Rad files annual, quarterly, and current reports, proxy statements, and other documents with the Securities and Exchange Commission (SEC) under the Securities Exchange Act of 1934, as amended. The SEC maintains an Internet website that contains reports, proxy and information statements, and other information regarding issuers, including Bio-Rad, that file electronically with the SEC. The public can obtain any documents that we file with the SEC at http://www.sec.gov.

Bio-Rad's website address is www.bio-rad.com. We make available, free of charge through our website, our Form 10-Ks, 10-Qs and 8-Ks, and any amendments to these forms, as soon as reasonably practicable after filing with the SEC. The information on our website is not part of this Annual Report on Form 10-K.

ITEM 1A. RISK FACTORS

In evaluating our business and whether to invest in any of our securities, you should carefully read the following risk factors in addition to the other information contained in this Annual Report. We believe that any of the following risks could have a material effect on our business, results of operations or financial condition, our industry or the trading price of our common stock. We operate in a continually changing business environment, and new risks and uncertainties emerge from time to time. We cannot predict these new risks and uncertainties, nor can we assess the extent to which any such new risks and uncertainties or the extent to which the risks and uncertainties set forth below may adversely affect our business, results of operations, financial condition, our industry or the trading price of our common stock.

Our settlement with government agencies in connection with violations by us of the U.S. Foreign Corrupt Practices Act could have a material adverse effect on our business, results of operations and financial condition.

As previously disclosed, we entered into a non-prosecution agreement (NPA) with the U.S. Department of Justice (DOJ) and the Securities and Exchange Commission (SEC) and consented to the entry of an Order by the SEC (SEC Order), effective November 3, 2014, which actions resolved both the DOJ and the SEC investigations into our violations of the U.S. Foreign Corrupt Practices Act (FCPA). Under the terms of the NPA and the SEC Order, we

agreed to pay a financial penalty and certain amounts in disgorgement and interest as well as to compliance, reporting and cooperation obligations to be performed for two years. On October 28, 2016, the DOJ and SEC informed Bio-Rad that they did not intend to extend the NPA after it expired November 2, 2016.

Whether by virtue of disclosure of the NPA and the SEC Order or otherwise, we may be subject to investigations by foreign governments or further claims by third parties arising from conduct subject to the investigation or our other international operations. Many of our customers in our significant international operations are government agencies or state-owned or state-controlled universities, hospitals and laboratories. The disclosure of the NPA and the SEC Order and any further violations of the FCPA could harm our reputation with these customers, which could materially adversely affect our business, results of operations and financial condition. Any further violations of the FCPA also could result in more punitive actions by the SEC and DOJ, which also could materially adversely affect our business, results of operations and financial condition.

Our international operations expose us to additional costs and legal and regulatory risks, which could have a material adverse effect on our business, results of operations and financial condition.

We have significant international operations. We have direct distribution channels in over 35 countries outside the United States, and in 2018 our foreign subsidiaries generated 62% of our net sales. Compliance with complex foreign and U.S. laws and regulations that apply to our international operations increases our cost of doing business. These numerous and sometimes conflicting laws and regulations include, among others, data privacy requirements (including the requirements for compliance with the EU General Data Protection Regulation, which went into effect May 25, 2018), labor relations laws, tax laws, anti-competition regulations, import and trade restrictions, tariffs, quotas and other trade barriers, export requirements, U.S. laws such as the FCPA and other U.S. federal laws and regulations established by the office of Foreign Asset Control, foreign laws such as the UK Bribery Act 2010 or other foreign laws which prohibit corrupt payments to governmental officials or certain payments or remunerations to customers. In addition, changes in laws or regulations potentially could be disruptive to our operations and business relationships in the affected regions. For example, the United Kingdom's anticipated withdrawal from the European Union (commonly referred to as “Brexit”) could disrupt the free movement of goods, services and people between the United Kingdom and the European Union and result in increased regulatory, legal, labor and tax complexities.

Given the high level of complexity of the foreign and U.S. laws and regulations that apply to our international operations, there is a risk that we may inadvertently breach some provisions, for example, through fraudulent or negligent behavior of individual employees, our failure to comply with certain formal documentation requirements, or otherwise. Our success depends, in part, on our ability to anticipate these risks and manage these challenges through policies, procedures and internal controls. However, we have a dispersed international sales organization, and we use distributors and agents in many of our international operations. This structure makes it more difficult for us to ensure that our international selling operations comply with our global policies and procedures.

Violations of these laws and regulations could result in fines, criminal sanctions against us, our officers or our employees, requirements to obtain export licenses, cessation of business activities in sanctioned countries, implementation of compliance programs, and prohibitions on the conduct of our business. Violations of laws and regulations also could result in prohibitions on our ability to offer our products in one or more countries and could materially damage our reputation, our brand, our international expansion efforts, our ability to attract and retain employees, or our business, results of operations and financial condition. See also our risk factors regarding government regulations and regarding global economic conditions below.

The industries and market segments in which we operate are highly competitive, and we may not be able to compete effectively.

The life science and clinical diagnostics markets are each highly competitive. Some of our competitors have merged, and some of our competitors have greater financial resources than we do, making them better equipped to license technologies and intellectual property from third parties or to fund research and development, manufacturing and marketing efforts. Moreover, competitive and regulatory conditions in many markets in which we operate restrict our

ability to fully recover, through price increases, higher costs of acquired goods and services resulting from inflation and other drivers of cost increases. Many public tenders have become more competitive due to governments lengthening the commitments of their public tenders to multiple years, which reduce the number of tenders in which we can participate annually. Because the value of these multiple-year tenders is so

high, our competitors have been more aggressive with their pricing. Our failure to compete effectively and/or pricing pressures resulting from competition could adversely affect our business, results of operations and financial condition.

We may not be able to grow our business because of our failure to develop new or improved products.

Our future growth depends in part on our ability to continue to improve our product offerings and develop and introduce new product lines and extensions that integrate technological advances. In particular, we may not be able to keep up with changes in the clinical diagnostics industry, such as the trend toward molecular diagnostics or point-of-care tests. If we are unable to integrate technological advances into our product offerings or to design, develop, manufacture and market new product lines and extensions successfully and in a timely manner, our business, results of operations and financial condition will be adversely affected. We have experienced product launch delays in the past, and may do so in the future. We cannot assure you that our product and process development efforts will be successful or that new products we introduce will achieve market acceptance. Failure to launch successful new products or improvements to existing products may cause our products to become obsolete, which could harm our business, results of operations and financial condition.

We are subject to foreign currency exchange fluctuations, which could have a material adverse effect on our results of operations and financial condition.

As stated above, a significant portion of our operations and sales are outside of the United States. When we make purchases and sales in currencies other than the U.S. dollars, we are exposed to fluctuations in foreign currencies relative to the U.S. dollar that may adversely affect our results of operations and financial condition. Our international sales are largely denominated in local currencies. As a result, the strengthening of the U.S. dollar negatively impacts our consolidated net sales expressed in U.S. dollars. Conversely, when the U.S. dollar weakens, our expenses at our international sites increase. In addition, the volatility of other currencies may negatively impact our operations outside of the United States and increase our costs to hedge against currency fluctuations. We cannot assure you that future shifts in currency exchange rates will not have a material adverse effect on our results of operations and financial condition.

We may experience difficulties implementing our new global enterprise resource planning system.

We are engaged in a multi-year implementation of a new global enterprise resource planning system (ERP). The ERP is designed to efficiently maintain our books and records and provide information important to the operation of our business to our management team. The ERP will continue to require significant investment of human and financial resources. In implementing the ERP, we may experience significant delays, increased costs and other difficulties. Any significant disruption or deficiency in the design and implementation of the ERP could adversely affect our ability to process orders, ship product, send invoices and track payments, fulfill contractual obligations or otherwise operate our business. For example, we experienced system implementation issues in our Clinical Diagnostics segment during our first deployment that impacted invoicing and caused an increase in accounts receivable. In our second deployment, we experienced delays in manufacturing and logistics, which adversely impacted our sales. In our third deployment in Western Europe in April 2017 we experienced system implementation issues impacting the timing of payment of vendor invoices and resulting in delays in product availability and shipments. We also experienced lower productivity levels related to the April 2017 go-live of the ERP in Western Europe, which adversely impacted our sales during the second and third quarters of 2017. We expect to implement the remaining smaller phases of the ERP platform over the next few years. In addition, our efforts to centralize various business processes and functions within our organization in connection with our ERP implementation may continue to disrupt our operations and negatively impact our business, results of operations and financial condition.

Recent and planned changes to our organizational structure and executive management team could negatively impact our business.

We made significant changes to our organizational structure over the past few years. In 2016, we began implementing the reorganization of the structure of our European organization, and we have continued implementing this reorganization in 2017 and 2018. Our Chief Operating Officer retired on March 30, 2018, and our search for a new Chief Operating Officer is underway. In addition, our Chief Financial Officer will be retiring on April 30, 2019, so we will have a new Chief Financial Officer in 2019. These changes may have unintended consequences, such as distraction of our management and employees, business disruption, attrition of our workforce, inability to attract or retain key employees, and reduced employee morale or productivity.

Our failure to establish and maintain effective internal control over financial reporting could result in material misstatements in our financial statements, our failure to meet our reporting obligations and cause investors to lose confidence in our reported financial information, which in turn could cause the trading price of our common stock to decline.

Maintaining effective disclosure controls and procedures and internal controls over financial reporting are necessary for us to produce reliable financial statements.

As previously discussed in Item 9A "Controls and Procedures" of our Annual Report for the period ended December 31, 2017, and Item 4 "Controls and Procedures" of our 2018 Form 10-Q's, management identified a material weakness in our internal control over financial reporting resulting from our ERP system conversion and European reorganization leading to the internal control deficiencies described below. We determined that we did not maintain a sufficient complement of personnel in certain European countries with appropriate training and expertise in accounting and reporting in the new ERP system following the system conversion and European reorganization that we undertook in April 2017, including the implementation of reporting lines, appropriate authorities and responsibilities within and between our accounting and reporting function, information technology and the business operations in these European countries. We did not conduct continuous risk assessment over changes in our European business operations, IT systems and personnel to identify and assess necessary changes in internal control over financial reporting. As a result, we did not design effective control activities over the accounting for financial statement amounts, including inventory and revenue, reported by entities impacted by the European reorganization, including management review controls with sufficient precision to identify and investigate potential outliers.

During the fourth quarter of 2017 and throughout 2018, management conducted an extensive remediation plan to address its material weakness. The remediation plan involved enhancing the control environment in the entities impacted by the ERP system conversion and European reorganization by (i) increasing resources with sufficient accounting and reporting expertise within our reorganized business and expertise in using our new ERP system, (ii) implementing and monitoring reporting lines and appropriate authorities and responsibilities within the accounting and reporting function, information technology and the business operations, and (iii) providing training to our control owners to effectively perform controls in the new environment including training on reconciliation review controls and certain ERP system enhancements. Management also enhanced its risk assessment process to continuously assess the potential impact on internal control over financial reporting of changes to business operations, including changes relating to similar ERP system conversions and reorganizations that may occur in the future. In addition, management designed and implemented additional control activities over financial statement amounts reported by entities impacted by the European reorganization, including inventory, revenue and cost of goods sold. Implementation of management's remediation plans described above have strengthened our internal control over financial reporting and addressed the material weakness that was identified in 2017. Based on this assessment, management concluded that the material weakness has been remediated as of December 31, 2018. However, we cannot assure you that additional

deficiencies or material weaknesses in our internal control over financial reporting will not be identified in the future.

Material weaknesses have adversely affected us in the past and could affect us in the future, and the results of our periodic management evaluations and annual auditor attestation reports regarding the effectiveness of our internal control over financial reporting required by Section 404 of the Sarbanes-Oxley Act of 2002. Any failure to maintain or implement new or improved internal controls, or any difficulties that we may encounter in their maintenance or implementation, could result in additional significant deficiencies or material weaknesses, result in material misstatements in our consolidated financial statements and cause us to fail to meet our reporting obligations. This could cause us to lose public confidence, and could cause the trading price of our common stock to decline. For further information regarding our controls and procedures, see Part II, Item 9A of this Annual Report on Form 10-K.

Breaches of our information systems could have material adverse effect on our business and results of operations.

Through our sales and eCommerce channels, we collect and store confidential information that customers provide to, among other things, purchase products or services, enroll in promotional programs and register on our Web site. We also acquire and retain information about suppliers and employees in the normal course of business. We also create and maintain proprietary information that is critical to our business, such as our product designs and manufacturing processes. Despite recent initiatives to improve our technology systems, such as our enterprise resource planning implementation and the centralization of our global information technology organization, we could experience a significant data security breach. Computer hackers may attempt to penetrate our or our vendors' information systems and, if successful, misappropriate confidential customer, supplier, employee or other business information, such as our intellectual property. Third parties could also gain control of our systems and use them for criminal purposes while appearing to be us. As a result, we could lose existing customers, have difficulty attracting new customers, be exposed to claims from customers, financial institutions, payment card associations, employees and other persons, have regulatory sanctions or penalties imposed, incur additional expenses or lose revenues as a result of a data privacy breach, or suffer other adverse consequences. Our operations and ability to process sales orders, particularly through our eCommerce channels, could also be disrupted. Any significant breakdown, intrusion, interruption, corruption, or destruction of our systems, as well as any data breaches, could have a material adverse effect on our business and results of operations. See also our risk factors regarding our ERP implementation above and our information technology systems below.

Risks relating to intellectual property rights may negatively impact our business.

We rely on a combination of copyright, trade secret, patent and trademark laws and third-party nondisclosure agreements to protect our intellectual property rights and products. However, we cannot assure you that our intellectual property rights will not be challenged, invalidated, circumvented or rendered unenforceable, or that meaningful protection or adequate remedies will be available to us. For instance, unauthorized third parties have attempted to copy our intellectual property, reverse engineer or obtain and use information that we regard as proprietary, or have developed equivalent technologies independently, and may do so in the future. Additionally, third parties have asserted patent, copyright and other intellectual property rights to technologies that are important to us, and may do so in the future. If we are unable to license or otherwise access protected technology used in our products, or if we lose our rights under any existing licenses, we could be prohibited from manufacturing and marketing such products. From time to time, we also must enforce our patents or other intellectual property rights or defend ourselves against claimed infringement of the rights of others through litigation. As a result, we could incur substantial costs, be forced to redesign our products, or be required to pay damages to an infringed party. Any of the foregoing matters could adversely impact our business, results of operations and financial condition.

Global economic conditions could adversely affect our operations.

In recent years, we have been faced with very challenging global economic conditions. A deterioration in the global economic environment may result in decreased demand for our products, increased competition, downward pressure

on the prices for our products and longer sales cycles. A weakening of macroeconomic conditions may also adversely affect our suppliers, which could result in interruptions in supply in the future. We have also experienced delays in collecting receivables in certain countries in Western Europe, and we may experience similar

delays in these and other countries or regions experiencing liquidity problems. In addition, a slowing of growth in the Chinese economy and in emerging markets, especially those oil-producing countries that would be affected by a decline in oil prices, could adversely affect our business, results of operations or financial condition. There is also uncertainty surrounding the impact that Brexit will have on European and worldwide economic conditions and the stability of global financial markets, and a negative effect from any of these things could adversely affect our business, results of operations or financial condition. Additionally, the United States and other countries recently have imposed tariffs on certain goods. While tariffs imposed by other countries on U.S. goods have not yet had a significant impact on our business, further escalation of tariffs or other trade barriers could adversely impact our profitability and/or our competitiveness. See also our risk factors regarding our international operations above and regarding government regulations below.

Reductions in government funding and the capital spending programs of our customers could have a material adverse effect on our business, results of operations or financial condition.

Our customers include universities, clinical diagnostics laboratories, government agencies, hospitals and pharmaceutical, biotechnology and chemical companies. The capital spending programs of these institutions and companies have a significant effect on the demand for our products. Such programs are based on a wide variety of factors, including the resources available to make such purchases, the availability of funding from grants by governments or government agencies, the spending priorities for various types of equipment and the policies regarding capital expenditures during industry downturns or recessionary periods. If government funding to our customers were to decrease, or if our customers were to decrease or reallocate their budgets in a manner adverse to us, our business, results of operations or financial condition could be materially and adversely affected.

Changes in the healthcare industry could have an adverse effect on our business, results of operations and financial condition.

There have been, and will continue to be, significant changes in the healthcare industry in an effort to reduce costs. These changes include:

- The trend towards managed care, together with healthcare reform of the delivery system in the United States and efforts to reform in Europe, has resulted in increased pressure on healthcare providers and other participants in the healthcare industry to reduce selling prices. Consolidation among healthcare providers and consolidation among other participants in the healthcare industry has resulted in fewer, more powerful groups, whose purchasing power gives them cost containment leverage. In particular, there has been a consolidation of laboratories and a consolidation of blood transfusion centers. These industry trends and competitive forces place constraints on the levels of overall pricing, and thus could have a material adverse effect on our gross margins for products we sell in clinical diagnostic markets.

- Third party payors, such as Medicare and Medicaid in the United States, have reduced their reimbursements for certain medical products and services. Our Clinical Diagnostics business is impacted by the level of reimbursement available for clinical tests from third party payors. In the United States payment for many diagnostic tests furnished to Medicare fee-for-service beneficiaries is made based on the Medicare Clinical Laboratory Fee Schedule (CLFS), a fee schedule established and adjusted from time to time by the Centers for Medicare and Medicaid Services (CMS). Some commercial payors are guided by the CLFS in establishing their reimbursement rates. Clinicians may decide not to order clinical diagnostic tests if third party payments are inadequate, and we cannot predict whether third party payors will offer adequate reimbursement for tests utilizing our products to make them commercially attractive. Legislation, such as the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act (PPACA) and the Middle Class Tax Relief and Job Creation Act of 2012, has reduced the payments for clinical laboratory services paid under the CLFS. In addition, the Protecting Access to Medicare Act of 2014 (PAMA) has

made significant changes to the way Medicare will pay for clinical laboratory services, which has further reduced reimbursement rates.

- The PPACA has also imposed a 2.3% excise tax on the sales of certain medical devices in the U.S., which we are required to pay on most of our United States Clinical Diagnostic sales. However, the Consolidated Appropriations Act, 2016 (Pub. L. 114-113), signed into law on December 18, 2015, included a two year moratorium on the medical device excise tax. On January 22, 2018, the moratorium on the medical device excise tax was further extended until January 1, 2020.

To the extent that the healthcare industry seeks to address the need to contain costs stemming from reform measures such as those contained in the PPACA and the PAMA, or in future legislation, by limiting the number of clinical tests being performed or the amount of reimbursement available for such tests, our business, results of operations and financial condition could be adversely affected. If these changes in the healthcare markets in the United States and Europe continue, we could be forced to alter our approach in selling, marketing, distributing and servicing our products.

We are subject to substantial government regulation, and any changes in regulation or violations of regulations by us could adversely affect our business, prospects, results of operations or financial condition.

Some of our products (primarily our Clinical Diagnostic products), production processes and marketing are subject to U.S. federal, state and local, and foreign regulation, including by the FDA in the United States and its foreign counterparts. The FDA regulates our Clinical Diagnostic products as medical devices, and we are subject to significant regulatory clearances or approvals to market our Clinical Diagnostic products and other requirements including, for example, recordkeeping and reporting requirements, such as the FDA's medical device reporting regulations and reporting of corrections and removals. The FDA has broad regulatory and enforcement powers. If the FDA determines that we have failed to comply with applicable regulatory requirements, it can impose a variety of enforcement actions ranging from public warning letters, fines, injunctions, consent decrees and civil penalties to suspension or delayed issuance of approvals, seizure or recall of our products, total or partial shutdown of production, withdrawal of approvals or clearances already granted, and criminal prosecution.

The FDA can also require us to repair, replace or refund the cost of devices that we manufactured or distributed. In addition, the FDA may change its clearance and approval policies, adopt additional regulations or revise existing regulations, or take other actions, which may prevent or delay approval or clearance of our products or impact our ability to modify our currently approved or cleared products on a timely basis. Changes in the FDA's review of certain clinical diagnostic products referred to as laboratory developed tests, which are tests developed by a single laboratory for use only in that laboratory, could affect some of our customers who use our Life Science instruments for laboratory developed tests. In the past, the FDA has chosen to not enforce applicable regulations and has not reviewed such tests for approval. However, the FDA has issued draft guidance that it may begin enforcing its medical device requirements, including premarket submission requirements, to such tests. Any delay in, or failure to receive or maintain, clearance or approval for our products could prevent us from generating revenue from these products and adversely affect our business operations and financial results. Additionally, the FDA and other regulatory authorities have broad enforcement powers. Regulatory enforcement or inquiries, or other increased scrutiny on us, could affect the perceived safety and efficacy of our products and dissuade our customers from using our products.

Many foreign governments have similar rules and regulations regarding the importation, registration, labeling, sale and use of our products. Such agencies may also impose new requirements that may require us to modify or re-register products already on the market or otherwise impact our ability to market our products in those countries. For example, in April 2017 the European Parliament voted to enact final regulations that include broad changes regarding in vitro diagnostic devices and medical devices, which will require us to modify or re-register some products and will result in additional costs. In addition, Russia has enacted more stringent medical product registration and labeling regulations, China has enacted stricter labeling requirements, and we expect other countries, such as Brazil and India, to impose more regulations that impact our product registrations. Brexit also will likely result in additional regulatory

requirements associated with goods sold in the United Kingdom and will likely result in additional complexities and possible delays with respect to goods, raw materials and personnel moving between the United Kingdom and the European Union. Due to these evolving and diverse requirements, we face uncertain product approval timelines, additional time and effort to comply, as well as the potential for

reduced sales and/or fines for noncompliance. Increasing protectionism in such countries also impedes our ability to compete with local companies. For example, we may not be able to participate in certain public tenders in Russia because of increasing measures to restrict access to such tenders for companies without local manufacturing capabilities. Such regulations could adversely affect our business, results of operations and financial condition. See also our risk factors regarding our international operations and regarding global economic conditions above.

We are also subject to government regulation of the use and handling of a number of materials and controlled substances. The U.S. Drug Enforcement Administration establishes registration, security, recordkeeping, reporting, storage, distribution and other requirements for controlled substances pursuant to the Controlled Substances Act of 1970. Failure to comply with present or future laws and regulations could result in substantial liability to us, suspension or cessation of our operations, restrictions on our ability to expand at our present locations or require us to make significant capital expenditures or incur other significant expenses.

We cannot assure you that we will be able to integrate acquired companies, products or technologies into our company successfully, or we may not be able to realize the anticipated benefits from the acquisitions.

As part of our overall business strategy, we pursue acquisitions of and investments in complementary companies, products and technologies. In order to be successful in these activities, we must, among other things:

- assimilate the operations and personnel of acquired companies;
- retain acquired business customers;
- minimize potential disruption to our ongoing business;
- retain key technical and management personnel;
- integrate acquired companies into our strategic and financial plans;
- accurately assess the value of target companies, products and technologies;
- comply with new regulatory requirements;
- harmonize standards, controls, procedures and policies;
- minimize the impact to our relationships with our employees and customers; and
- assess, document and remediate any deficiencies in disclosure controls and procedures and internal control over financial reporting.

The benefits of any acquisition may prove to be less than anticipated and may not outweigh the costs reported in our financial statements. Completing any potential future acquisitions could cause significant diversion of our management's time and resources. If we acquire new companies, products or technologies, we may be required to assume contingent liabilities or record impairment charges for goodwill and other intangible assets over time. Goodwill and non-amortizable intangible assets are subject to impairment testing, and potential periodic goodwill impairment charges, amortization expenses related to certain intangible assets, and other write-offs could harm our operating results. Impairment tests are highly sensitive to changes in assumptions and minor changes to assumptions could result in impairment losses. If the results forecast in our impairment tests are not achieved, or business trends vary from the assumptions used in forecasts, or external factors change detrimentally, future impairment losses may occur. For example, as we previously discussed in Item 7 of our Annual Report for the period ended December 31, 2017, one reporting unit, whose goodwill was primarily from the acquisitions of Biotest AG and DiaMed Holding AG, had excess fair value over book value of only 8% at December 31, 2017. The goodwill allocated to this reporting unit as of December 31, 2017 was $263.6 million. We impaired all the goodwill related to this reporting unit for the year ended December 31, 2018 because assumptions utilized in our 2017 forecast did not materialize.

We cannot assure you that we will successfully overcome these risks or any other problems we encounter in connection with any acquisitions, and any such acquisitions could adversely affect our business, results of operations and financial condition.

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Product quality and liability issues could harm our reputation and negatively impact our business, results of operations and financial condition.

We must adequately address quality issues associated with our products, including defects in our engineering, design and manufacturing processes, as well as defects in third-party components included in our products. Our instruments, reagents and consumables are complex, and identifying the root cause of quality issues, especially those affecting reagents or third-party components, is difficult. We may incur significant costs and expend substantial time in researching and remediating such issues. Quality issues could also delay our launching or manufacturing of new products. In addition, quality issues, unapproved uses of our products, or inadequate disclosure of risks related to our products, could result in product recalls or product liability or other claims being brought against us. These issues could harm our reputation, impair our relationship with existing customers and harm our ability to attract new customers, which could negatively impact our business, results of operations and financial condition.

Lack of key personnel could hurt our business.

Our products are very technical in nature. In general, only highly qualified and well-trained scientists have the necessary skills to develop, market and sell our products, and many of our manufacturing positions require very specialized knowledge and skills. In addition, the global nature of our business also requires that we have sophisticated and experienced staff to comply with increasingly complex international laws and regulations. We face intense competition for these professionals from our competitors, customers, marketing partners and other companies throughout our industry. In particular, the job market in Northern California, where many of our employees are located, is very competitive. If we do not offer competitive compensation and benefits, we may fail to retain or attract a sufficient number of qualified personnel, which could impair our ability to properly run our business.

In some cases we rely on temporary personnel or consultants, and we may do so in the future. Such temporary personnel or consultants may lack the knowledge and/or specific skills necessary for our business, require time to train without benefiting us through extended employment and increase our costs. In addition, as noted above, our strategic initiatives, such as our internal restructuring and ERP implementation, may be burdensome and disruptive and lead to employee dissatisfaction and attrition.

A reduction or interruption in the supply of components and raw materials could adversely affect our manufacturing operations and related product sales.

The manufacture of many of our products requires the timely delivery of sufficient amounts of quality components and materials. We manufacture our products in numerous manufacturing facilities around the world. We acquire our components and materials from many suppliers in various countries. We work closely with our suppliers to ensure the continuity of supply but we cannot guarantee these efforts will always be successful. Further, while we seek to diversify our sources of components and materials, in certain instances we acquire components and materials from a sole supplier. In addition, due to the regulatory environment in which we operate, we may be unable to quickly establish additional or replacement sources for some components or materials. If our supply is reduced or interrupted or of poor quality, and we are unable to develop alternative sources for such supply, our ability to manufacture our products in a timely or cost-effective manner could be adversely affected, which would adversely affect our ability to sell our products.

If our information technology systems are disrupted, or if we fail to successfully implement, manage and integrate our information technology and reporting systems, our business, results of operations and financial condition could be harmed.

Our information technology (IT) systems are an integral part of our business, and a serious disruption of our IT systems could have a material adverse effect on our business, results of operations and financial condition. We depend on our IT systems to process orders, manage inventory and collect accounts receivable. Our IT systems also allow us to efficiently purchase products from our suppliers and ship products to our customers on a timely basis, maintain cost-effective operations and provide customer service. We may experience disruption of our IT systems due to redundancy issues with our network servers. We cannot assure you that our contingency plans will allow us to operate at our current level of efficiency.

Our ability to implement our business plan in a rapidly evolving market requires effective planning, reporting and analytical processes. We expect that we will need to continue to improve and further integrate our IT systems, reporting systems and operating procedures by training and educating our employees with respect to these improvements and integrations on an ongoing basis in order to effectively run our business. We may suffer interruptions in service, loss of data or reduced functionality when we upgrade or change systems. If we fail to successfully manage and integrate our IT systems, reporting systems and operating procedures, it could adversely affect our business, results of operations and financial condition. See also our risk factors regarding our ERP implementation and data security above and events beyond our control below.

Natural disasters, terrorist attacks, acts of war or other events beyond our control may cause damage or disruption to us and our employees, facilities, information systems, security systems, vendors and customers, which could significantly impact our business, results of operations and financial condition.

We have significant manufacturing and distribution facilities, including in the western United States, France, Switzerland, Germany and Singapore. In particular, the western United States has experienced a number of earthquakes, wildfires, floods, landslides and other natural disasters in recent years. These occurrences could damage or destroy our facilities which may result in interruptions to our business and losses that exceed our insurance coverage. In addition, strikes or other labor unrest at any of our sites or surrounding areas could cause disruption to our business.

Acts of terrorism, bioterrorism, violence or war could also affect the markets in which we operate, our business operations and strategic plans. Political unrest may affect our sales in certain regions, such as in Southeast Asia, the Middle East and Eastern Europe. Any of these events could adversely affect our business, results of operations and financial condition.

We may have higher than anticipated tax liabilities.

We are subject to income taxes in the United States and many foreign jurisdictions. We report our results of operations based on our determination of the amount of taxes owed in various tax jurisdictions in which we operate. The determination of our worldwide provision for income taxes and other tax liabilities requires estimation, judgment and calculations where the ultimate tax determination may not be certain. Our determination of tax liability is always subject to review or examination by tax authorities in various tax jurisdictions. Tax authorities have disagreed with our judgment in the past and may disagree with positions we take in the future resulting in assessments of additional taxes. Any adverse outcome of such review or examination could have a negative impact on our operating results and financial condition.

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Economic and political pressures to increase tax revenues in various jurisdictions may make resolving tax disputes more difficult. For example, in recent years, the tax authorities in Europe have disagreed with our tax positions related to hybrid debt, research and development credits, transfer pricing and indirect taxes, among others. We regularly assess the likelihood of the outcome resulting from these examinations to determine the adequacy of our provision for income taxes. Although we believe our tax estimates are reasonable, the final determination of tax audits and any related litigation could be materially different from our historical income tax provisions and accruals.

The results from various tax examinations, audits and litigation may differ from the liabilities recorded in our financial statements and could materially and adversely affect our financial results and cash flows in the period or periods for which that determination is made.

Changes in tax laws or rates, changes in the interpretation of tax laws or changes in the jurisdictional mix of our earnings could adversely affect our financial position and results of operations.

On December 22, 2017, the U.S. enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the "Tax Act"). The Tax Act made a number of substantial changes, including the imposition of a one-time mandatory deemed repatriation tax on the 2017 unrepatriated earnings accumulated offshore since 1986, the establishment of global minimum income tax and base erosion tax provisions related to offshore activities and affiliated party payments, and the reduction of the corporate tax rate from 35% to 21% for U.S. taxable income, resulting in a one-time remeasurement of deferred taxes to reflect their value at a lower tax rate of 21%. These changes to U.S. tax laws will significantly impact how U.S. multinational corporations are taxed on foreign earnings.

The U.S Treasury, Internal Revenue Service and other standard setting bodies are continuing to issue guidance and interpretation relating to the Tax Act. As future guidance is issued, we may make adjustments to amounts previously reported that could materially impact our financial statements.

Our global operations subject us to income and other taxes in the U.S. and in numerous foreign jurisdictions, each with different tax schemes and tax rates. In addition to the changes in tax laws and the interpretation of tax laws and tax rates in these jurisdictions, the jurisdictional mix of our earnings in countries with differing statutory tax rates can have a significant impact on our effective tax rate from period to period.

The tax effect of our investment in Sartorius AG and the jurisdictional mix of our earnings could continue to materially affect our financial results and cash flow.

In addition, the adoption of some or all of the recommendations set forth in the Organization for Economic Co-operation and Development's project on "Base Erosion and Profit Shifting" (BEPS) by tax authorities in the countries in which we operate, could negatively impact our effective tax rate. These recommendations focus on payments from affiliates in high tax jurisdictions to affiliates in lower tax jurisdictions and the activities that give rise to a taxable presence in a particular country.

Our reported financial results may be materially affected by changes in accounting principles generally accepted in the United States.

Generally accepted accounting principles in the United States, or U.S. GAAP, are subject to interpretation by the Financial Accounting Standards Board, or FASB, the U.S. Securities and Exchange Commission, or SEC, and various bodies formed to promulgate and interpret appropriate accounting principles. A change in these principles or interpretations could have a significant effect on our reported financial results, and could affect the reporting of transactions completed before the announcement of a change.

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For example, in January 2016, the FASB issued Accounting Standards Update No. (ASU) 2016-01, "Recognition and Measurement of Financial Assets and Financial Liabilities." Amendments under ASU 2016-01, among other items, require that all equity investments in unconsolidated entities (other than those accounted for using the equity method of accounting), such as our investment in Sartorius AG, will be measured at fair value through earnings. The impact of adoption of ASU 2016-01 in the first quarter of 2018 materially impacted our Consolidated Statement of Income due to our investment in Sartorius AG. In future periods, changes in the market value of our investment in Sartorius AG may continue to materially impact our Consolidated Statement of Income.

Also for example, in February 2016, the FASB issued ASU 2016-02, "Leases," which will require, among other items, lease accounting to recognize most leases as assets and liabilities on the balance sheet. We will adopt ASU 2016-02 on a modified retrospective basis effective January 1, 2019 with practical expedients. Where we act as a lessee, the adoption of the standard will result in material additions to the balance sheet for right-of-use assets and the associated liabilities. Where we act as a lessor in reagent rental arrangements, we estimate an insignificant impact to our consolidated financial statements.

We may incur losses in future periods due to write-downs in the value of financial instruments.
We have positions in a variety of financial instruments including asset backed securities and other similar instruments. Financial markets are volatile and the markets for these securities can be illiquid. The value of these securities will continue to be impacted by external market factors including default rates, changes in the value of the underlying property, such as residential or commercial real estate, rating agency actions, the prices at which observable market transactions occur and the financial strength of various entities, such as financial guarantors who provide insurance for the securities. Should we need to convert these positions to cash, we may not be able to sell these instruments without significant losses due to current debtor financial conditions or other market considerations.

We also have positions in equity securities, including our investment in Sartorius AG. Financial markets are volatile and the markets for these equity securities can be illiquid as well. A decline in the market value of our investment in Sartorius AG or in the market value of the other equity securities that we own could result in significant losses due to write-downs in the value of the equity securities. In addition, if we need to convert these positions to cash, we may not be able to sell these equity securities without significant losses.

Environmental, health and safety regulations and enforcement proceedings may negatively impact our business, results of operations and financial condition.

Our operations are subject to federal, state, local and foreign environmental laws and regulations that govern such activities as transportation of goods, emissions to air and discharges to water, as well as handling and disposal practices for solid, hazardous and medical wastes. In addition to environmental laws that regulate our operations, we are also subject to environmental laws and regulations that create liability and clean-up responsibility for spills, disposals or other releases of hazardous substances into the environment as a result of our operations or otherwise impacting real property that we own or operate. The environmental laws and regulations also subject us to claims by third parties for damages resulting from any spills, disposals or releases resulting from our operations or at any of our properties. We must also comply with various health and safety regulations in the United States and abroad in connection with our operations.

We may in the future incur capital and operating costs to comply with currently existing laws and regulations, and possible new statutory enactments, and these expenditures may be significant. We have incurred, and may in the future incur, fines related to environmental matters and/or liability for costs or damages related to spills or other releases of hazardous substances into the environment at sites where we have operated, or at off-site locations where we have sent hazardous substances for disposal. We cannot assure you, however, that such matters or any future

obligations to comply with environmental or health and safety laws and regulations will not adversely affect our business, results of operations or financial condition.

Our debt may restrict our future operations.

We have substantial debt and have the ability to incur additional debt. As of December 31, 2018, we had approximately $439.4 million of outstanding indebtedness. In addition, we have a revolving credit facility that provides for up to $200.0 million, $0.2 million of which has been utilized for domestic standby letters of credit. Our incurrence of substantial amounts of debt may have important consequences. For instance, it could:

- make it more difficult for us to satisfy our financial obligations, including those relating to our outstanding debt;
- require us to dedicate a substantial portion of our cash flow from operations to the payment of interest and principal due under our debt, which will reduce funds available for other business purposes;
- increase our vulnerability to general adverse economic and industry conditions;
- limit our flexibility in planning for, or reacting to, changes in our business and the industries in which we operate;
- place us at a competitive disadvantage compared with some of our competitors that have less debt; and
- limit our ability to obtain additional financing required to fund working capital and capital expenditures and for other general corporate purposes.

Our existing credit facility and the terms of our other debt instruments, including agreements we may enter in the future, contain or will contain covenants imposing significant restrictions on our business. These restrictions may affect our ability to operate our business and may limit our ability to take advantage of potential business opportunities as they arise. These covenants place restrictions on our ability to, among other things: incur additional debt; acquire other businesses or assets through merger or purchase; create liens; make investments; enter into transactions with affiliates; sell assets; in the case of some of our subsidiaries, guarantee debt; and declare or pay dividends, redeem stock or make other distributions to stockholders. Our existing credit facility also requires that we comply with certain financial ratios, including a maximum consolidated leverage ratio test and a minimum consolidated interest coverage ratio test.

Our ability to comply with these covenants may be affected by events beyond our control, including prevailing economic, financial and industry conditions. The breach of any of these restrictions could result in a default. An event of default under our debt agreements would permit some of our lenders to declare all amounts borrowed from them to be due and payable, together with accrued and unpaid interest. In addition, acceleration of our other indebtedness may cause us to be unable to make interest payments on our outstanding notes and repay the principal amount of our outstanding notes or may cause the future subsidiary guarantors, if any, to be unable to make payments under the guarantees.

We are subject to healthcare fraud and abuse laws and regulations and could face substantial penalties if we are unable to fully comply with such laws.

We are subject to healthcare fraud and abuse regulation and enforcement by both the U.S. federal government and the U.S. states and foreign governments in which we conduct our business. These healthcare laws and regulations include, for example:

- the U.S. federal Anti-Kickback Statute, which prohibits, among other things, persons or entities from soliciting, receiving, offering or providing remuneration, directly or indirectly, in return for or to induce either the referral of an individual for, or the purchase order or recommendation of, any item or services for which payment may be made under a federal healthcare program such as the Medicare and Medicaid programs;

- U.S. federal false claims laws, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment from Medicare, Medicaid, or other third-party payors that are false or fraudulent. In addition, the U.S. federal government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the false claims statutes;

- the U.S. Physician Payment Sunshine Act, which requires certain manufacturers of drugs, biologics, devices and medical supplies to record any transfers of value to U.S. physicians and U.S. teaching hospitals;

- the Health Insurance Portability and Accountability Act ("HIPAA"), as amended by the Health Information Technology for Economic and Clinical Health Act, which governs the conduct of certain electronic healthcare transactions and protects the security and privacy of protected health information; and

- state or foreign law equivalents of each of the U.S. federal laws above, such as anti-kickback and false claims laws, which may apply to items or services reimbursed by any third-party payor, including commercial insurers.

These laws will continue to impose administrative, cost and compliance burdens on us. The shifting compliance environment and the need to build and maintain robust systems to comply with multiple jurisdictions with different compliance and/or reporting requirements increases the possibility that a healthcare company may violate one or more of these requirements. In addition, any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management’s attention from the operation of our business. If our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, damages, fines, exclusion from the Medicare and Medicaid programs, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business, results of operations and financial condition.

Regulations related to “conflict minerals” could adversely impact our business.

As part of the Dodd-Frank Wall Street Reform and Consumer Protection Act, the SEC adopted disclosure requirements regarding the use of certain minerals, known as conflict minerals, which are mined from the Democratic Republic of Congo (DRC) and adjoining countries, as well as procedures regarding a manufacturer's efforts to identify the sourcing of such minerals and metals produced from those minerals. In March and April 2017, the European Parliament and the European Council formally approved a conflict minerals regulation, and the requirements will become effective starting in January 2021. We have incurred, and will continue to incur, additional costs in order to comply with the SEC’s disclosure requirements. In addition, we might incur further costs due to possible changes to our products, processes, or sources of supply as a consequence of our due diligence activities. As our supply chain is complex, we may not be able to sufficiently verify the origins of the specified minerals used in our products through our due diligence procedures, which may harm our reputation. In addition, we may encounter challenges to satisfy those customers who require that all of the components of our products be certified as “DRC conflict free”, which could place us at a competitive disadvantage if we do not do so. We filed our report for the calendar year 2017 with the SEC on May 4, 2018.

Risks related to our common stock

A significant majority of our voting stock is held by the Schwartz family, which could lead to conflicts of interest. We have two classes of voting stock: Class A Common Stock and Class B Common Stock. With a few exceptions, holders of Class A and Class B Common Stock vote as a single class. When voting as a single class, each share of Class A Common Stock is entitled to one-tenth of a vote, while each share of Class B Common Stock has one vote. In the election or removal of directors, the classes vote separately and the holders of Class A Common Stock are entitled to elect 25% of the Board of Directors, with holders of Class B Common Stock electing the remaining directors.

As a result of the Schwartz family's ownership of our Class A and Class B Common Stock, they are able to elect a majority of our directors, effect fundamental changes in our direction and control matters affecting us, including the determination of business opportunities that may be suitable for our company. The Schwartz family may exercise its control over us according to interests that are different from other investors' or debtors' interests. In particular, this concentration of ownership and voting power may have the effect of delaying or preventing a change in control of our company.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

We own our corporate headquarters located in Hercules, California. The principal manufacturing and research locations for each segment are as follows:

Segment	Location	Owned/Leased
Life Science	Greater San Francisco Bay Area, California	Owned/Leased
	Singapore, Singapore	Leased
	Oxford, England	Leased
Clinical Diagnostics	Greater San Francisco Bay Area, California	Owned/Leased
	Irvine, California	Leased
	Greater Seattle Area, Washington	Leased
	Lille, France	Owned
	Greater Paris Area, France	Leased
	Nazareth-Eke, Belgium	Leased
	Cressier, Switzerland	Owned/Leased
	Dreieich, Germany	Owned/Leased

Most manufacturing and research facilities also house administration, sales and distribution activities. In addition, we lease office and warehouse facilities in a variety of locations around the world. The facilities are used principally for sales, service, distribution and administration for both segments.

ITEM 3. LEGAL PROCEEDINGS

On May 27, 2015, our former general counsel, Sanford S. Wadler, filed a lawsuit in the U.S. District Court, Northern District of California, against us and four of our then current directors and one former director. The plaintiff's suit alleged whistleblower retaliation in violation of the Sarbanes-Oxley Act and the Dodd-Frank Act for raising FCPA-related concerns. Mr. Wadler also alleged wrongful termination in violation of public policy, non-payment of wages and waiting time penalties in violation of the California Labor Code. The plaintiff sought back pay, compensatory damages for lost wages, earnings, retirement benefits and other employee benefits, compensation for mental pain and anguish and emotional distress, waiting time penalties, punitive damages, litigation costs (including attorneys' fees) and reinstatement of employment. On July 28, 2015, we filed a motion to dismiss the plaintiff's complaint and specifically requested dismissal of the claims alleged against us under the Dodd-Frank Act and California Labor Code 1102.5 and the claims against the directors under the Sarbanes-Oxley Act and the Dodd-Frank Act. On October 23, 2015, the District Court granted our motion with respect to the alleged violations of the Sarbanes-Oxley Act against all the director defendants except Norman Schwartz with prejudice. The Court denied our motion to dismiss the claims under the Dodd-Frank Act as against both us and the director defendants. The trial commenced on January 17, 2017 and concluded on February 6, 2017. Mr. Wadler was awarded $10.92 million, plus prejudgment interest of $141,608, post-judgment interest, and Mr. Wadler's litigation costs, expert witness fees, and reasonable attorneys' fees as approved by the Court. We have provided for the judgment, interest and Mr. Wadler's litigation costs. On June 6, 2017, we filed a notice of appeal with the United States Court of Appeals for the Ninth Circuit. Oral arguments occurred on November 14, 2018. On February 26, 2019, the United States Court of Appeals for the Ninth Circuit issued its decision, reversing in part,

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vacating in part, and affirming in part. Specifically, the court: (1) reversed the Dodd-Frank claim, which amounts to about $2.96 million plus interest, and directed the district court to enter judgment in Bio-Rad's favor on that claim; (2) vacated the SOX claim due to instructional error and remanded for further proceedings, including whether a new trial is needed; and (3) affirmed the California public policy claim and the $7.96 million in damages attributable to it. On March 12, 2019 we filed a petition for panel rehearing or rehearing *en banc* with the United States Court of Appeals for the Ninth Circuit.

We are also party to various other claims, legal actions and complaints arising in the ordinary course of business. We cannot at this time reasonably estimate a range of exposure, if any, of the potential liability with respect to these matters. While we do not believe, at this time, that any ultimate liability resulting from any of these other matters will have a material adverse effect on our results of operations, financial position or liquidity, we cannot give any assurance regarding the ultimate outcome of these other matters and their resolution could be material to our operating results for any particular period, depending on the level of income for the period.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II.

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

Information Concerning Common Stock

Bio-Rad's Class A and Class B Common Stock are listed on the New York Stock Exchange with the ticker symbols BIO and BIO.B, respectively.

On March 26, 2019, we had 233 holders of record of Class A Common Stock and 111 holders of record of Class B Common Stock. Bio-Rad has never paid a cash dividend and has no present plans to pay cash dividends.

In November, 2017, the Board of Directors authorized a new share repurchase program, granting Bio-Rad authority to repurchase, on a discretionary basis, up to $250.0 million of outstanding shares of our common stock. Repurchases may be made at management's discretion from time to time on the open market or through privately negotiated transactions. This new authorization superseded the prior authorization of up to $18.0 million of Bio-Rad's common stock and has no expiration.

The following table contains information on the shares of our common stock that we purchased or otherwise acquired during the three months ended December 31, 2018, as required by the Securities and Exchange Commission rules. These were the only repurchases of our shares during 2018.

Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Maximum Number (or Approximate Dollar Value) of Shares that May yet be Purchased Under the Plans or Programs (in millions)
October 1 to October 31, 2018	—	$—	—	$ 250.0
November 1 to November 30, 2018	178,911 Class A	$273.39	178,911 Class A	$ 201.1
December 1 to December 31, 2018	—	$—	—	$ 201.1

See Item 12 of Part III of this report for the security ownership of certain beneficial owners and management and for securities authorized for issuance under equity compensation plans.

Stock Performance Graph

The following graph compares the cumulative stockholder returns over the past five years for our Class A Common Stock, the S&P 400 MidCap Index and a selected peer group, assuming $100 invested on December 31, 2013, and reinvestment of dividends if paid:

(1) The Peer Group consists of the following public companies: Danaher, Becton Dickinson, Thermo Fisher Scientific, Meridian Bioscience and PerkinElmer. Companies in our peer group reflect our participation in two different markets: life science research products and clinical diagnostics. No single public or private company has a comparable mix of products which serve the same markets. In many cases, only one division of a peer-group company competes in the same market as we do. Collectively, however, our peer group reflects products and markets similar to those of Bio-Rad.

This stock performance graph shall not be deemed incorporated by reference by any general statement incorporating by reference into any filing under the Securities Act or the Exchange Act, and shall not otherwise be deemed filed under these Acts.

ITEM 6. SELECTED FINANCIAL DATA

BIO-RAD LABORATORIES, INC.
Selected Financial Data
(In thousands, except per share data)

	Year Ended December 31,				
	2018	2017	2016	2015	2014
Net sales	$2,289,415	$2,160,153	$2,068,172	$2,019,441	$2,175,044
Cost of goods sold	1,066,264	972,450	929,744	897,771	996,527
Gross profit	1,223,151	1,187,703	1,138,428	1,121,670	1,178,517
Selling, general and administrative expense	834,783	806,790	814,697	761,990	808,200
Research and development expense	199,196	250,157	205,708	192,972	220,333
Impairment losses on goodwill and long-lived assets	292,513	11,506	62,305	—	—
Interest expense	23,962	23,014	23,380	21,692	22,131
Foreign currency exchange losses, net	2,861	9,128	4,542	10,249	9,305
Change in fair market value of equity securities	(606,230)	—	—	—	—
Other (income) expense, net	(36,593)	(10,697)	(13,764)	(11,080)	(13,009)
Income before income taxes	512,659	97,805	41,560	145,847	131,557
(Provision for) benefit from income taxes	(147,045)	24,444	(15,560)	(36,608)	(42,712)
Net income	$365,614	$122,249	$26,000	$109,239	$88,845
Basic earnings per share	$12.25	$4.12	$0.88	$3.74	$3.08
Diluted earnings per share	$12.10	$4.07	$0.88	$3.71	$3.05
Cash dividends paid per common share	$—	$—	$—	$—	$—
Total assets	$5,611,068	$4,273,012	$3,850,504	$3,709,718	$3,341,278
Long-term debt, net of current maturities	$438,937	$434,581	$434,186	$433,883	$435,710

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

This discussion should be read in conjunction with the information contained in our consolidated financial statements and the accompanying notes which are an integral part of the statements.

Overview. We are a multinational manufacturer and worldwide distributor of our own life science research and clinical diagnostics products. Our business is organized into two primary segments, Life Science and Clinical Diagnostics, with the mission to provide scientists with specialized tools needed for biological research and clinical diagnostics.

We sell more than 9,000 products and services to a diverse client base comprised of scientific research, healthcare, education and government customers worldwide. We do not disclose quantitative information about our different products and services as it is impractical to do so based primarily on the numerous products and services that we sell and the global markets that we serve.

We manufacture and supply our customers with a range of reagents, apparatus and equipment to separate complex chemical and biological materials and to identify, analyze and purify components. Because our customers require standardization for their experiments and test results, much of our revenues are recurring.

We are impacted by the support of many governments for both research and healthcare. The current global economic outlook is still uncertain as the need to control government social spending by many governments limits opportunities for growth. Adding to this uncertainty was the referendum in the United Kingdom to withdraw from the European Union, and a change in the U.S. executive branch of government. Approximately 38% of our 2018 consolidated net sales are derived from the United States and approximately 62% are derived from international locations, with Europe being our largest international region. The international sales are largely denominated in local currencies such as the Euro, Swiss Franc, Japanese Yen, Chinese Yuan and British Sterling. As a result, our consolidated net sales expressed in dollars benefit when the U.S. dollar weakens and suffer when the dollar strengthens. When the U.S. dollar strengthens, we benefit from lower cost of sales from our own international manufacturing sites as well as non-U.S. suppliers, and from lower international operating expenses. We regularly discuss our changes in revenue and expense categories in terms of both changing foreign exchange rates and in terms of a currency neutral basis, if notable, to explain the impact currency has on our results.

Impairment losses on goodwill and long-lived assets

In 2018, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A., 2007 through 2012 acquisitions of DiaMed Holding AG, DiaMed Fennica Oy, DiaMed (G.B.) Limited, and DiaMed Benelux (collectively DiaMed), 2010 acquisition of Biotest AG, and 2013 acquisition of AbD Serotec in the amounts of $18.1 million, $247.2 million, $10.8 million and $5.9 million, respectively. Goodwill for DiaMed, Biotest AG and AbD Serotec was fully impaired at December 31, 2018.

In 2018, we impaired developed product technology and fully impaired covenants not to compete in the amounts of $8.8 million and $1.7 million, respectively, associated with our 2012 acquisition of a cell sorting system from Propel Labs, Inc.

In 2017, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A. and with our 2013 acquisition of AbD Serotec in the amounts of $2.8 million and $8.7 million, respectively.

In 2016, we fully impaired goodwill and in-process research and development in the amounts of $13.5 million and $46.4 million, respectively, associated with the 2014 acquisition of GnuBIO, Inc. Also in 2016, we impaired an intellectual property license associated with a research and development project for $2.4 million.

Restructuring Costs for Termination of a Diagnostics Research and Development Project and Facility Closures

In December 2018, we announced the closure of a small manufacturing facility outside Paris, France. We recorded restructuring charges related to severance and employee benefits of $3.9 million and exit costs of $0.2 million for the year ended December 31, 2018.

In June 2018, we announced the closure of a small manufacturing operation in Munich, Germany. We recorded $1.7 million of expense in restructuring charges related to severance and employee benefits for the year ended December 31, 2018.

In December 2017, we announced the termination of a diagnostics research and development project in Europe. We recorded restructuring charges and adjustments related to severance and employee benefits of $0.4 million and $11.0 million, and asset write-offs and exit costs of $(0.1) million and $10.1 million for the years ended December 31, 2018 and 2017, respectively.

Restructuring charges for the termination of a diagnostics research and development project and the facility closures are all included in our Clinical Diagnostics segment's results of operations. The facility closures are a natural evolution from the larger consolidations that began with the 2016 European reorganization activities described below. The amounts recorded were reflected in Cost of goods sold of $5.4 million and $2.3 million, in Selling, general and administrative expense of $0.4 million and $3.3 million, and in Research and development expense of $0.3 million and $15.5 million in the Consolidated Statements of Income for the years ended December 31, 2018 and 2017, respectively. The liability of $11.5 million as of December 31, 2018 consisted of $7.3 million recorded in Accrued payroll and employee benefits, and $4.2 million recorded in Other long-term liabilities in the Consolidated Balance Sheets.

Restructuring Costs for GnuBIO, Inc.

In September 2017, we announced that we were closing the GnuBIO research program facilities in Massachusetts. We recorded restructuring charges in September 2017 related to severance and employee benefits of $2.9 million and asset write-offs of $5.5 million. The amounts recorded were reflected in Selling, general and administrative expense of $0.8 million and in Research and development expense of $7.6 million in the Consolidated Statements of Income for the year ended December 31, 2017. The liability balance as of December 31, 2017 was $1.4 million and was recorded in Accrued payroll and employee benefits in the Consolidated Balance Sheets. The liability was paid in early 2018.

Restructuring Costs for European Reorganization

In May 2016, we announced that we would take certain actions in our Europe geographic region designed to better align expenses to our revenue and gross margin profile and position us for improved operating performance. These actions, aligned with creation and evolution of our organization structure and coordinated with the implementation of our global single instance enterprise resource planning ("ERP") platform, are expected to be incurred through 2019. We recorded approximately $(0.2) million, $0.5 million and $12.5 million in restructuring charges and adjustments related to severance and other employee benefits for the years ended December 31, 2018, 2017 and 2016, respectively. From May 2016 to December 31, 2018, total expenses were $12.8 million. The liability of $1.6 million as of December 31, 2018 was recorded in Accrued payroll and employee benefits in the Consolidated Balance Sheets. The amounts recorded were reflected in Cost of goods sold of $(0.1) million, $(0.2) million and $2.1 million, and in Selling, general and administrative expense of $(0.1) million, $0.7 million and $10.4 million in the Consolidated Statements of Income for the years ended December 31, 2018, 2017 and 2016, respectively. The amounts adjusted were primarily for additional positions identified for elimination, partially offset by employees finding other positions within Bio-Rad or leaving prematurely.

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Acquisition of RainDance Technologies, Inc.
In February 2017, we acquired all the issued and outstanding stock of RainDance Technologies, Inc. (RainDance) for approximately $72.7 million. Cash payments at closing were $72.9 million. In addition, we had a cash payment of $10.0 million for a preexisting condition concurrent with the acquisition that was recorded in Cost of goods sold. The acquisition was included in our Life Science segment's results of operations from the acquisition date and was accounted for as a business combination. RainDance's foundational intellectual property portfolio and product lines encompass a wide range of biological reactions in droplets, with potential applications in life science research and clinical research. These genomic tools provide ultra-sensitive detection of genetic variations in cancer as well as inherited and infectious diseases, enabling research in areas such as non-invasive liquid biopsy. We believe that RainDance's droplet-based solutions will extend our reach into next-generation sequencing applications and strengthen our position in the area of Droplet Digital™ PCR, offering customers solutions for a wide range of nucleic acid detection applications.
The final allocation for the payments of $72.9 million was $37.6 million to definite-lived intangibles, $0.2 million to acquired net assets, $26.2 million to goodwill, a deferred tax liability of $13.6 million primarily related to the purchased intangibles and a deferred tax asset of $22.5 million primarily related to the acquired net operating losses.

Critical Accounting Policies and Estimates

The accompanying discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles (GAAP). The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities and contingencies as of the date of the financial statements and reported amounts of revenues and expenses during the reporting periods. We evaluate our estimates on an on-going basis. We base our estimates on historical experience and on other assumptions that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. However, future events may cause us to change our assumptions and estimates, which may require adjustment. Actual results could differ from these estimates. We have determined that for the periods reported in this Annual Report on Form 10-K the following accounting policies and estimates are critical in understanding our financial condition and results of operations.

Accounting for Income Taxes. Management is required to make estimates related to our income tax provision in each of the jurisdictions in which we operate. This process involves estimating our current tax exposures, as well as making judgments regarding the recoverability of deferred tax assets in each jurisdiction. Deferred tax assets and liabilities reflect the tax effects of losses, credits, and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Management assesses the likelihood that the deferred tax assets will be recovered from future taxable income and to the extent management believes that recovery is not likely, a valuation allowance must be established. To the extent management establishes a valuation allowance or increases this allowance in a period, an increase to expense within the Provision for income taxes in the Consolidated Statements of Income may result.

As of December 31, 2018 and 2017, we recorded a valuation allowance of $70.8 million and $66.4 million, respectively, due to uncertainties related to our ability to utilize some of the deferred tax assets, primarily consisting of certain foreign net operating losses carried forward and certain state research and development credits. The valuation allowance is based on management's current estimates of taxable income for the jurisdictions in which we operate and the period over which the deferred tax assets will be recoverable. In the event that actual results differ from these estimates, or these estimates are adjusted in future periods, an additional valuation allowance may need to be established, which would increase the tax provision, lowering income and impacting our financial position.

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Should realization of these deferred tax assets for which a valuation allowance has been provided occur, the provision for income taxes may decrease, raising income and positively impacting Bio-Rad's financial position.

We recognize the tax benefit from an uncertain tax position only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. The tax benefits recognized in the financial statements on a particular tax position are measured based on the largest benefit that has a greater than 50% likelihood of being realized upon settlement. The amount of unrecognized tax benefits is adjusted as appropriate for changes in facts and circumstances, such as significant amendments to existing tax law, new regulations or interpretations by the taxing authorities, new information obtained during a tax examination, or resolution of an examination. We recognize both accrued interest and penalties, where appropriate, related to unrecognized tax benefits in income tax expense. Our overall effective tax rate is subject to fluctuations because of changes in the geographic mix of earnings, changes to statutory tax rates and tax laws, and because of the impact of various tax audits and assessments, as well as generation of tax credits.

On December 22, 2017, the U.S. enacted comprehensive tax legislation (the "Tax Act"). The new legislation contains significant tax provisions that affect us, including a one-time mandatory deemed repatriation tax on certain unrepatriated foreign earnings ("Transition Tax"), a reduction of the corporate income tax rate from 35% to 21% effective January 1, 2018, and a change from a worldwide tax system to a modified territorial system.

We are required to recognize the effect of the tax law changes in the period of enactment, such as the computation of the Transition Tax, remeasurement of our U.S. deferred tax assets and liabilities, as well as reassessment of the net realizability of our deferred tax assets and liabilities.

Subsequent to the enactment of the Tax Act, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to complete the accounting under Accounting Standards Codification ("ASC") 740, "Income Taxes." We have completed the accounting for the income tax effects of the Tax Act, under SAB 118, as of December 31, 2018. As noted in our 2017 Annual Report, we were able to make reasonable estimates and provisionally recorded an income tax benefit of $70 million related to the Transition Tax and remeasurement of our U.S. federal deferred tax assets and liabilities. The final accounting for the Tax Act resulted in an additional income tax benefit of $49 million for a final income tax benefit of $119 million. This is comprised of $169 million tax benefit related to the remeasurement of U.S. federal deferred tax assets and liabilities, offset by $50 million tax detriment for the Transition Tax. We elected to account for the tax effect of the Global Intangible Low-Taxed Income ("GILTI") in the period in which it is incurred.

Valuation of Business Acquisitions, Goodwill and Long-lived Assets. Upon the consummation of a business combination, we use multiple analyses to determine the fair market value of the consideration of assets acquired and liabilities assumed. Once the fair market value of the acquired business is determined, any residual value between fair market value and the consideration is defined as goodwill.

Goodwill represents the excess of the cost over the fair value of net tangible and identifiable intangible assets of acquired businesses, which could include contingent consideration. Contingent consideration is an obligation of the acquirer to transfer additional assets or equity interest to the former owners of an acquiree as part of the exchange for control of the acquiree if specified future events occur or conditions are met. Contingent consideration is reported at fair value each reporting period until the contingency is resolved. Any changes in fair value are recognized in earnings, which could become volatile over time depending on the facts and circumstances.

Goodwill amounts are assigned to reporting units at the time of acquisition and are adjusted for any subsequent significant transfers of business between reporting units. We assess the impairment of goodwill annually in the fourth quarter or whenever events or changes in circumstances indicate that the carrying value may not be recoverable. We perform the impairment tests of goodwill at our reporting unit level, which is one level below our operating segments. On January 1, 2017, we adopted Accounting Standards Update 2017-04, "Simplifying the Test for Goodwill Impairment," in which a goodwill impairment will be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill.

We use a projected discounted cash flow model to determine the fair value of a reporting unit. This discounted cash flow method for determining goodwill may be different from the fair value that would result from an actual transaction between a willing buyer and a willing seller. Projections such as discounted cash flow models are inherently uncertain and accordingly, actual future cash flows may differ materially from projected cash flows. Management judgment is required in developing the assumptions for the discounted cash flow model. These assumptions include revenue growth rates, profit margins, future capital expenditures, working capital needs, expected foreign currency rates, discount rates and terminal values. We estimate future cash flows using current and longer-term financial forecasts. These forecasts take into account the current economic environment. The discount rates used are compiled using independent sources, current trends in similar businesses and other observable market data. Changes to these rates might result in material changes in the valuation and determination of the recoverability of goodwill. For example, an increase in the discount rate used to discount cash flows will decrease the computed fair value.

Impairment tests are highly sensitive to changes in assumptions and minor changes to assumptions could result in impairment losses. Our forecasts utilized in our 2018 impairment test assumed, among other things, sales growth from executing our sales and marketing programs, new product introductions, successful product development and timely registration of our products when required, while controlling costs to manufacture and service our equipment at the customer site. In addition, external factors, such as competitive pricing in the market, currency, inflation rates, cost of capital, and forecasted tax rates could affect the determination of fair value of our reporting units. Aside from our Pasteur Sanofi Diagnostics S.A., DiaMed Holding AG, Biotest AG, and AbD Serotec reporting units, which reflected a carrying value that exceeded its fair value, our impairment tests resulted in excessive fair value over book value ranging from 13% to more than 400% for our various reporting units. One reporting unit, which consists of our 2001 acquisition of Helix Inc., had excess fair value over book value of only 13% at December 31, 2018. Goodwill in the amount of $1.4 million is allocated to this reporting unit at December 31, 2018. If the initiatives mentioned above do not achieve the desired results, or external factors change detrimentally, future impairment losses may occur.

To validate the reasonableness of the reporting unit fair values, we reconcile the aggregate fair values of the reporting units to the enterprise market capitalization. In performing the reconciliation we may, depending on the volatility of the market value of our stock price, use either the stock price on the valuation date or the average stock price over a range of dates around the valuation date.

For purposes of recognition and measurement of an impairment loss, a long-lived asset or assets are grouped with other assets and liabilities at the lowest level for which identifiable cash flows are largely independent of the cash flows of other assets and liabilities. We assess the impairment of long-lived assets (including identifiable intangibles) whenever events or changes in circumstances indicate that the carrying value may not be recoverable. In addition to the required quantitative review, we also review quarterly qualitative factors that we consider important, which could trigger an impairment review and include:

- significant reporting unit under-performance relative to expected, historical or projected future operating results;
- significant changes in the manner of use of the long-lived assets, intangible assets or the strategy for our overall business;
- a current expectation that, more likely than not, a long-lived asset will be sold or otherwise disposed of before the end of its previously estimated useful life; and
- significant negative industry, legal, regulatory or economic trends.

When management determines that the carrying value of long-lived assets may not be recoverable based upon the existence of one or more of the above indicators of impairment, we test for any impairment based on a projected undiscounted cash flow method. Projected future operating results and cash flows of the asset or asset group are used to establish the fair value used in evaluating the carrying value of long-lived and intangible assets. We estimate the future cash flows of the long-lived assets using current and long-term financial forecasts. The carrying amount of a long-lived asset is not recoverable if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset. If this is the case, an impairment loss would be recognized. The impairment loss recognized is the amount by which the carrying amount exceeds the fair value.

In 2018, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A., 2007 through 2012 acquisitions of DiaMed Holding AG, DiaMed Fennica Oy, DiaMed (G.B.) Limited, and DiaMed Benelux (collectively DiaMed), 2010 acquisition of Biotest AG, and 2013 acquisition of AbD Serotec in the amounts of $18.1 million, $247.2 million, $10.8 million and $5.9 million, respectively. Goodwill for DiaMed, Biotest AG and AbD Serotec was fully impaired at December 31, 2018. In 2018, we impaired developed product technology and fully impaired covenants not to compete in the amounts of $8.8 million and $1.7 million, respectively, associated with our 2012 acquisition of a cell sorting system from Propel Labs, Inc.

In 2017, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A. and with our 2013 acquisition of AbD Serotec in the amounts of $2.8 million and $8.7 million, respectively.

In 2016, we fully impaired goodwill and in-process research and development in the amounts of $13.5 million and $46.4 million, respectively, associated with our 2014 acquisition of GnuBIO, Inc.

All the impairments above were based upon a revision of our Level 3 valuation inputs, i.e., expected future cash flows.

Also in 2016, we impaired intellectual property in the amount of $2.4 million associated with the termination of a research and development project.

Valuation of Inventories. We value inventory at the lower of the actual cost to purchase and/or manufacture the inventory, or the current estimated net realizable value of the inventory. We review inventory quantities on hand and reduce the cost basis of excess and obsolete inventory based primarily on an estimated forecast of product demand, production requirements and the quality, efficacy and potency of raw materials. This review is done on a quarterly basis or, if warranted by the circumstances, more frequently. In addition, our industry is characterized by technological change, frequent new product development and product obsolescence that could result in an increase in the amount of obsolete inventory quantities on hand. Our estimates of future product demand may prove to be inaccurate, and if too high, we may have overstated the carrying value of our inventory. In the future, if inventory is determined to be overvalued, we would be required to write down the value of inventory to market and recognize such costs in our cost of goods sold at the time of such determination. Therefore, although we make efforts to ensure the accuracy of our forecasts of future product demand and perform procedures to safeguard overall inventory quality, any significant unanticipated changes in demand, technological developments, regulations, storage conditions, or other

economic or environmental factors affecting biological materials, could have a significant impact on the value of our inventory and reported results of operations.

Results of Operations - Sales, Gross Margins and Expenses

The following shows cost of goods sold, gross profit, expense items and net income as a percentage of net sales:

	Year Ended December 31,		
	2018	2017	2016
Net sales	100.0%	100.0%	100.0%
Cost of goods sold	46.6	45.0	45.0
Gross profit	53.4	55.0	55.0
Selling, general and administrative expense	36.5	37.3	39.4
Research and development expense	8.7	11.6	9.9
Net income	16.0	5.7	1.3

Net sales

Net sales (sales) in 2018 were $2.29 billion, an increase of 6.0% compared to $2.16 billion in 2017. Excluding the impact of foreign currency exchange rate fluctuations, 2018 sales increased by approximately 5.0% compared to 2017. Currency neutral sales increased in all regions, with a slight increase in Europe. On January 1, 2018, we adopted FASB Accounting Standards Codification ("ASC") 606, “Revenue from Contracts with Customers,” using the modified retrospective method applied to those contracts which were not completed as of January 1, 2018 (see Note 1 to the consolidated financial statements). The impact to revenue as a result of applying ASC 606 for 2018 was not significant.

The Life Science segment sales in 2018 were $861.7 million, an increase of 9.7% compared to 2017. On a currency neutral basis, sales increased 8.9% compared to 2017. The currency neutral sales increase was primarily in our Droplet Digital™ PCR, process chromatography, Real Time amplification systems, food science, cell biology, and antibody businesses. The currency neutral sales increase was primarily reflected in North America, Europe, Brazil within Latin America, and all countries within Asia Pacific except Japan.

The Clinical Diagnostics segment sales in 2018 were $1.41 billion, an increase of 3.7% compared to 2017. On a currency neutral basis, sales increased 2.6% compared to 2017. The currency neutral sales increase was primarily attributable to growth across quality control, immunology, blood typing product lines, including the resolution of a claim relating to a licensed patent of $6.0 million in the first quarter of 2018. On a geographic view, currency neutral sales for the year were up in the Americas and Asia Pacific, partially offset by decreased sales in Europe primarily due to pricing pressure on product renewals, loss of a few customers and timing on several Middle Eastern customer orders.

Net sales (sales) in 2017 were $2.16 billion, an increase of 4.4% compared to $2.07 billion in 2016. Excluding the impact of foreign currency exchange rate fluctuations, 2017 sales increased by approximately 3.5% compared to 2016. Currency neutral sales growth was reflected in most regions.

The Life Science segment sales in 2017 were $785.2 million, an increase of 7.5% compared to 2016. On a currency neutral basis, sales increased 6.8% compared to 2016. The currency neutral sales increase was primarily driven by growth in our Droplet Digital™ PCR and gene expression product lines, in addition to sales from our acquisition of RainDance in 2017. The currency neutral sales increase was primarily reflected in all regions except Latin America

mostly due to government imposed spend control.

The Clinical Diagnostics segment sales in 2017 were $1.36 billion, an increase of 2.8% compared to 2016. On a currency neutral basis, sales increased 1.6% compared to 2016. The currency neutral sales increase was primarily attributable to growth across quality control, immunohematology, diabetes and immunology, partially offset by lower sales in infectious disease. On a geographic view, the currency neutral sales increases for 2017 were primarily reflected in Asia Pacific, excluding Japan, and Latin America, partially offset by lower sales in North America and Japan.

Gross margin

Consolidated gross margins were 53.4% in 2018 compared to 55.0% in 2017. Life Science segment gross margins in 2018 increased when compared to 2017 by approximately 1.2 percentage points primarily due to a $10.0 million one-time expense associated with the RainDance acquisition in 2017 and lower intangible amortization within digital biology that was partially offset by an increase for royalty amortization within gene expression. In addition in 2017, gross margins were impacted by legal matters that reduced 2017 cost of goods sold by approximately $10.4 million. Clinical Diagnostics segment gross margins in 2018 decreased by approximately 2.9 percentage points compared to 2017 and were primarily driven by product mix and competitive pricing pressures, impacting particularly equipment that consumes reagents for diagnostic testing. Other factors were $18.6 million of higher costs for excess and expired inventory and on-site service, as well as $5.4 million of expenses associated with the closing of a small manufacturing operation in Munich, Germany and a small manufacturing facility outside Paris, France. The decrease in gross margins was partially offset by $6.0M of royalties generated by a license resolution on a patent owned by Bio-Rad.

Consolidated gross margins were 55.0% in 2017 compared to 55.0% in 2016. Life Science segment gross margins in 2017 increased from 2016 by approximately 1.2 percentage points primarily due to higher margins in gene expression and digital biology businesses largely due to a decline in royalty expense for license agreements relating to amplification reagents. In addition, gross margins were impacted by legal matters that reduced cost of goods sold by approximately $10.4 million. These gross margin improvements were partially offset by $10.0 million for a preexisting condition and higher acquisition intangible amortization, both associated with the RainDance acquisition. Clinical Diagnostics segment gross margins in 2017 decreased by approximately 0.8 percentage points compared to 2016 primarily due to lower margin sales and the termination of an infectious disease research and development project that effected cost of goods sold at a cost of $2.3 million in 2017, partially offset by lower amortization of intangibles, licenses fees and favorable manufacturing variances as compared to 2016.

Selling, general and administrative expense

Consolidated selling, general and administrative expenses (SG&A) increased to $834.8 million or 36.5% of sales in 2018 compared to $806.8 million or 37.3% of sales in 2017. Increases to SG&A primarily were related to professional fees of $14.9 million primarily for legal matters to defend our intellectual property, a lower benefit from the reversal of contingent consideration of $11.9 million, normal increases in employee related expenses of $8.6 million (excluding restructuring costs) and increased bad debt that was occasioned by the failure of a certain distributor in the Middle East. These expenses were partially offset by lower restructuring costs in 2018 of approximately $8.5 million, and equipment savings of $2.0 million primarily due to lower information technology maintenance for hardware and software support.

Consolidated SG&A decreased to $806.8 million or 37.3% of sales in 2017 compared to $814.7 million or 39.4% of sales in 2016. Decreases to SG&A were primarily due to $21.0 million for various legal matters in 2016 that did not occur in 2017, including the Wadler judgment as discussed further in Note 13 to the consolidated financial statements compared to a few legal matters in 2017 that reduced SG&A by approximately $0.7 million, $10.4 million of restructuring costs associated with the European reorganization announced in June 2016 (see Note 15) that did not

occur in 2017 compared to the other restructuring costs in 2017 of approximately $8.5 million that are also in Note 15 in addition to a few other reduction in force activities, lower contingent consideration of $19.7 million, lower third party commissions of $2.5 million and other numerous net costs of $12.1 million. Increases to

SG&A primarily included employee-related expenses (excluding restructuring costs) of $17.0 million, facilities of $12.2 million, software of $7.7 million, bad debt expense of $5.4 million, advertising of $3.5 million, other taxes of $3.3 million, travel of $3.0 million and purchase accounting amortization of $1.0 million. Some of these increased costs were associated with the transition that took place to a new European operating model supported by the European ERP implementation, the inclusion of RainDance, closure costs for the GnuBIO research program facilities, and the termination of an infectious disease research and development project that all occurred in 2017.

Research and development expense

Research and development expense decreased to $199.2 million or 8.7% of sales in 2018 compared to $250.2 million or 11.6% of sales in 2017. Life Science segment research and development expense decreased in 2018 from 2017 primarily due to lower development milestone expenses of $11.7 million, as well as the consolidation of the RainDance research and development. The decrease was partially offset by additional spending for new product development within the Droplet Digital business. Clinical Diagnostics segment research and development expense decreased in 2018 from 2017 as a result of reduced research and development activity.

Research and development expense increased to $250.2 million or 11.6% of sales in 2017 compared to $205.7 million or 9.9% of sales in 2016. Life Science segment research and development expense increased in 2017 from 2016 primarily due to higher milestone expenses of $5.5 million associated with the 2016 Propel platform acquisition, and increased project activities, which included our recent RainDance acquisition. Clinical Diagnostics segment research and development expense increased in 2017 from 2016 primarily driven by a termination of an infectious disease research and development project of $15.5 million (see Note 15 to the consolidated financial statements), an asset purchase for an early stage diagnostic device for $7.5 million, and closure costs of $7.6 million that included severance and the impairment of equipment and leasehold improvements for the GnuBIO research program, which all occurred in 2017, partially offset by lower spending due to the timing of projects.

Impairment losses on goodwill and long-lived assets

In 2018, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A., 2007 through 2012 acquisitions of DiaMed Holding AG, DiaMed Fennica Oy, DiaMed (G.B.) Limited, and DiaMed Benelux (collectively DiaMed), 2010 acquisition of Biotest AG, and 2013 acquisition of AbD Serotec in the amounts of $18.1 million, $247.2 million, $10.8 million and $5.9 million, respectively. Goodwill for DiaMed, Biotest AG and AbD Serotec was fully impaired at December 31, 2018. Impairments for the Pasteur Sanofi Diagnostics S.A., DiaMed and Biotest AG were included in our Clinical Diagnostics segment's results of operations, and the impairment for AbD Serotec was included in our Life Science segment's results of operations.

In 2018, we impaired developed product technology and fully impaired covenants not to compete in the amounts of $8.8 million and $1.7 million, respectively, associated with our 2012 acquisition of a cell sorting system from Propel Labs, Inc. These impairments were included in our Life Science segment's results of operations.

In 2017, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A. and with our 2013 acquisition of AbD Serotec in the amounts of $2.8 million and $8.7 million, respectively. Impairment for the Pasteur Sanofi Diagnostics S.A. was included in our Clinical Diagnostics segment's results of operations, and the impairment for AbD Serotec was included in our Life Science segment's results of operations.

In 2016, we fully impaired goodwill and in-process research and development in the amounts of $13.5 million and $46.4 million, respectively, associated with our 2014 acquisition of GnuBIO, Inc. Also in 2016, we impaired an intellectual property license associated with a research and development project for $2.4 million. These impairments were included in our Clinical Diagnostics segment's results of operations.

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Results of Operations – Non-operating

Interest expense

Interest expense in 2018 was $24.0 million, a slight increase compared to 2017 of $23.0 million.

Interest expense in 2017 was $23.0 million, a slight decrease from 2016 of $23.4 million.

Foreign currency exchange gains and losses

Foreign currency exchange gains and losses consist primarily of foreign currency transaction gains and losses on intercompany net receivables and payables and the change in fair value of our forward foreign exchange contracts used to manage our foreign currency exchange risk. Net foreign currency exchange losses for 2018, 2017 and 2016 were $2.9 million, $9.1 million and $4.5 million, respectively. The 2018, 2017 and 2016 net foreign currency exchange losses were attributable to market volatility, the result of the estimating process inherent in the timing of shipments and payments of intercompany debt, and the intercompany movement of assets and capital for the new European operating model in 2017, and the cost of hedging. All years are affected by the economic hedging program we employ to hedge our intercompany receivables and payables denominated in foreign currencies.

Change in fair market value of equity securities

Change in fair market value of equity securities of $606.2 million for 2018 compared to none for 2017 and 2016 was primarily due to the adoption of ASU 2016-01 (see Note 1 to the consolidated financial statements) and mostly consisted of holding gains on our investment in Sartorius AG.

Other (income) expense, net

Other (income) expense, net includes investment and dividend income, generally interest income on our cash and cash equivalents, short-term investments and long term marketable securities. Other (income) expense, net in 2018 increased to $36.6 million of income compared to $10.7 million of income in 2017. Other income, net increased primarily due higher dividends of $14.0 million in 2018 compared to $10.9 million in 2017 from our investment in Sartorius AG, higher investment income of approximately $11.9 million, and a land sale of $4.1 million and a divestiture of a product line of $5.1 million that both occurred in the first quarter of 2018.

Other (income) expense, net in 2017 decreased to $10.7 million income compared to $13.8 million income in 2016. The decrease was primarily due to $6.4 million of higher other-than-temporary impairment losses on investments in 2017 than in 2016 in light of continuing declines in the investment market prices and investees' financial conditions at that time, partially offset by $1.2 million of higher dividend income in 2017 than in 2016 on the ordinary and preferred shares of our investment in Sartorius AG, and higher investment income.

Effective tax rate

On December 22, 2017, the U.S. enacted comprehensive tax legislation (the “Tax Act”). The Tax Act made broad and complex changes to the U.S. tax code that affect our 2017 financial statements, including the imposition of a one-time mandatory deemed repatriation tax (“Transition Tax”) on certain earnings accumulated offshore since 1986 and the reduction of the corporate tax rate from 35% to 21% for U.S. taxable income, resulting in a one-time remeasurement of U.S. federal deferred tax assets and liabilities.

Our effective tax rate was 29%, (25)% and 37% in 2018, 2017 and 2016, respectively. The effective tax rate for 2018 was driven by detriments due to non-deductible impairment charges and the taxation of our foreign operations, partially offset by a $49 million benefit recorded as a result of the completion of our accounting for the Tax Act under SAB 118. The effective tax rate for 2017 was driven by a $70 million benefit recorded as a provisional estimate of the accounting for the Tax Act. The effective tax rate for 2016 included additional tax

liabilities for unrecognized tax benefits related to the non-deductibility of interest expense in our foreign jurisdictions. Our effective tax rate may be impacted in the future, either favorably or unfavorably, by many factors including, but not limited to, changes to statutory tax rates, changes in tax laws or regulations, tax audits and settlements, and generation of tax credits.

Our income tax returns are audited by U.S. federal, state and foreign tax authorities. We are currently under examination by many of these tax authorities. There are differing interpretations of tax laws and regulations, and as a result, significant disputes may arise with these tax authorities involving issues of the timing and amount of deductions and allocations of income among various tax jurisdictions. We evaluate our exposures associated with our tax filing positions on a quarterly basis.

We record liabilities for unrecognized tax benefits related to uncertain tax positions. We do not believe the resolution of our uncertain tax positions will have a material adverse effect on our consolidated financial statements, although an adverse resolution of one or more of these uncertain tax positions in any period may have a material impact on the results of operations for that period.

As of December 31, 2018, based on the expected outcome of certain examinations or as a result of the expiration of statutes of limitation for certain jurisdictions, we believe that within the next twelve months it is reasonably possible that our previously unrecognized tax benefits could decrease by approximately $3.1 million. Substantially all such amounts will impact our effective income tax rate.

Liquidity and Capital Resources

Bio-Rad operates and conducts business globally, primarily through subsidiary companies established in the markets in which we trade. Goods are manufactured in a small number of locations, and are then shipped to local distribution facilities around the world. Our product mix is diversified, and certain products compete largely on product efficacy, while others compete on price. Gross margins are generally sufficient to exceed normal operating costs, and funding for research and development of new products, as well as routine outflows of capital expenditures, interest and taxes. In addition to the annual positive cash flow from operating activities, additional liquidity is readily available via the sale of short-term investments and access to our domestic $200.0 million unsecured Credit Agreement, and to a lesser extent international lines of credit. Borrowings under the 2014 Credit Agreement are available on a revolving basis and can be used to make permitted acquisitions, for working capital and for other general corporate purposes. We had no outstanding borrowings under the Credit Agreement as of December 31, 2018, however, $0.2 million was utilized for domestic standby letters of credit that reduced our borrowing availability. The Credit Agreement matures in June 2019. We are currently evaluating our options on renewing the Credit Agreement or similar arrangements. In total under domestic and international lines of credit, standby letters of credit and guarantee arrangements, we had approximately $208.2 million available for borrowing and usage as of December 31, 2018, which was reduced by approximately $3.1 million that was utilized for standby letters of credit and guarantee arrangements issued by our banks to support our obligations. Management believes that this availability, together with cash flow from operations, will be adequate to meet our current objectives for operations, research and development, capital additions for manufacturing and distribution, plant and equipment, information technology systems and an acquisition of reasonable proportion to our existing total available capital.

At December 31, 2018, we had available $844.8 million in cash, cash equivalents and short-term investments, of which approximately 17% was held in our foreign subsidiaries. We believe that our holdings of cash, cash equivalents and short-term investments in the U.S. and in our foreign subsidiaries are sufficient to meet both the current and long-term needs of our global operations. The amount of funds held in the United States can fluctuate due to the timing of receipts and payments in the ordinary course of business and due to other reasons, such as

business-development activities. As part of our ongoing liquidity assessments, we regularly monitor the mix of domestic and foreign cash flows (both inflows and outflows).

It is generally our intention to repatriate certain foreign earnings to the extent that such repatriations are not restricted by local laws or accounting rules, and there are no substantial incremental costs. During the current year, we recorded approximately $6.7 million of deferred tax liability for the earnings of certain foreign jurisdictions that we may repatriate in the future. The determination of the amount of the unrecognized deferred tax liability for foreign earnings that are indefinitely reinvested is not practicable to estimate.

Demand for our products and services could change more dramatically than in previous years based on activity, funding, reimbursement constraints and support levels from government, universities, hospitals and private industry, including diagnostic laboratories. The need for certain sovereign nations with large annual deficits to curtail spending, and international trade disputes and increased regulation, could lead to slower growth of, or even a decline in, our business. Sovereign nations either delaying payment for goods and services or renegotiating their debts could impact our liquidity.

Cash Flows from Operations

Net cash provided by operations was $285.5 million, $104.1 million and $216.1 million in 2018, 2017, and 2016, respectively. The net increase between 2018 and 2017 of $181.4 million primarily resulted from:

- higher cash received from customers in 2018 primarily due to higher sales, in addition to improving collections subsequent to the ERP implementation in 2017,
- net proceeds in 2018 compared to net payments in 2017 for forward foreign exchange contracts, and
- higher investment income received, partially offset by
- higher cash paid to suppliers in 2018 primarily for inventory build, employee related costs and professional fees, and included in 2017 was a $10.0 payment for the RainDance preexisting condition, and
- higher income tax payments in 2018 compared to 2017.

The net decrease between 2017 and 2016 of $112.0 million primarily resulted from:

- more cash paid to suppliers primarily related to increased inventory, higher employee related costs, an asset purchase for an early stage diagnostic device for $7.5 million, $10.0 million for the RainDance preexisting condition, and higher value added taxes in part due to the European reorganization,
- higher net payments in 2017 compared to 2016 for forward foreign exchange contracts primarily associated with the timing of product shipments, intercompany debt payments, and the intercompany movement of assets and capital for the new European operating model, and
- lower income tax refunds in 2017 compared to 2016, partially offset by
- higher cash received from customers in 2017 primarily due to higher sales, partially offset by higher accounts receivable balances due in part to implementation matters associated with the European ERP system, and
- higher investment income received.

Cash flows from operations during the first quarter have historically had larger payments for royalties, fourth quarter sales commissions to third parties and annual employee bonuses, and we expect this pattern to recur in the first quarter of 2019.

Cash Flows from Investing Activities

Net cash used in investing activities was $187.0 million, $175.6 million and $213.9 million for 2018, 2017 and 2016, respectively. Purchases of marketable securities and investments, net of combined proceeds from sales and maturities, were net purchases of $68.7 million in 2018 compared to net proceeds in 2017 of $17.1 million. Improved cash

generated from operations in 2018 generated more purchases of marketable securities and investments. Proceeds from sales and maturities, net of purchases of marketable securities and investments combined were net proceeds of$17.1 million in 2017 compared to net purchases of $58.2 million in 2016.

Our investment objective is to maintain liquidity to meet anticipated operational and other corporate requirements in which capital is preserved and increased through investing in low risk, high quality securities with commensurate returns, consistent with our risk tolerance level.

During the first quarter of 2018, we received $7.0 million for a divestiture of a product line. Purchases of intangible assets in 2017 were primarily due to a $3.8 million payment for an acquired technology and know-how to expand our product offerings. Payments for acquisitions, net of cash received, and long-term investments in 2017 and 2016 were primarily due to the following:

- in February 2017, we acquired all the issued and outstanding stock of RainDance for approximately $72.7 million including certain assumed net liabilities. Cash payments at closing were $72.9 million.
- in January 2016, we acquired a high performance analytical flow cytometer platform from Propel for total consideration of $32.8 million, which included $9.5 million paid in cash at the closing date and $23.3 million in contingent consideration potentially payable to Propel, after the effects of a calculation revision that were reflected in the fourth quarter of 2016.

We continue to review possible acquisitions, including early stage businesses, to expand both our Life Science and Clinical Diagnostics segments. We routinely meet with the principals or brokers of the subject companies. However, it is not certain at this time that any of these discussions will advance to completion.

Capital expenditures in 2018 totaled $129.8 million, compared to $111.3 million and $141.4 million in 2017 and 2016, respectively. Capital expenditures represent the addition and replacement of production machinery and research equipment, ongoing manufacturing and facility additions for expansion, regulatory, environmental and compliance. Also included in capital expenditures are investments in business systems and data communication upgrades and enhancements. All periods include equipment placed with Clinical Diagnostics segment customers who then contract to purchase our reagents for use. Capital expenditures were higher in 2018 than 2017 primarily due to an investment in two office buildings and adjacent land in the greater San Francisco Bay Area, California. Capital expenditures were lower in 2017 than in 2016 as implementation costs were higher in 2016 for the third phase of the ERP platform, which was implemented in April 2017. As we implement the remaining smaller phases of the ERP platform, we expect lower levels of information technology capital expenditures as the majority of the ERP platform has been implemented.

Cash Flows from Financing Activities

Net cash used in financing activities was $48.7 million in 2018, and net cash provided by financing activities was $0.3 million and $9.0 million in 2017 and 2016, respectively. In 2018 and 2017, we repurchased our common stock for $48.9 million and $2.9 million, respectively, under our repurchase programs as described below. In 2018, 2017 and 2016, there were payments of $2.1 million, $3.7 million and $3.5 million, respectively, to Propel Labs' shareholders in contingent consideration for sales milestones that were associated with the acquisitions in 2016 and 2012. Income taxes paid from net share settlement for share-based compensation in 2018, 2017 and 2016 was $8.9 million, $7.3 million and zero, respectively. Proceeds from issuance of our common stock in 2018, 2017 and 2016 were $14.1 million, $14.6 million and $11.3 million, respectively.

We have outstanding Senior Notes of $425.0 million, which are not due until December 2020. We believe the current cash is sufficient to meet normal operating costs, and funding for research and development of new products, as well as routine outflows of capital expenditures, interest and taxes.

In November, 2017, the Board of Directors authorized a new share repurchase program, granting Bio-Rad authority to repurchase, on a discretionary basis, up to $250.0 million of outstanding shares of our common stock. Repurchases

may be made at management's discretion from time to time on the open market or through privately negotiated transactions. This new authorization superseded the prior authorization of up to $18.0 million of Bio-Rad's common stock and has no expiration. See Note 7 to the consolidated financial statements for the share repurchase activity.

Off-Balance Sheet Arrangements

We do not have any off-balance sheet arrangements that have had or are reasonably likely to have a current or future material effect on our financial condition, results of operations or liquidity.

Contractual Obligations

The following summarizes certain of our contractual obligations as of December 31, 2018 and the effect such obligations are expected to have on our cash flows in future periods (in millions):

	Payments Due by Period				
Contractual Obligations	Total	Less Than One Year	1-3 Years	3-5 Years	More than 5 Years
Long-term debt, including current portion (1)	$440.7	$ 0.5	$428.3	$ 2.0	$ 9.9
Interest payments (1)	40.2	20.7	19.5	—	—
Operating lease obligations (2)	168.8	44.4	65.2	33.7	25.5
Purchase obligations (3)	12.5	6.5	5.4	0.4	0.2
Long-term liabilities (4)	110.9	5.8	22.6	5.9	76.6

(1) These amounts represent expected cash payments, including capital lease obligations, which are included in our December 31, 2018 Consolidated Balance Sheet. Our debt is fixed and primarily consists of the 4.875% Notes. See Note 5 of the Consolidated Financial Statements for additional information about our debt.

(2) Operating lease obligations are described in Note 12 of the Consolidated Financial Statements.

(3) Purchase obligations include agreements to purchase goods or services that are enforceable and legally binding to Bio-Rad and that specify all significant terms. Purchase obligations exclude agreements that are cancelable without penalty.

(4) These amounts primarily represent long-term obligations for other post-retirement benefits mostly due in more than 5 years, and long-term deferred revenue. Excluded from this table are tax liabilities for uncertain tax positions and contingencies in the amount of $36.0 million. We are not able to reasonably estimate the timing of future cash flows of these tax liabilities, therefore, our income tax obligations are excluded from the table above. See Note 6 of the Consolidated Financial Statements for additional information about our income taxes.

Recent Accounting Pronouncements Adopted and to be Adopted

See Note 1 to the consolidated financial statements for recent accounting pronouncements adopted and to be adopted.

ITEM 7A. QUANTITIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Financial Risk Management

The main goal of Bio-Rad's financial risk management program is to reduce the variance in expected cash flows arising from unexpected foreign exchange rate and interest rate changes. Financial exposures are managed through operational means and by using various financial instruments, including cash and liquid resources, borrowings, and

forward and spot foreign exchange contracts. No derivative financial instruments are entered into for the purpose of trading or speculation. Company policy requires that all derivative positions are undertaken to manage the risks arising from underlying business activities. These derivative transactions do not qualify for hedge accounting treatment. Derivative instruments used in these transactions are valued at fair value and changes in fair value are included in reported earnings.

Foreign Exchange Risk. We operate and conduct business in many countries and are exposed to movements in foreign currency exchange rates. We face transactional currency exposures that arise when we enter into transactions denominated in currencies other than U.S. dollars. Additionally, our consolidated net equity is impacted by the conversion of the net assets of our international subsidiaries for which the functional currency is not the U.S. dollar.

Foreign currency exposures are managed on a centralized basis. This allows for the netting of natural offsets and lowers transaction costs and net exposures. Where possible, we seek to manage our foreign exchange risk in part through operational means, including matching same-currency revenues to same-currency costs, and same-currency assets to same-currency liabilities. Moreover, weakening in one currency can often be offset by strengthening in another currency. Foreign exchange risk is also managed through the use of forward foreign exchange contracts. Positions are primarily in Euro, Swiss Franc, Japanese Yen, Chinese Yuan and British Sterling. The majority of forward contracts are for periods of 90 days or less. We record the change in value of our foreign currency receivables and payables as a Foreign exchange (gain) loss on our Consolidated Statements of Income along with the change in fair market value of the forward exchange contract used as an economic hedge of those assets or liabilities.

Our forward contract holdings at year-end were analyzed to determine their sensitivity to fluctuations in foreign currency exchange rates. All other variables were held constant. Market risk associated with derivative holdings is the potential change in fair value of derivative positions arising from an adverse movement in foreign exchange rates. A decline of 10% on quoted foreign exchange rates would result in an approximate net-present-value loss of $26 million on our derivative position as of December 31, 2018. This impact of a change in exchange rates excludes the offset derived from the change in value of the underlying assets and liabilities, which could reduce the adverse effect significantly.

Interest Rate Risk of Debt Instruments. Bio-Rad centrally manages the short-term cash surpluses and shortfalls of its subsidiaries. Our holdings of variable rate debt instruments at year-end were analyzed to determine their sensitivity to movements in interest rates. Due to the relatively small amount of short-term variable rate debt we have outstanding, there would not be a material impact to earnings or cash flows if interest rates moved adversely by 10%. Our long-term debt consists primarily of fixed-rate instruments, and is thus insulated from interest rate changes. As of December 31, 2018, the overall interest rate risk associated with our debt was not significant.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

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Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Bio-Rad Laboratories, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Bio-Rad Laboratories, Inc. and subsidiaries (the Company) as of December 31, 2018 and 2017, the related consolidated statements of income, comprehensive income, changes in stockholders' equity, and cash flows for each of the years in the three year period ended December 31, 2018, and the related notes and financial statement schedule (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated March 29, 2019 expressed an unqualified opinion on the effectiveness of the Company's internal control over financial reporting.

Changes in Accounting Principle

As discussed in note 1 to the consolidated financial statements, the Company has changed its method of accounting for revenue from contracts with customers effective January 1, 2018, due to the adoption of Accounting Standards Codification 606 (ASC 606), *Revenue from Contracts with Customers.* The Company has also changed its method of accounting for equity instruments effective January 1, 2018 due to the adoption of Financial Accounting Standards Board ("FASB") issued Accounting Standards Update (ASU) No. 2016-01, *Recognition and Measurement of Financial Assets and Financial Liabilities.*

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the 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. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2013.

Santa Clara, California
March 29, 2019

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Bio Rad Laboratories, Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited Bio-Rad Laboratories, Inc. and subsidiaries' (the Company) internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2018 and 2017, the related consolidated statements of income, comprehensive income, changes in stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes and financial statement schedule (collectively, the consolidated financial statements), and our report dated March 29, 2019 expressed an unqualified opinion on those consolidated financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit 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 audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

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

/s/ KPMG LLP
Santa Clara, California

March 29, 2019

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BIO-RAD LABORATORIES, INC.
Consolidated Balance Sheets
(In thousands, except share data)

	December 31, 2018	2017
ASSETS		
Current assets:		
Cash and cash equivalents	$431,526	$383,824
Short-term investments	413,270	371,154
Restricted investments	5,560	5,560
Accounts receivable, less allowance for doubtful accounts of $26,713 at 2018 and $25,549 at 2017	392,443	464,847
Inventories:		
Raw materials	108,008	113,925
Work in process	145,051	142,589
Finished goods	330,756	338,290
Total inventories	583,815	594,804
Prepaid expenses	187,249	146,135
Other current assets	9,615	10,325
Total current assets	2,023,478	1,976,649
Property, plant and equipment:		
Land and improvements	25,185	18,026
Buildings and leasehold improvements	331,563	315,984
Equipment	970,081	971,140
Total property, plant and equipment	1,326,829	1,305,150
Less: accumulated depreciation and amortization	(818,139)	(811,654)
Property, plant and equipment, net	508,690	493,496
Goodwill, net	219,770	506,069
Purchased intangibles, net	133,123	174,113
Other investments	2,655,709	1,027,736
Other assets	70,298	94,949
Total assets	$5,611,068	$4,273,012

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

BIO-RAD LABORATORIES, INC.
Consolidated Balance Sheets
(continued)
(In thousands, except share data)

	December 31, 2018	2017
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$122,450	$135,182
Accrued payroll and employee benefits	143,510	171,632
Current maturities of long-term debt	493	420
Income taxes payable	27,513	19,802
Other taxes payable	28,675	20,139
Deferred revenue	26,936	28,233
Other current liabilities	101,218	127,288
Total current liabilities	450,795	502,696
Long-term debt, net of current maturities	438,937	434,581
Deferred income taxes	553,239	222,209
Other long-term liabilities	147,766	183,276
Total liabilities	1,590,737	1,342,762
Commitments and contingent liabilities		
Stockholders' equity:		
Preferred stock, $0.0001 par value, 7,500,000 shares authorized; issued and outstanding - none	—	—
Class A common stock, $0.0001 par value; 80,000,000 shares authorized; shares issued - 24,884,265 and 24,679,127 at 2018 and 2017, respectively; shares outstanding - 24,704,772 and 24,678,545 at 2018 and 2017, respectively	2	2
Class B common stock, $0.0001 par value; 20,000,000 shares authorized; shares issued - 5,096,421 and 5,107,674 at 2018 and 2017, respectively; shares outstanding - 5,095,504 and 5,106,757 at 2018 and 2017, respectively	1	1
Additional paid-in capital	394,342	361,231
Class A treasury stock at cost, 179,493 shares at 2018 and 582 shares at 2017	(49,040)	(128)
Class B treasury stock at cost, 917 shares at 2018 and 2017	(89)	(89)
Retained earnings	3,722,073	1,830,439
Accumulated other comprehensive (loss) income	(46,958)	738,794
Total stockholders' equity	4,020,331	2,930,250
Total liabilities and stockholders' equity	$5,611,068	$4,273,012

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

BIO-RAD LABORATORIES, INC.
Consolidated Statements of Income
(In thousands, except per share data)

	Year Ended December 31,		
	2018	2017	2016
Net sales	$2,289,415	$2,160,153	$2,068,172
Cost of goods sold	1,066,264	972,450	929,744
Gross profit	1,223,151	1,187,703	1,138,428
Selling, general and administrative expense	834,783	806,790	814,697
Research and development expense	199,196	250,157	205,708
Impairment losses on goodwill and long-lived assets	292,513	11,506	62,305
(Loss) income from operations	(103,341)	119,250	55,718
Interest expense	23,962	23,014	23,380
Foreign currency exchange losses, net	2,861	9,128	4,542
Change in fair market value of equity securities	(606,230)	—	—
Other (income) expense, net	(36,593)	(10,697)	(13,764)
Income before income taxes	512,659	97,805	41,560
(Provision for) benefit from income taxes	(147,045)	24,444	(15,560)
Net income	$365,614	$122,249	$26,000
Basic earnings per share:			
Net income per basic share	$12.25	$4.12	$0.88
Weighted average common shares - basic	29,836	29,655	29,440
Diluted earnings per share:			
Net income per diluted share	$12.10	$4.07	$0.88
Weighted average common shares - diluted	30,228	30,034	29,646

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

BIO-RAD LABORATORIES, INC.
Consolidated Statements of Comprehensive Income
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Net income	$365,614	$122,249	$26,000
Other comprehensive (loss) income:			
Foreign currency translation adjustments	(112,857)	76,050	(32,394)
Foreign other post-employment benefits adjustments, net of income taxes	7,549	(3,767)	2,086
Net unrealized holding (losses) gains on available-for-sale (AFS) investments, net of income taxes and effect of adoption of ASU 2018-02*	(1,187)	248,745	65,936
Other comprehensive (loss) income, net of income taxes	(106,495)	321,028	35,628
Comprehensive income	$259,119	$443,277	$61,628

*See Note 8, "Accumulated Other Comprehensive Income (Loss)"
Reclassification adjustments are calculated using the specific identification method.
The accompanying notes are an integral part of these consolidated financial statements.

BIO-RAD LABORATORIES, INC.
Consolidated Statements of Cash Flows
(In thousands)

	Year Ended December 31,		
	2018	2017	2016
Cash flows from operating activities:			
Cash received from customers	$2,326,310	$2,093,948	$2,074,024
Cash paid to suppliers and employees	(1,989,685)	(1,916,119)	(1,808,687)
Interest paid, net	(22,703)	(22,224)	(22,756)
Income tax payments, net	(62,414)	(52,136)	(38,442)
Investment proceeds and miscellaneous receipts, net	26,383	18,392	14,597
Excess tax benefits from share-based compensation	—	—	(1,506)
Proceeds from (payments for) forward foreign exchange contracts, net	7,603	(17,724)	(1,164)
Net cash provided by operating activities	285,494	104,137	216,066
Cash flows from investing activities:			
Capital expenditures	(129,825)	(111,332)	(141,436)
Proceeds from dispositions of property, plant and equipment	4,315	86	398
Proceeds from divestiture of a product line	6,964	—	—
Proceeds from (payments for) acquisitions and long-term investment	266	(76,645)	(14,165)
Payments for purchases of intangible assets	(3)	(3,795)	(135)
Payments for purchases of restricted investment	—	(1,000)	(350)
Payments for purchases of marketable securities and investments	(371,019)	(282,656)	(278,071)
Proceeds from sales of marketable securities and investments	77,029	97,523	76,859
Proceeds from maturities of marketable securities and investments	225,295	202,247	143,020
Net cash used in investing activities	(186,978)	(175,572)	(213,880)
Cash flows from financing activities:			
Net (payments) borrowings on line-of-credit arrangements and notes payable	—	(36)	37
Payments on long-term borrowings	(2,961)	(316)	(303)
Proceeds from issuances of common stock for share-based compensation	14,133	14,604	11,280
Tax payments from net share settlement	(8,862)	(7,310)	—
Payments for purchases of treasury stock	(48,912)	(2,920)	—
Payments of contingent consideration	(2,078)	(3,681)	(3,500)
Excess tax benefits from share-based compensation	—	—	1,506
Net cash (used in) provided by financing activities	(48,680)	341	9,020
Effect of foreign exchange rate changes on cash	(655)	(1,094)	(12,858)
Net increase (decrease) in cash, cash equivalents and restricted cash	49,181	(72,188)	(1,652)
Cash, cash equivalents and restricted cash at beginning of year	384,983	457,171	458,823
Cash, cash equivalents and restricted cash at end of year	$434,164	$384,983	$457,171

The following table provides a reconciliation of cash, cash equivalents, and restricted cash reported within the Consolidated Balance Sheets that agrees to the same amounts shown in the Consolidated Statements of Cash Flows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Cash and cash equivalents	$431,526	$383,824	$456,264
Restricted cash included in Other current assets	111	882	494
Restricted cash included in Other assets	2,527	277	413

Total cash, cash equivalents, and restricted cash shown in the Consolidated Statements of Cash Flows	$434,164	$484,983	$457,171

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

BIO-RAD LABORATORIES, INC.
Consolidated Statements of Changes in Stockholders' Equity
(In thousands)

	Common Stock	Additional Paid-in Capital	Treasury Stock	Retained Earnings	Accumulated Other Comprehensive Income	Total Stockholders' Equity
Balance at December 31, 2015	$ 3	$300,408	$(101)	$1,802,581	$382,138	$2,485,029
Net income	—	—	—	26,000	—	26,000
Other comprehensive loss, net of tax	—	—	—	—	35,628	35,628
Issuance of common stock	—	11,280	—	—	—	11,280
Stock compensation expense	—	19,730	—	—	—	19,730
Tax benefit-exercise stock options	—	1,493	—	—	—	1,493
Balance at December 31, 2016	3	332,911	(101)	1,828,581	417,766	2,579,160
Net income	—	—	—	122,249	—	122,249
Effect of adoption of ASU 2016-09**	—	391	—	(256)	—	135
Other comprehensive income, net of tax	—	—	—	—	200,893	200,893
Effect of adoption of ASU 2018-02***	—	—	—	(120,135)	120,135	—
Issuance of common stock	—	4,490	—	—	—	4,490
Stock compensation expense	—	23,439	—	—	—	23,439
Purchase of treasury stock	—	—	(2,920)	—	—	(2,920)
Issuance of treasury stock	—	—	2,804			2,804
Balance at December 31, 2017	3	361,231	(217)	1,830,439	738,794	2,930,250
Effect of adoption of ASU 2016-01 and ASU 2018-03*	—	—	—	1,543,747	(679,257)	864,490
Effect of adoption of ASU 2016-16*	—	—	—	(17,591)		(17,591)
Effect of adoption of ASC 606*	—	—	—	(136)	—	(136)
Net income	—	—	—	365,614	—	365,614
Other comprehensive loss, net of tax	—	—	—	—	(106,495)	(106,495)
Issuance of common stock	—	5,271	—	—	—	5,271
Stock compensation expense	—	27,840	—	—	—	27,840
Purchase of treasury stock	—	—	(48,912)	—	—	(48,912)
Balance at December 31, 2018	$ 3	$394,342	$(49,129)	$3,722,073	$(46,958)	$4,020,331

* See Note 1, "Significant Accounting Policies" under "Recent Accounting Pronouncements Adopted"
** See Note 9, "Share-Based Compensation/Equity Award and Purchase Plans" under "Share-Based Compensation"
*** See Note 8, "Accumulated Other Comprehensive Income (Loss)"

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

BIO-RAD LABORATORIES, INC.
Notes to Consolidated Financial Statements

1.SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The consolidated financial statements include the accounts of Bio-Rad Laboratories, Inc. and all of our wholly and majority owned subsidiaries (referred to in this report as “Bio-Rad,” “we,” “us” and “our”) after elimination of intercompany balances and transactions. The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Actual results could differ from those estimates.

We evaluate subsequent events and the evidence they provide about conditions existing at the date of the balance sheet as well as conditions that arose after the balance sheet date but through the date the financial statements are issued. The effects of conditions that existed at the balance sheet date are recognized in the financial statements. Events and conditions arising after the balance sheet date but before the financial statements are issued are evaluated to determine if disclosure is required to keep the financial statements from being misleading. To the extent such events and conditions exist, disclosures are made regarding the nature of events and the estimated financial effects for those events and conditions.

Cash and Cash Equivalents

Cash and cash equivalents consist of cash and highly liquid investments with original maturities of three months or less which are readily convertible into cash. Cash equivalents are stated at cost, which approximates fair value.

Short-term Restricted Investments

Short-term restricted investments of $5.6 million at both December 31, 2018 and 2017 represent a money market fund that is renewed annually for collateral that secures worker's compensation and general liability insurance. Investment income accrues to Bio-Rad and is recorded in Cash and cash equivalents in the Consolidated Balance Sheets.

Available-for-Sale Investments

Available-for-sale investments consist of corporate obligations, municipal securities, asset backed securities, U.S. government sponsored agencies and marketable equity securities. Management classifies investments at the time of purchase and reevaluates such classification at each balance sheet date. Investments with maturities beyond one year may be classified as short-term based on their liquid nature and because such marketable securities represent the investment of cash that is available for current operations. Available-for-sale investments are reported at fair value based on quoted market prices and other observable market data. Unrealized gains and losses are reported as a component of other comprehensive income, net of any related tax effect. Effective January 1, 2018, changes in fair value for equity securities are reported in Change in fair market value of equity securities in the Consolidated Statements of Income due to the adoption of ASU 2016-01 (see Recent Accounting Pronouncement Adopted at the end of this Note and Note 3). Unrealized losses are charged against income when a decline in the fair value of an individual security is determined to be other-than-temporary. We review our available-for-sale debt securities for other-than-temporary losses on a quarterly basis. Realized gains and losses and other-than-temporary impairments on investments are included in Other (income) expense, net (see Note 10).

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Concentration of Credit Risk

Financial instruments that potentially subject us to concentration of credit risk consist primarily of cash and cash equivalents, investments, foreign exchange contracts and trade accounts receivable. Cash and cash equivalents and investments are placed with various highly rated major financial institutions located in different geographic regions.

The forward contracts used in managing our foreign currency exposures have an element of risk in that the counterparties may be unable to meet the terms of the agreements. We attempt to minimize this risk by limiting the counterparties to a diverse group of highly-rated domestic and international financial institutions. In the event of non-performance by these counterparties, the carrying values of our financial instruments represent the maximum amount of loss we would have incurred as of our fiscal year-end.

We perform credit evaluation procedures related to our trade receivables and with the exception of certain developing countries, generally do not require collateral. As a result of increased risk in certain developing countries, some Bio-Rad sales are subject to collateral letters of credit from our customers. Credit risk for trade accounts receivable is generally limited due to the large number of customers and their dispersion across many geographic areas. However, a significant amount of trade receivables are with national healthcare systems in countries within the European Union.

Accounts Receivable

We maintain an allowance for doubtful accounts for estimated losses resulting from the inability of our customers to make required payments. The amount of the allowance is determined by analyzing known uncollectible accounts, aged receivables, economic conditions in the customers' country or industry, historical losses and our customers' credit-worthiness. Amounts later determined and specifically identified to be uncollectible are charged or written off against this allowance.

Inventory

Inventories are valued at the lower of cost and net realizable value and include material, labor and overhead costs. The first-in, first-out method is used to relieve inventory for products sold.

Property, Plant and Equipment

Property, plant and equipment are carried at cost, less accumulated depreciation and amortization. Included in property, plant and equipment are buildings and equipment acquired under capital lease arrangements, reagent rental equipment and capitalized software, including costs for software developed or obtained for internal use. Property, plant and equipment are assessed for impairment quarterly or whenever events or changes in circumstances indicate that the carrying amount may not be recoverable.

Depreciation is computed on a straight-line basis over the estimated useful lives of the assets. The estimated useful lives of property, plant and equipment are generally as follows: buildings and leasehold improvements, 15-39 years or the term of the leases or life of the improvements, whichever is shorter; reagent rental equipment, 1-5 years; equipment and capitalized software, 3-12 years.

Goodwill

Goodwill represents the excess of the cost over the fair value of net tangible and identifiable intangible assets of acquired businesses. Goodwill is assessed for impairment by applying fair value based tests annually in the fourth

quarter or whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. We perform impairment tests of goodwill at our reporting unit level, which is one level below our operating segments. Our reporting units are identified as components for which discrete financial information is available and is regularly reviewed by management. Goodwill amounts are assigned to reporting units at the time of acquisition.

Effective January 1, 2017 in accordance with Accounting Standards Update No. 2017-04, "Simplifying the Test for Goodwill Impairment," the goodwill impairment amount will be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. We use a projected discounted cash flow model to determine the fair value of a reporting unit.

Prior to January 1, 2017, the goodwill impairment test consisted of a two-step process. The first step of the goodwill impairment test, used to identify potential impairment, compared the fair value of a reporting unit to its carrying value, including goodwill. We used a projected discounted cash flow model to determine the fair value of a reporting unit. If the fair value of the reporting unit exceeded its carrying amount, goodwill of the reporting unit was considered not impaired, and the second step of the impairment test was not required. The second step, if required, compared the implied fair value of the reporting unit goodwill with the carrying amount of that goodwill. The fair value of a reporting unit was allocated to all of the assets and liabilities of that unit (including any unrecognized intangible assets) as if the reporting unit had been acquired in a business combination and the fair value of the reporting unit was the price paid to acquire the reporting unit. If the carrying amount of the reporting unit’s goodwill exceeded its implied fair value, an impairment charge is recognized in an amount equal to that excess.

Long-Lived Assets

For purposes of recognition and measurement of an impairment loss, a long-lived asset or assets are grouped with other assets and liabilities at the lowest level for which identifiable cash flows are largely independent of the cash flows of other assets and liabilities. We assess the impairment of long-lived assets (including identifiable intangible assets) quarterly or whenever events or changes in circumstances indicate that the carrying value may not be recoverable. Factors that we consider important that could trigger an impairment review include:

- significant under-performance relative to expected, historical or projected future operating results;
- significant changes in the manner of use of the long-lived assets, intangible assets or the strategy for our overall business;
- a current expectation that, more likely than not, a long-lived asset will be sold or otherwise disposed of at a loss before the end of its previously estimated useful life; and
- significant negative industry, legal, regulatory or economic trends.

When management determines that the carrying value of long-lived assets may not be recoverable based upon the existence of one or more of the above indicators of impairment, we test for any impairment based on a projected undiscounted cash flow method. Projected future operating results and cash flows of the asset or asset group are used to establish the fair value used in evaluating the carrying value of long-lived and intangible assets. We estimate the future cash flows of the long-lived assets using current and long-term financial forecasts. The carrying amount of a long-lived asset is not recoverable if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset. If this is the case, an impairment loss would be recognized. The impairment loss recognized is the amount by which the carrying amount exceeds the fair value.

Income Taxes

We account for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred tax assets and liabilities reflect the tax effects of losses, credits, and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. They are determined using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is

recognized in income in the period that includes the enactment date.

We record deferred tax assets to the extent we believe these assets will more likely than not be realized. In making such determination, we consider all available positive and negative evidence, including scheduled reversals of deferred tax liabilities, projected future taxable income, tax planning strategies and recent financial operations. To the extent we determine that we are able to realize our deferred income tax assets in the future in excess of their net recorded amount, we make an adjustment to the valuation allowance which may reduce the provision for income taxes. When we establish or reduce the valuation allowance against our deferred tax assets, our provision for income taxes will increase or decrease, respectively, in the period that determination to change the valuation allowance is made.

We recognize the tax benefit from an uncertain tax position only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the position. The tax benefits recognized in the financial statements on a particular tax position are measured based on the largest benefit that has a greater than a 50% likelihood of being realized upon settlement. The amount of unrecognized tax benefits is adjusted as appropriate for changes in facts and circumstances, such as significant amendments to existing tax law, new regulations or interpretations by the taxing authorities, new information obtained during a tax examination, or resolution of an examination. We recognize both accrued interest and penalties, where appropriate, related to unrecognized tax benefits in the provision for income taxes.

On December 22, 2017, the U.S. enacted comprehensive tax legislation (the “Tax Act”). The new legislation contains significant tax provisions that affect us, including a one-time mandatory deemed repatriation tax on certain unrepatriated foreign earnings ("Transition Tax"), a reduction of the corporate income tax rate from 35% to 21% effective January 1, 2018, and a change from a worldwide tax system to a modified territorial system.

We are required to recognize the effect of the tax law changes in the period of enactment, such as the computation of the Transition Tax, remeasurement of our U.S. federal deferred tax assets and liabilities, as well as reassessment of the net realizability of our deferred tax assets and liabilities.

Subsequent to the enactment of the Tax Act, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to complete the accounting under Accounting Standards Codification ("ASC") 740, "Income Taxes." We have completed the accounting for the income tax effects of the Tax Act, under SAB 118, as of December 31, 2018. As noted in our 2017 Annual Report, we were able to make reasonable estimates and provisionally recorded an income tax benefit of $70 million related to the Transition Tax and remeasurement of our U.S. federal deferred tax assets and liabilities. The final accounting for the Tax Act resulted in an additional income tax benefit of $49 million for a final income tax benefit of $119 million. This is comprised of $169 million tax benefit related to the remeasurement of U.S. federal deferred tax assets and liabilities, offset by a $50 million tax detriment for the Transition Tax. We elected to account for the tax effect of the Global Intangible Low-Taxed Income (“GILTI”) in the period in which it is incurred.

During the fourth quarter of 2017, we early adopted ASU 2018-02, "Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income." With respect to stranded income tax effects in accumulated other comprehensive income, our policy is to use the portfolio method to reclassify such amounts.

Revenue Recognition

On January 1, 2018, we adopted Accounting Standards Codification ("ASC") 606, "Revenue from Contracts with Customers," using the modified retrospective method applied to those contracts that were not completed as of January

1, 2018. Results for reporting periods beginning on January 1, 2018 are presented under ASC 606, while prior period amounts are not adjusted and continue to be reported under prior revenue guidance ASC 605, "Revenue Recognition."

We recorded a net reduction to opening retained earnings of $0.1 million as of January 1, 2018 due to the cumulative impact of adopting ASC 606 with the impact primarily related to a customer loyalty program in the United States for which the resulting non-cash consideration is treated as variable consideration under the new revenue recognition accounting standard. The impact to revenue as a result of applying ASC 606 as compared to ASC 605 for 2018 was not significant.

We recognize revenue from operations through the sale of products, services, and rental of instruments. Revenue from contracts with customers is recognized upon transfer of control of promised products or services to customers in an amount that reflects the consideration we expect to receive in exchange for those products or services. We enter into contracts that can include various combinations of products and services, which are generally accounted for as distinct performance obligations. Revenue is recognized net of any taxes collected from customers (sales tax, value added tax, etc.), which are subsequently remitted to government authorities.

Our contracts from customers often include promises to transfer multiple products and services to a customer. Determining whether products and services are considered distinct performance obligations that should be accounted for separately versus together may require significant judgment and may or may not impact the timing of revenue recognition. Revenue associated with equipment that requires factory installation is not recorded until installation is complete and customer acceptance, if required, has occurred. Certain equipment requires installation due to the fact that the instruments are being operated in a clinical/laboratory environment, and the installation services could result in modification of the equipment in order to ensure that the instruments are working according to specifications of the customer which are subject to validation tests upon completion of the installation. In these arrangements, which require factory installation, the delivery of the equipment and the installation are separate performance obligations. We will recognize the transaction price allocated to the equipment only upon customer acceptance, as the transfer of control has occurred in relation to the equipment at that point in time as the customer has the ability to direct the use of and obtain substantially all of the remaining benefits from the asset. The transaction price allocated to the installation services is also recognized upon completion of the services because without the completion of the installation services and related customer acceptance the customer cannot receive any of the benefits of the service. At the time revenue is recognized, a provision is recognized for estimated product returns as this right is considered variable consideration. Accordingly, when product revenues are recognized, the transaction price is reduced to the estimated amount that we expect to receive in exchange for transferring control for those products.

Service revenues on extended warranty contracts are recognized ratably over the life of the service agreement as a stand-ready performance obligation. For arrangements that include a combination of products and services, transaction prices are allocated to performance obligations based on stand-alone selling prices. The method used to determine the stand-alone selling prices for service revenues is based on the observable prices when the services have been sold separately.

In those instances where the timing of revenue recognition differs from the timing of invoicing, we have determined that our contracts generally do not include a significant financing component. The primary purpose of our invoicing terms is to provide customers with simple and predictable methods of purchasing our products and services, not to either provide or receive financing to or from our customers. We record contract liabilities when cash payments are received or due in advance of our performance.

We do not disclose the value of unsatisfied performance obligations for contracts with an original expected length of one year or less and for contracts in which we recognize revenue at the amount to which we have the right to invoice for services performed. Our payment terms vary by the type and location of our customer, and the products and services offered. The term between invoicing and when payment is due is not significant.

Reagent Rental Agreements

Reagent rental agreements are a diagnostic industry sales method that provides use of an instrument and consumables (reagents) to a customer on a per test basis. These agreements may also include maintenance of the underlying instruments retained at customer locations as well as initial training. We concluded that the use of the instrument and related maintenance services (collectively known as "lease elements") are not within the guidance of ASC 606 but rather ASC 840 Leases. Accordingly, we first allocate the transaction price between the lease elements and the non-lease elements based on relative standalone selling prices. The determination of the transaction price requires judgment and requires consideration of any fixed/minimum payments as well as estimates of variable consideration. After determining what portion of the transaction price should be allocated to the lease elements, any fixed consideration would be considered the minimum lease payment to be amortized straight line over the lease term and any variable consideration would be contingent rent to be recognized monthly as earned, which coincides with the transfer of control of the non-lease elements.

For the portion of the transaction price allocated to the non-lease elements, which are principally the reagents, the related revenue will be recognized at a point in time when control transfers. Generally, the terms of the arrangements result in the transfer of control upon either (i) when the consumables are delivered or (ii) when the consumables are consumed by the customer.

Revenue allocated to the lease elements of these reagent rental arrangements represents approximately 5% of total revenue and are included as part of the Net sales in our Consolidated Statements of Income.

Contract costs:

As a practical expedient, we expense as incurred costs to obtain contracts as the amortization period would have been one year or less. These costs, recorded within Selling, general and administrative expense, include our internal sales force compensation programs and certain partner sales incentive programs, as we have determined that annual compensation is commensurate with annual selling activities.

Disaggregation of Revenue:

The disaggregation of our revenue by geographic region based primarily on the location of the use of the product service, and by industry segment sources, and the disaggregation of our revenues by industry segment sources are presented in our Segment Information footnote (see Note 14).

Deferred revenues represent mostly unrecognized fees billed or collected for extended service arrangements. Deferred revenues are generally recognized ratably over the term of the service contract as our performance extends over the life of the arrangement. A majority of our deferred revenue balance is classified as current with an expected length of one year or less. The increase in our total deferred revenue balance from $36.7 million at December 31, 2017 to $37.3 million at December 31, 2018 is primarily driven by $28.0 million, net, of cash payments received or due in advance of satisfying our performance obligations, partially offset by $27.4 million of revenue recognized that were included in our deferred revenue balance as of December 31, 2017.

We warrant certain equipment against defects in design, materials and workmanship, generally for a period of one year. Upon revenue recognition of that equipment, we establish, as part of Cost of goods sold, a provision for the expected costs of such warranty based on historical experience, specific warranty terms and customer feedback. A review is performed on a quarterly basis to assess the adequacy of our warranty accrual.

Components of the warranty accrual, included in Other current liabilities and Other long-term liabilities in the Consolidated Balance Sheets, were as follows (in millions):

	2018	2017
January 1	$18.7	$17.6
Provision for warranty	25.5	29.9
Actual warranty costs	(34.1)	(28.8)
December 31	$10.1	$18.7

Shipping and Handling

We classify all freight costs billed to customers as Net sales. Related freight costs are recognized upon transfer of control of the promised products to customers as a fulfillment cost and included in Cost of goods sold.

Research and Development

Internal research and development costs are expensed as incurred. Third-party research and development costs are expensed when the contracted work has been performed.

We conduct extensive research and development activities in all areas of our business, employing approximately 800 employees worldwide in these activities, including degreed scientists and technical support staff. Research and development has played a major role in Bio-Rad's growth and is expected to continue to do so in the future. Our research teams are continuously developing new products and new applications for existing products. In our development of new products and applications, we interact with scientific and medical professionals at universities, hospitals and medical schools, and within our industry.

Foreign Currency

Balance sheet accounts of international subsidiaries are translated at the current exchange rates as of the end of each accounting period. Income statement items are translated at average exchange rates for the period. The resulting translation adjustments are recorded as a separate component of stockholders' equity.

Foreign currency transaction gains and losses are included in Foreign exchange losses, net in the Consolidated Statements of Income. Transaction gains and losses result primarily from fluctuations in exchange rates when intercompany receivables and payables are denominated in currencies other than the functional currency of our subsidiary that recorded the transaction.

Forward Foreign Exchange Contracts

As part of distributing our products, we regularly enter into intercompany transactions. We enter into forward foreign exchange contracts to manage foreign exchange risk of future movements in exchange rates that affect foreign currency denominated intercompany receivables and payables. We do not use derivative financial instruments for speculative or trading purposes, nor do we seek hedge accounting treatment for any of our contracts. As a result, these contracts, generally with maturity dates of 90 days or less and denominated primarily in currencies of industrial countries, are recorded as an asset or liability measured at their fair value at each balance sheet date. The resulting gains or losses offset exchange gains or losses, on the related receivables and payables, all of which are recorded in Foreign exchange losses, net in the Consolidated Statements of Income.

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Share-Based Compensation Plans

Share-based compensation expense for all share-based payment awards granted is determined based on the grant-date fair value. We recognize these compensation costs net of forfeitures over the requisite service period of the award, which is generally the vesting term of the share-based payment awards. Starting in 2017, we recognize forfeitures as they occur due to a change in accounting principle, and in prior periods we estimated the forfeiture rate based on our historical experience. These plans are described more fully in Note 9.

Earnings Per Share

Basic earnings per share is computed by dividing net income attributable to Bio-Rad by the weighted average number of common shares outstanding for that period. Diluted earnings per share takes into account the effect of dilutive instruments, such as stock options and restricted stock, and uses the average share price for the period in determining the number of potential common shares that are to be added to the weighted average number of shares outstanding. Potential common shares are excluded from the diluted earnings per share calculation if the effect would be anti-dilutive.

The weighted average number of common shares outstanding used to calculate basic and diluted earnings per share and the anti-dilutive shares are as follows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Basic weighted average shares outstanding	29,836	29,655	29,440
Effect of potentially dilutive stock options and restricted stock awards	392	379	206
Diluted weighted average common shares	30,228	30,034	29,646
Anti-dilutive stock options and restricted stock awards excluded from the computation of diluted EPS	84	13	113

Fair Value of Financial Instruments

For certain financial instruments, including cash and cash equivalents, short-term investments, accounts receivable, marketable securities, notes payable, accounts payable and foreign exchange contracts, the carrying amounts approximate fair value.

The estimated fair value of financial instruments is based on the exchange price that would be received for an asset or paid to transfer a liability (an exit price) using available market information or other appropriate valuation methodologies in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants. Estimates are not necessarily indicative of the amounts that could be realized in a current market exchange as considerable judgment is required in interpreting market data used to develop estimates of fair value. The use of different market assumptions or estimation techniques could have a material effect on the estimated fair value (see Note 3).

Recent Accounting Pronouncements Adopted

In February 2018, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update No. ("ASU") 2018-03, "Technical Corrections and Improvements to Financial Instruments - Recognition and

Measurement of Financial Assets and Financial Liabilities." ASU 2018-03 amends certain items in ASU 2016-01 (see below) such as equity securities without a readily determinable fair value. ASU 2018-03 clarifies that an entity that uses the measurement alternative for equity securities without readily determinable fair values can change its measurement approach to fair value and once made the election is irrevocable. If an entity measures equity securities without readily determinable fair values at fair value, it must record a cumulative-effect adjustment to

Retained earnings as of the beginning of the fiscal year in which the guidance is adopted. We adopted ASU 2018-03 on January 1, 2018 and made an irrevocable election to account for our investment of the ordinary shares of Sartorius AG at fair value (see ASU 2016-01 below).

In January 2016, the FASB issued ASU 2016-01, "Recognition and Measurement of Financial Assets and Financial Liabilities." Amendments under ASU 2016-01, among other items, require that all equity investments in unconsolidated entities (other than those accounted for using the equity method of accounting) will generally be measured at fair value through earnings. Changes in fair value for equity securities will no longer be reported in other comprehensive income. For equity investments without readily determinable fair values, the cost method is also eliminated. We adopted ASU 2016-01 on January 1, 2018 and record equity investments without readily determinable fair values at cost, less impairment, and plus or minus subsequent adjustments for observable price changes and were valued at $0.6 million as of December 31, 2018. Changes in the basis of these equity investments are reported in current earnings. For equity securities that are affected by ASU 2016-01 and ASU 2018-03, see Note 3 to the consolidated financial statements, which primarily consists of our investment in Sartorius AG.

The impact of the adoption of ASU 2016-01 and ASU 2018-03 on January 1, 2018 was through a cumulative-effect adjustment of $864.5 million to Total stockholders' equity by increasing Retained earnings of $1,543.7 million and decreasing Accumulated other comprehensive income of $679.2 million, including an increase in Deferred income taxes of $232.9 million and an increase in Other investments of $1,097.4 million in our Consolidated Balance Sheet. As a result of ASU 2016-01 and ASU 2018-03 for 2018, we recorded a gain of $606.2 million for the Change in fair market value of equity securities in the Consolidated Statement of Income that resulted in a deferred tax expense of $133.9 million.

In March 2017, the FASB issued ASU 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost," which changed how we present the net periodic benefit cost of our defined benefit pension and/or other postretirement plans. We adopted ASU 2017-07 on January 1, 2018 and applied the practical expedient to estimate amounts for comparative purposes utilizing the information disclosed in Note 12 to the consolidated financial statements in our Form 10-K for the year ended December 31, 2017. The interest costs are recorded in Interest expense, and the other costs are recorded in Other (income) expense, net in the Consolidated Statements of Income. For 2017 for interest costs and other costs, we reclassified $0.304 million, $2.152 million, and $0.144 million from Cost of goods sold (COGS), Selling, general and administrative expense (SG&A) and Research and Development expense (R&D), respectively, to Interest expense of $1.1 million and Other (income) expense, net of $1.5 million. For 2016 for interest costs and other costs, we reclassified $0.341 million, $2.027 million and $0.156 million from COGS, SG&A and R&D, respectively, to Interest expense of $1.438 million and Other (income) expense, net of $1.086 million.

In November 2016, the FASB issued ASU 2016-18, "Restricted Cash," which required us to cease to present transfers between cash and cash equivalents and restricted cash and restricted cash equivalents in the statement of cash flows. We adopted ASU 2016-18 on January 1, 2018 and updated the Consolidated Statements of Cash Flows to incorporate restricted cash included in Other current assets and Other assets of $2.6 million as of December 31, 2018 and $1.2 million as of December 31, 2017.

In October 2016, the FASB issued ASU 2016-16, "Intra-Entity Transfers of Assets Other Than Inventory," which required immediate recognition of income tax consequences of intercompany asset transfers, other than inventory transfers. We adopted ASU 2016-16 on January 1, 2018 on a modified retrospective basis through a cumulative-effect adjustment by decreasing Retained earnings by $17.6 million, and decreasing Prepaid taxes by $22.8 million and increasing Deferred tax assets by $5.2 million that are both recorded in Other assets in our Consolidated Balance Sheet.

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In August 2016, FASB issued ASU 2016-15, "Classification of Certain Cash Receipts and Cash Payments" and adopted it on January 1, 2018, which did not have an impact to our statement of cash flows presentation.

In May 2014, the FASB issued ASU 2014-09, Revenue from Contracts with Customers ("ASC 606"), an updated standard on revenue recognition. The new standard provides enhancements to the quality and consistency of how revenue is reported under the principle that revenue should be recognized in an amount that reflects the consideration to which we expect to be entitled in exchange for the transfer of promised goods or services. We adopted ASC 606 as of January 1, 2018 using the cumulative effect transition method as more fully described above under the caption “Revenue Recognition.”

Recent Accounting Pronouncements to be Adopted

In November 2018, the FASB issued ASU 2018-18, "Clarifying the Interaction between Topic 808 and Topic 606." Topic 808 is Collaborative Arrangements, and Topic 606 is Revenue from Contracts with Customers. ASU 2018-18 clarifies that certain transactions between collaborative partners should be accounted for as revenue under ASC 606 when the collaborative partner is a customer. We currently do not have any customers that are collaborative partners or anticipate any in the near future. ASU 2018-18 will be effective January 1, 2020 and we will not early adopt.

In August 2018, the FASB issued ASU 2018-15, "Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract." ASU 2018-15 amends the definition of a hosting arrangement and requires a customer in a hosting arrangement that is a service contract to capitalize certain implementation costs as if the arrangement was an internal-use software project. The internal-use software guidance states that only qualifying costs incurred during the application development stage can be capitalized. We will prospectively adopt ASU 2018-15 effective January 1, 2019. We do not expect ASU 2018-15 to have a material impact to our consolidated financial statements.

In August 2018, the FASB issued ASU 2018-14, "Disclosure Framework - Changes to the Disclosure Requirements for Defined Benefit Plans." ASU 2018-14 eliminates and adds certain disclosures for defined benefit plans. ASU 2018-14 is effective for fiscal years ending after December 15, 2020 using a retrospective approach, with early adoption permitted. We are currently evaluating the disclosures and the timing of adoption but do not expect ASU 2018-14 to have a material impact to our disclosures for defined benefit plans.

In August 2018, the FASB issued ASU 2018-13, "Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement." ASU 2018-13 eliminates, adds and modifies certain disclosures for fair value measurements. ASU 2018-13 is effective for fiscal years beginning after December 15, 2019 and for interim periods within those fiscal years. Early adoption is permitted in interim periods, including periods for which financial statements have not yet been issued. We do not expect ASU 2018-13 to have a material impact to our fair value disclosures and we currently do not plan to early adopt.

In June 2016, the FASB issued ASU 2016-13, "Measurement of Credit Losses on Financial Instruments." ASU 2016-13 will replace the current incurred loss approach with an expected loss model for instruments measured at amortized cost and require entities to record allowances for available-for-sale debt securities rather than reduce the carrying amount under the current other-than-temporary impairment model. In November 2018, the FASB issued ASU 2018-19, "Codification Improvements to Topic 326, Financial Instruments-Credit Losses," which clarifies that receivables arising from operating leases are not within the scope of Topic 326. ASU 2016-13 is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. We are currently evaluating the effect ASU 2016-13 will have on our consolidated financial statements.

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In February 2016, the FASB issued ASU 2016-02, "Leases," and related accounting standard updates, which will require, among other items, lease accounting to recognize most leases as assets and liabilities on the balance sheet. Qualitative and quantitative disclosures will be enhanced to better understand the amount, timing and uncertainty of cash flows arising from leases. We will adopt ASU 2016-02 on a modified retrospective basis effective January 1, 2019 with practical expedients, and will not restate comparative prior periods. The practical expedients, include, among other items, for leases that existed prior January 1, 2019, to not reassess whether any contracts are or contain embedded leases, reassessing the classification of existing leases, and reassessing whether previously capitalized initial direct costs qualify for capitalization. Where we act as a lessee, we also elected not to separate lease and non-lease components. Where we act as a lessor in our reagent rental arrangements, we allocate the consideration in the contract to the separate lease components and the non-lease components. After the allocation, the amount of variable payments allocated to lease components will be recognized as income in accordance with the new lease accounting standard updates, while the amount of variable payments allocated to non-lease components will be recognized as income in accordance with ASC 606. Such reagent rental arrangements are more fully described above under the caption "Reagent Rental Agreements." Where we act as a lessee, the adoption of the standard will result in material additions to the balance sheet for right-of-use assets and the associated liabilities. We will complete our review of the completeness and accuracy of the lease data, discount rate and finalize our updated controls in accordance with the new standard during the first quarter of 2019. Where we act as a lessor in reagent rental arrangements, we estimate an insignificant impact to our consolidated financial statements.

2. ACQUISITIONS

RainDance Technologies, Inc.

In February 2017, we acquired all the issued and outstanding stock of RainDance Technologies, Inc. (RainDance) for approximately $72.7 million. Cash payments at closing were $72.9 million. In addition, we had a cash payment of $10.0 million for a preexisting condition concurrent with the acquisition that was recorded in Cost of goods sold. The acquisition was included in our Life Science segment’s results of operations from the acquisition date and was accounted for as a business combination. The amount of acquisition-related costs was minimal as Bio-Rad primarily represented itself during the acquisition process. The goodwill related to this acquisition is not deductible for income tax purposes. Pro forma financial statements are not provided as the acquisition is immaterial to Bio-Rad taken as a whole for the periods presented.

The final allocation for the payments of $72.9 million was $37.6 million to definite-lived intangibles, $0.2 million to acquired net assets, $26.2 million to goodwill, a deferred tax liability of $13.6 million primarily related to the purchased intangibles and a deferred tax asset of $22.5 million primarily related to the acquired net operating losses. RainDance's foundational intellectual property portfolio and product lines encompass a wide range of biological reactions in droplets, with potential applications in life science research and clinical research. These genomic tools provide ultra-sensitive detection of genetic variations in cancer as well as inherited and infectious diseases, enabling research in areas such as non-invasive liquid biopsy. We believe that RainDance's droplet-based solutions will extend our reach into next-generation sequencing applications and strengthen our position in the area of Droplet Digital™ PCR, offering customers solutions for a wide range of nucleic acid detection applications.

3. FAIR VALUE MEASUREMENTS

We determine the fair value of an asset or liability based on the assumptions that market participants would use in pricing the asset or liability in an orderly transaction between market participants at the measurement date. The identification of market participant assumptions provides a basis for determining what inputs are to be used for pricing each asset or liability. A fair value hierarchy has been established which gives precedence to fair value measurements calculated using observable inputs over those using unobservable inputs. This hierarchy prioritizes the inputs into three broad levels as follows:

- Level 1: Quoted prices in active markets for identical instruments
- Level 2: Other significant observable inputs (including quoted prices in active markets for similar instruments)
- Level 3: Significant unobservable inputs (including assumptions in determining the fair value of certain investments)

Financial assets and liabilities carried at fair value and measured on a recurring basis as of December 31, 2018 are classified in the hierarchy as follows (in millions):

	Level 1	Level 2	Level 3	Total
Financial Assets Carried at Fair Value:				
Cash equivalents (a):				
Commercial paper	$—	$77.8	$—	$77.8
Time deposits	22.7	10.0	—	32.7
Asset-backed securities	—	0.3	—	0.3
Money market funds	36.9	—	—	36.9
Total cash equivalents	59.6	88.1	—	147.7
Restricted investment	5.6	—	—	5.6
Equity Securities (b)	2,672.9	—	—	2,672.9
Available-for-sale investments:				
Corporate debt securities	—	215.0	—	215.0
U.S. government sponsored agencies	—	80.3	—	80.3
Foreign government obligations	—	3.6	—	3.6
Municipal obligations	—	11.0	—	11.0
Asset-backed securities	—	63.3	—	63.3
Total available-for-sale investments (c)	—	373.2	—	373.2
Forward foreign exchange contracts (d)	—	0.6	—	0.6
Total financial assets carried at fair value	$2,738.1	$461.9	$—	$3,200.0
Financial Liabilities Carried at Fair Value:				
Forward foreign exchange contracts (e)	$—	$0.7	$—	$0.7
Contingent consideration (f)	—	—	8.4	8.4
Total financial liabilities carried at fair value	$—	$0.7	$8.4	$9.1

As of first quarter 2018, our equity securities are no longer reported as Available-for-sale investments due to the implementation of ASU 2016-01. Changes in fair value of equity securities are now reported on the Consolidated Statements of Income rather than Other Comprehensive Income (see Note 1).

Financial assets and liabilities carried at fair value and measured on a recurring basis as of December 31, 2017 are classified in the hierarchy as follows (in millions):

	Level 1	Level 2	Level 3	Total
Financial Assets Carried at Fair Value:				
Cash equivalents (a):				
Commercial paper	$—	$36.0	—	$36.0
Time deposits	43.7	10.0	—	53.7
U.S. government sponsored agencies	—	11.2	—	11.2
Money market funds	3.4	—	—	3.4
Total cash equivalents	47.1	57.2	—	104.3
Restricted investment:	5.6	—	—	5.6
Available-for-sale investments (c):				
Corporate debt securities	—	185.7	—	185.7
U.S. government sponsored agencies	—	67.6	—	67.6
Foreign government obligations	—	3.4	—	3.4
Brokered certificates of deposit	—	0.7	—	0.7
Municipal obligations	—	15.0	—	15.0
Marketable equity securities	973.4	—	—	973.4
Asset-backed securities	—	55.6	—	55.6
Total available-for-sale investments	973.4	328.0	—	1,301.4
Forward foreign exchange contracts (d)	—	0.5	—	0.5
Total financial assets carried at fair value	$1,026.1	$385.7	—	$1,411.8
Financial Liabilities Carried at Fair Value:				
Forward foreign exchange contracts (e)	$—	$1.6	—	$1.6
Contingent consideration (f)	—	—	16.7	16.7
Total financial liabilities carried at fair value	$—	$1.6	$16.7	$18.3

(a) Cash equivalents are included in Cash and cash equivalents in the Consolidated Balance Sheets.

(b) Equity securities are included in the following accounts in the Consolidated Balance Sheets (in millions):

	December 31, 2018
Short-term investments	$ 40.2
Other investments	2,632.7
Total	$ 2,672.9

The unrealized gains on our equity securities still held as of December 31, 2018 are $607.7 million and are primarily due to our investment in Sartorius AG and is recorded in our Consolidated Statements of Income due to the adoption of ASU 2016-01 (see Note 1).

(c) Available-for-sale investments are included in the following accounts in the Consolidated Balance Sheets (in millions):

	December 31, 2018	December 31, 2017
Short-term investments	$ 373.0	$ 371.2
Other investments	0.2	930.2

Total	$ 373.2	$ 1,301.4

In accordance with our adoption of ASU 2016-01 January 1, 2018, our investment in Sartorius AG preferred shares, which was reported within marketable equity securities as Available-for-sale as of December 31, 2017, is now reported as an Equity security as of December 31, 2018 (see Note 1 and footnote (b) above).

(d) Forward foreign exchange contracts in an asset position are included in Other current assets in the Consolidated Balance Sheets.

(e) Forward foreign exchange contracts in a liability position are included in Other current liabilities in the Consolidated Balance Sheets.

(f) Contingent consideration liabilities are included in the following accounts in the Consolidated Balance Sheets (in millions):

	December 31, 2018	December 31, 2017
Other current liabilities	$ 3.2	$ 2.7
Other long-term liabilities	5.2	14.0
Total	$ 8.4	$ 16.7

During the first quarter of 2016, we recognized a contingent consideration liability upon our acquisition of a high performance analytical flow cytometer platform from Propel. At the acquisition date, the amount of contingent consideration was determined based on a probability-weighted income approach related to the achievement of sales milestones, ranging from 39% to 20% for the calendar years 2017 through 2020. The sales milestones could potentially range from $0 to an unlimited amount. In the first and third quarters of 2018, we paid $1.3 million and $0.8 million, respectively, per the purchase agreement. Since 2016 we have had a net decrease in the cumulative valuation of the sales milestones of $12.2 million. The contingent consideration was accrued at its estimated fair value of $8.4 million as of December 31, 2018.

The following table provides a reconciliation of the Level 3 analytical flow cytometer platform contingent consideration liabilities measured at estimated fair value (in millions):

	2018
January 1	$16.7
Payment of sales milestone	(2.1)
Net decrease in estimated fair value of contingent consideration included in Selling, general and administrative expense	(6.2)
December 31	$8.4

Significant increases or decreases in these inputs in isolation could result in a significantly lower or higher fair value measurement.

	Valuation Technique	Unobservable Input	Percentage	
Analytical flow cytometer platform	Probability-weighted income approach	Sales milestones:		
		Discount rate	11.0	%
		Cost of debt	5.1	%

To estimate the fair value of Level 2 debt securities as of December 31, 2018 and 2017, our primary pricing provider uses Securities Evaluations as the primary pricing source. Our pricing process allows us to select a hierarchy of pricing sources for securities held. If Securities Evaluations does not price a Level 2 security that we hold, then the pricing provider will utilize our custodian supplied pricing as the secondary pricing source.

For all commercial paper as of December 31, 2018, our primary pricing provider uses its leading pricing source in the hierarchy to determine pricing. For discount commercial paper as of December 31, 2017, pricing was determined by a straight-line calculation, starting with the purchase price on the date of purchase and increasing to par at maturity. As of December 31, 2017, interest bearing certificates of deposit and commercial paper were priced at par.

Our primary pricing provider performs daily reasonableness testing of the Securities Evaluations prices. Price changes of 5% or greater are investigated and resolved. In addition, we perform a quarterly testing of the Securities Evaluations prices to custodian reported prices. Price differences outside a tolerable variance of approximately 1% are investigated and resolved.

Available-for-sale investments consist of the following (in millions):

	December 31, 2018			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
Short-term investments:				
Corporate debt securities	$216.2	$ 0.1	$ (1.3)	$ 215.0
Municipal obligations	11.1	—	(0.1)	11.0
Asset-backed securities	63.5	—	(0.4)	63.1
U.S. government sponsored agencies	80.9	0.2	(0.8)	80.3
Foreign government obligations	3.6	—	—	3.6
	375.3	0.3	(2.6)	373.0
Long-term investments:				
Asset-backed securities	0.2	—	—	0.2
	0.2	—	—	0.2
Total	$375.5	$ 0.3	$ (2.6)	$ 373.2

The following is a summary of the amortized cost and estimated fair value of our debt securities at December 31, 2018 by contractual maturity date (in millions):

	Amortized Cost	Estimated Fair Value
Mature in less than one year	$ 155.5	$ 155.2
Mature in one to five years	172.4	171.3
Mature in more than five years	47.6	46.7
Total	$ 375.5	$ 373.2

Available-for-sale investments consist of the following (in millions):

	December 31, 2017			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
Short-term investments:				
Corporate debt securities	$185.9	$ 0.3	$ (0.5)	$185.7
Brokered certificates of deposit	0.7	—	—	$0.7
Municipal obligations	15.1	—	(0.1)	15.0
Asset-backed securities	55.6	—	(0.2)	55.4
U.S. government sponsored agencies	68.3	—	(0.7)	67.6
Foreign government obligations	3.4	—	—	3.4
Marketable equity securities	34.4	9.0	—	43.4
	363.4	9.3	(1.5)	371.2
Long-term investments:				
Marketable equity securities	54.5	875.5	—	930.0
Asset-backed securities	0.2	—	—	0.2
	54.7	875.5	—	930.2
Total	$418.1	$ 884.8	$ (1.5)	$1,301.4

The following is a summary of investments with gross unrealized losses and the associated fair value (in millions):

	December 31, 2018	December 31, 2017
Fair value of investments in a loss position 12 months or more	$ 117.9	$ 43.9
Fair value of investments in a loss position less than 12 months	$ 193.0	$ 168.7
Gross unrealized losses for investments in a loss position 12 months or more	$ 1.8	$ 0.7
Gross unrealized losses for investments in a loss position less than 12 months	$ 0.8	$ 0.8

The unrealized losses on these securities are due to a number of factors, including changes in interest rates, changes in economic conditions and changes in market outlook for various industries, among others. Because Bio-Rad has the ability and intent to hold these investments with unrealized losses until a recovery of fair value, or for a reasonable period of time sufficient for a forecasted recovery of fair value, which may be maturity, we do not consider these investments to be other-than-temporarily impaired at December 31, 2018 or at December 31, 2017.

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As part of distributing our products, we regularly enter into intercompany transactions. We enter into forward foreign exchange contracts to manage foreign exchange risk of future movements in foreign exchange rates that affect foreign currency denominated intercompany receivables and payables. We do not use derivative financial instruments for speculative or trading purposes. We do not seek hedge accounting treatment for these contracts. As a result, these contracts, generally with maturity dates of 90 days or less and denominated primarily in currencies of industrial countries, are recorded at their fair value at each balance sheet date. The notional principal amounts provide one measure of the transaction volume outstanding as of December 31, 2018 and do not represent the amount of Bio-Rad's exposure to loss. The estimated fair value of these contracts was derived using the spot rates from Reuters on the last business day of the quarter and the points provided by counterparties. The resulting gains or losses offset exchange gains or losses on the related receivables and payables, both of which are included in Foreign exchange losses, net in the Consolidated Statements of Income.

The following is a summary of our forward foreign currency exchange contracts (in millions):

	December 31, 2018
Contracts maturing in January through March 2019 to sell foreign currency:	
Notional value	$ 50.6
Unrealized gain	$ 0.2
Contracts maturing in January through March 2019 to purchase foreign currency:	
Notional value	$ 284.5
Unrealized loss	$ (0.5)

The estimated fair value of financial instruments that are not recognized at fair value in the Consolidated Balance Sheets and are included in Other investments, are presented in the table below. Fair value has been determined using significant observable inputs, including quoted prices in active markets for similar instruments. Estimates are not necessarily indicative of the amounts that could be realized in a current market exchange as considerable judgment is required in interpreting market data used to develop estimates of fair value. The use of different market assumptions or estimation techniques could have a material effect on the estimated fair value. Other investments include financial instruments, the majority of which has fair value based on similar, actively traded stock adjusted for various discounts, including a discount for marketability. Long-term debt, excluding leases and current maturities, has an estimated fair value based on quoted market prices for the same or similar issues.

The estimated fair value of the financial instruments discussed above and the level of the fair value hierarchy within which the fair value measurement is categorized are as follows (in millions):

	December 31, 2018			December 31, 2017		
	Carrying Amount	Estimated Fair Value	Fair Value Hierarchy Level	Carrying Amount	Estimated Fair Value	Fair Value Hierarchy Level
Other investments	$—	$ —		$91.8	$ 1,249.4	2
Total long-term debt, excluding leases and current maturities	$423.7	$ 435.8	2	$423.1	$ 449.8	2

We own shares of ordinary voting stock of Sartorius AG (Sartorius), of Goettingen, Germany, a process technology supplier to the biotechnology, pharmaceutical, chemical and food and beverage industries. We own over 37% of the outstanding voting shares (excluding treasury shares) of Sartorius as of December 31, 2018. The Sartorius family trust and Sartorius family members hold a controlling interest of the outstanding voting shares. We do not have any representative or designee on Sartorius' board of directors, nor do we have the ability to exercise significant influence over the operating and financial policies of Sartorius. As of December 31, 2018, due to the adoption of ASU 2016-01 and ASU 2018-03 as of January 1, 2018, we account for this investment at fair market value as determined at period end by a quoted price on an organized exchange (see Note 1).

4. GOODWILL AND OTHER PURCHASED INTANGIBLE ASSETS

Changes to goodwill by segment were as follows (in millions):

	2018			2017		
	Life Science	Clinical Diagnostics	Total	Life Science	Clinical Diagnostics	Total
Balances as of January 1:						
Goodwill	$234.7	$ 324.6	$559.3	$207.1	$ 311.7	$518.8
Accumulated impairment losses and write-offs	(35.9)	(17.3)	(53.2)	(27.2)	(14.5)	(41.7)
Goodwill, net	198.8	307.3	506.1	179.9	297.2	477.1
Acquisitions	—	—	—	26.2	—	26.2
Divestiture	—	(1.4)	(1.4)	—	—	—
Impairment	(5.9)	(276.1)	(282.0)	(8.7)	(2.8)	(11.5)
Currency fluctuations	(0.2)	(2.7)	(2.9)	1.4	12.9	14.3
Balances as of December 31:						
Goodwill	234.5	320.5	555.0	234.7	324.6	559.3
Accumulated impairment losses and write-offs	(41.8)	(293.4)	(335.2)	(35.9)	(17.3)	(53.2)
Goodwill, net	$192.7	$ 27.1	$219.8	$198.8	$ 307.3	$506.1

In March 2018, we wrote off $1.4 million of goodwill from our Clinical Diagnostics segment as a result of a divestiture of a product line.

In conjunction with the purchase of all the issued and outstanding stock of RainDance Technologies, Inc. in February 2017 (see Note 2, "Acquisitions"), we recorded $26.2 million of goodwill and $37.6 million of definite-lived intangible assets: $36.4 million of licenses, $1.0 million of developed product technology and $0.2 million of tradenames.

In 2018, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A., 2007 through 2012 acquisitions of DiaMed Holding AG, DiaMed Fennica Oy, DiaMed (G.B.) Limited, and DiaMed Benelux (collectively DiaMed), 2010 acquisition of Biotest AG, and 2013 acquisition of AbD Serotec in the amounts of $18.1 million, $247.2 million, $10.8 million and $5.9 million, respectively. Goodwill for DiaMed, Biotest AG and AbD Serotec was fully impaired at December 31, 2018. Impairments for the Pasteur Sanofi Diagnostics S.A., DiaMed and Biotest AG were included in our Clinical Diagnostics segment's results of operations, and the impairment for AbD Serotec was included in our Life Science segment's results of operations.

In 2017, we impaired goodwill associated with our 1999 acquisition of Pasteur Sanofi Diagnostics S.A. and with our 2013 acquisition of AbD Serotec in the amounts of $2.8 million and $8.7 million, respectively. Impairment for the

Pasteur Sanofi Diagnostics S.A. was included in our Clinical Diagnostics segment's results of operations, and the impairment for AbD Serotec was included in our Life Science segment's results of operations.

The impairments were based upon a revision of our Level 3 valuation inputs, i.e., expected future cash flows.

Other than goodwill, we have no intangible assets with indefinite lives. Information regarding our identifiable purchased intangible assets with definite lives is as follows (in millions):

	December 31, 2018			
	Average Remaining Life (years)	Purchase Price	Accumulated Amortization	Net Carrying Amount
Customer relationships/lists	1-6	$ 88.7	$ (68.3)	$ 20.4
Know how	1-7	190.6	(159.8)	30.8
Developed product technology	1-10	130.4	(86.6)	43.8
Licenses	7-11	76.3	(40.9)	35.4
Tradenames	2-6	3.9	(3.3)	0.6
Covenants not to compete	7	3.2	(1.1)	2.1
Total definite-lived intangible assets		$ 493.1	$ (360.0)	$ 133.1

	December 31, 2017			
	Average Remaining Life (years)	Purchase Price	Accumulated Amortization	Net Carrying Amount
Customer relationships/lists	1-7	$ 92.3	$ (64.4)	$ 27.9
Know how	1-8	194.9	(157.9)	37.0
Developed product technology	1-12	133.3	(70.3)	63.0
Licenses	1-12	76.7	(36.0)	40.7
Tradenames	1-6	3.9	(3.0)	0.9
Covenants not to compete	1-8	7.9	(3.3)	4.6
Total definite-lived intangible assets		$ 509.0	$ (334.9)	$ 174.1

In 2018, we impaired developed product technology and fully impaired covenants not to compete in the amounts of $8.8 million and $1.7 million, respectively, associated with our 2012 acquisition of a cell sorting system from Propel Labs, Inc. These impairments were included in our Life Science segment's results of operations. The impairments were based upon a revision of our Level 3 valuation inputs, i.e., expected future cash flows.

Amortization expense related to purchased intangible assets for the years ended December 31, 2018, 2017 and 2016 was $28.3 million, $30.8 million and $35.2 million, respectively. Estimated future amortization expense (based on existing purchased intangible assets) for the years ending December 31, 2019, 2020, 2021, 2022, 2023 and thereafter is $21.7 million, $19.7 million, $18.9 million, $15.7 million, $14.8 million, and $42.3 million, respectively.

5.NOTES PAYABLE AND LONG-TERM DEBT

Under domestic and international lines of credit, standby letters of credit and guarantee arrangements, we had $208.2 million available for borrowing and usage as of December 31, 2018, which was reduced by $3.1 million that was utilized for standby letters of credit and guarantee arrangements issued by our banks to support our obligations.

The principal components of long-term debt are as follows (in millions):

	December 31, 2018	December 31, 2017
4.875% Senior Notes due 2020, net of discount	$ 425.0	$ 425.0
Less unamortized discount and debt issuance costs	(1.3)	(1.9)
Long-term debt less unamortized discount and debt issuance costs	423.7	423.1
Capital leases and other debt	15.7	11.9
	439.4	435.0
Less current maturities	(0.5)	(0.4)
Long-term debt	$ 438.9	$ 434.6

Senior Notes due 2020

In December 2010, Bio-Rad sold $425.0 million principal amount of Senior Notes due December 2020 (4.875% Notes). The sale yielded net cash proceeds of $422.6 million at an effective rate of 4.946%. The 4.875% Notes pay a fixed rate of interest of 4.875% per year. We have the option to redeem any or all of the 4.875% Notes at any time at a redemption price of 100% of the principal amount (plus a specified make-whole premium as defined in the indenture governing the 4.875% Notes) and accrued and unpaid interest thereon to the redemption date. Our obligations under the 4.875% Notes are not secured and rank equal in right of payment with all of our existing and future unsubordinated indebtedness. Certain covenants apply at each year end to the 4.875% Notes including limitations on the following: liens, sale and leaseback transactions, mergers, consolidations or sales of assets and other covenants. We were in compliance with these covenants as of December 31, 2018. There are no restrictive covenants relating to total indebtedness, interest coverage, stock repurchases, recapitalizations, dividends and distributions to shareholders or current ratios.

Credit Agreement

In June 2014, Bio-Rad entered into a $200.0 million unsecured Credit Agreement. Borrowings under the Credit Agreement are on a revolving basis and can be used to make permitted acquisitions, for working capital and for other general corporate purposes. We had no outstanding borrowings under the Credit Agreement as of December 31, 2018 or 2017; however, $0.2 million and $0.5 million were utilized for domestic standby letters of credit that reduced our borrowing availability as of December 31, 2018 and 2017, respectively. The Credit Agreement matures in June 2019. If we had borrowed against our Credit Agreement, the borrowing rate would have been 3.925% at December 31, 2018.

The Credit Agreement requires Bio-Rad to comply with certain financial ratios and covenants, among other things. These ratios and covenants include a leverage ratio test and an interest coverage test, as well as restrictions on our ability to declare or pay dividends, incur debt, guarantee debt, enter into transactions with affiliates, merge or consolidate, sell assets, make investments and create liens. We were in compliance with all of these ratios and covenants as of December 31, 2018.

Maturities of long-term debt at December 31, 2018 are as follows: 2019 - $0.5 million; 2020 - $426.6 million; 2021 - $1.7 million; 2022 - $1.6 million; 2023 - $0.4 million; thereafter - $9.9 million.

6. INCOME TAXES

The U.S. and international components of income before taxes are as follows (in millions):

	Year Ended December 31,		
	2018	2017	2016
U.S.	$363.4	$72.8	$(38.5)
International	149.3	25.0	80.1
Income before taxes	$512.7	$97.8	$41.6

The provision for income taxes consists of the following (in millions):

	Year Ended December 31,		
	2018	2017	2016
Current tax expense:			
U.S. Federal	$8.8	$6.7	$16.1
State	2.2	3.4	3.1
International	30.5	32.0	30.4
Current tax expense	41.5	42.1	49.6
Deferred tax expense (benefit):			
U.S. Federal	114.0	(69.8)	(42.4)
State	6.6	4.3	(2.8)
International	0.3	(19.3)	(6.0)
Deferred tax expense (benefit)	120.9	(84.8)	(51.2)
Non-current tax (benefit) expense	(15.4)	18.3	17.2
Provision for (benefit from) income taxes	$147.0	$(24.4)	$15.6

The reconciliation between our effective tax rate on income before taxes and the statutory tax rate is as follows:

	Year Ended December 31,		
	2018	2017	2016
U. S. statutory tax rate	21 %	35 %	35 %
Impact of foreign operations	(4)	6	(15)
Foreign dividends, net	—	—	(40)
Research tax credits	(1)	(4)	(9)
Nontaxable subsidies	—	(2)	(4)
Tax settlements and changes to unrecognized tax benefits	—	—	47
Goodwill impairment	6	1	11
Domestic manufacturing deduction	—	—	(4)
Share-based compensation	(1)	(5)	3
Nondeductible executive compensation	—	2	3
Fines and penalties	—	—	2
Prior period adjustments	(1)	—	4
U.S. taxation of foreign income	15	3	2
Acquisition-related	—	10	—
U.S. tax reform	(10)	(71)	—
State taxes	2	3	1
Other	2	(3)	1
Provision for (benefit from) income taxes	29 %	(25)%	37 %

On December 22, 2017, the U.S. enacted comprehensive tax legislation (the “Tax Act”). The Tax Act made broad and complex changes to the U.S. tax code that affect our 2017 financial statements, including the imposition of a one-time mandatory deemed repatriation tax (“Transition Tax”) on certain earnings accumulated offshore since 1986 and the reduction of the corporate tax rate from 35% to 21% for U.S. taxable income, resulting in a one-time remeasurement of U.S. federal deferred tax assets and liabilities.

Subsequent to the enactment of the Tax Act, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118"), which provides guidance on accounting for the tax effects of the Tax Act. SAB 118 provides a measurement period that should not extend beyond one year from the Tax Act enactment date for companies to complete the accounting under Accounting Standards Codification ("ASC") 740, "Income Taxes." We have completed our accounting for the income tax effects of the Tax Act, under SAB 118, as of December 31, 2018. As noted in our 2017 Annual Report, we were able to make reasonable estimates and provisionally recorded an income tax benefit of $70 million related to the Transition Tax and remeasurement of our U.S. federal deferred tax assets and liabilities. The final accounting for the Tax Act resulted in an additional income tax benefit of $49 million for a final income tax benefit of $119 million. This is comprised of $169 million tax benefit related to the remeasurement of U.S. federal deferred tax assets and liabilities, offset by a $50 million tax detriment for the Transition Tax. We elected to account for the tax effect of the Global Intangible Low-Taxed Income (“GILTI”) in the period in which it is incurred.

Our effective income tax rate was 29%, (25)% and 37% in 2018, 2017 and 2016, respectively. The effective tax rate for 2018 was driven by detriments due to non-deductible impairment charges and the taxation of our foreign operations, partially offset by a $49 million benefit recorded as a result of the completion of our accounting for the Tax Act under SAB 118. The effective tax rate for 2017 was driven by a $70 million benefit recorded as a provisional estimate of the accounting for the Tax Act. The effective tax rate for 2016 included additional tax liabilities for unrecognized tax benefits related to the non-deductibility of interest expense in our foreign jurisdictions.

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Many jurisdictions in which we operate have statutory tax rates that differ from the U.S. statutory tax rate of 21%. Our effective tax rate is impacted, either favorably or unfavorably, by many factors including, but not limited to the jurisdictional mix of income before tax, changes to statutory tax rates, changes in tax laws or regulations, tax audits and settlements, and generation of tax credits.

Deferred tax assets and liabilities reflect the tax effects of losses, credits, and temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of deferred tax assets and liabilities are as follows (in millions):

	December 31,	
	2018	2017
Deferred tax assets:		
Bad debt, inventory and warranty accruals	$21.7	$28.6
Other post-employment benefits, vacation and other reserves	23.0	24.0
Tax credit and net operating loss carryforwards	75.3	73.3
Other	27.1	19.7
Total gross deferred tax assets	147.1	145.6
Valuation allowance	(70.8)	(66.4)
Total deferred tax assets	76.3	79.2
Deferred tax liabilities:		
Property and equipment	40.1	33.5
Investments and intangible assets	540.6	219.1
Total deferred tax liabilities	580.7	252.6
Net deferred tax liabilities	$(504.4)	$(173.4)

The realization of deferred tax assets is dependent upon the generation of sufficient taxable income of the appropriate character in future periods. We regularly assess our ability to realize our deferred tax assets and establish a valuation allowance if it is more likely than not that some portion, or all, of our deferred tax assets will not be realized. In assessing the realizability of our deferred tax assets, we weigh all available positive and negative evidence. Due to the weight of objectively verifiable negative evidence, we believe that it is more likely than not that our California and certain foreign deferred tax assets will not be realized as of December 31, 2018, and have maintained a valuation allowance on such deferred tax assets. The valuation allowance against our deferred tax assets in California and certain foreign jurisdictions increased by $4.4 million in 2018.

As of December 31, 2018, our foreign and California net operating loss carryforwards were approximately $205.0 million and $52.7 million, respectively. Of our foreign net operating losses, $118.8 million may be carried forward indefinitely. The majority of the remaining foreign net operating losses, if not utilized, will begin to expire in 2025. Our California net operating loss carryforwards, if not utilized, will begin to expire in 2029. As of December 31, 2018, our California research tax credit carryforwards were approximately $32.1 million and may be carried forward indefinitely.

Our income tax returns are audited by U.S. federal, state and foreign tax authorities. We are currently under examination by many of these tax authorities. The tax years open to examination include the years 2014 and forward for the U.S. and the years 2012 and forward for certain foreign jurisdictions including France, Germany, India and Switzerland. There are differing interpretations of tax laws and regulations, and as a result, significant disputes may arise with these tax authorities involving issues of the timing and amount of deductions and allocations of income among various tax jurisdictions. We evaluate our exposures associated with our tax filing positions on a quarterly

basis.

We record liabilities for unrecognized tax benefits related to uncertain tax positions. We do not believe any currently pending uncertain tax positions will have a material adverse effect on our consolidated financial statements, although an adverse resolution of one or more of these uncertain tax positions in any period may have a material impact on the results of operations for that period.

The following is a tabular reconciliation of the total amounts of unrecognized tax benefits (in millions):

	2018	2017	2016
Unrecognized tax benefits – January 1	$54.9	$21.1	$11.9
Additions to tax positions related to prior years	0.6	1.3	10.4
Reductions to tax positions related to prior years	(20.2)	(1.0)	—
Additions to tax positions related to the current year	4.6	34.8	3.4
Settlements	(6.8)	(0.2)	(2.4)
Lapse of statute of limitations	(1.1)	(3.4)	(2.3)
Currency translation	(2.2)	2.3	0.1
Unrecognized tax benefits – December 31	$29.8	$54.9	$21.1

Bio-Rad recognizes accrued interest and penalties related to unrecognized tax benefits as income tax expense. Related to the unrecognized tax benefits noted above, the cumulative amount of accrued interest and penalties as of December 31, 2018, 2017 and 2016, respectively was $9.5 million, $10.9 million and $11.8 million. Bio-Rad accrued interest and penalties of $(1.4) million, $(0.9) million, and $8.7 million in 2018, 2017, and 2016, respectively. The total unrecognized tax benefits and interest and penalties of $39.3 million in 2018 was partially offset by deferred tax assets of $1.6 million and prepaid taxes of $5.5 million, for a net amount of $32.2 million.

As of December 31, 2018, based on the expected outcome of certain examinations or as a result of the expiration of statutes of limitation for certain jurisdictions, we believe that within the next twelve months it is reasonably possible that our previously unrecognized tax benefits could decrease by approximately $3.1 million. Substantially all such amounts will impact our effective income tax rate if recognized.

It is generally our intention to repatriate certain foreign earnings to the extent that such repatriations are not restricted by local laws or accounting rules, and there are no substantial incremental costs. During the current year, we recorded approximately $6.7 million of deferred tax liability for the earnings of certain foreign jurisdictions that we may repatriate in the future. The determination of the amount of the unrecognized deferred tax liability for foreign earnings that are indefinitely reinvested is not practicable to estimate.

7. STOCKHOLDERS' EQUITY

Bio-Rad’s issued and outstanding stock consists of Class A Common Stock (Class A) and Class B Common Stock (Class B). Each share of Class A and Class B participates equally in the earnings of Bio-Rad, and is identical in all respects except as follows. Class A has limited voting rights. Each share of Class A is entitled to one tenth of a vote on most matters, and each share of Class B is entitled to one vote. Additionally, Class A stockholders are entitled to elect 25% of the Board of Directors and Class B stockholders are entitled to elect 75% of the directors. Cash dividends may be paid on Class A shares without paying a cash dividend on Class B shares but no cash dividend may be paid on Class B shares unless at least an equal cash dividend is paid on Class A shares. Class B shares are convertible at any time into Class A shares on a one-for-one basis at the option of the stockholder. The founders of Bio-Rad, the Schwartz family, collectively hold a majority of Bio-Rad’s voting stock. As a result, the Schwartz family is able to exercise significant influence over Bio-Rad.

Changes to Bio-Rad's issued common stock shares are as follows (in thousands):

	Class A Shares	Class B Shares
Balance at January 1, 2016	24,230	5,131
B to A conversions	13	(13)
Issuance of common stock	211	6
Balance at December 31, 2016	24,454	5,124
B to A conversions	34	(34)
Issuance of common stock	191	18
Balance at December 31, 2017	24,679	5,108
B to A conversions	30	(30)
Issuance of common stock	175	18
Balance at December 31, 2018	24,884	5,096

Treasury Shares

In November, 2017, the Board of Directors authorized a new share repurchase program, granting Bio-Rad authority to repurchase, on a discretionary basis, up to $250.0 million of outstanding shares of our common stock. Repurchases may be made at management's discretion from time to time on the open market or through privately negotiated transactions. This new authorization superseded the prior authorization of up to $18.0 million of Bio-Rad's common stock and has no expiration. The share repurchase activity under the share repurchase program through open market transactions in 2017 and 2018 is summarized as follows:

	Number of Shares Purchased	Weighted-Average Price per Share	Total Shares Repurchased To Date	Remaining Authorized Value (in millions)
May 1, 2017 - May 31, 2017	2,500	$ 220.02	3,539	$ 2.7
June 1, 2017 - June 30, 2017	1,500	$ 221.82	5,039	$ 2.4
August 1, 2017 - August 31, 2017	9,200	$ 221.45	14,239	$ 0.4
November 1, 2018 - November 30, 2018	178,911	$ 273.39	193,150	$ 201.1

In September 2017, we used 12,740 of the repurchased shares in connection with the vesting of restricted stock units under the 2007 Incentive Award Plan in order to obtain a tax deduction in some of our foreign entities. The Credit Agreement may limit our ability to repurchase our stock.

8. ***ACCUMULATED OTHER COMPREHENSIVE INCOME (LOSS)***

Accumulated other comprehensive income (loss) included in our Consolidated Balance Sheets and Consolidated Statements of Changes in Stockholders' Equity consists of the following components (in millions):

	Foreign currency translation adjustments	Foreign other post-employment benefits adjustments	Net unrealized holding gains (losses) on available-for-sale investments	Total Accumulated other comprehensive income (loss)
Balances as of January 1, 2017	$ 1.3	$ (18.6)	$ 435.0	$ 417.7
Other comprehensive income (loss), before reclassifications	76.1	(6.5)	203.6	273.2
Amounts reclassified from Accumulated other comprehensive income	—	2.1	(0.1)	2.0
Income tax effects	—	0.7	(74.9)	(74.2)
Effect of adoption of ASU 2018-02	—	—	120.1	120.1
Other comprehensive income (loss), net of income taxes	76.1	(3.7)	248.7	321.1
Balances as of December 31, 2017	$ 77.4	$ (22.3)	$ 683.7	$ 738.8
Effect of adoption of ASU 2016-01 and 2018-03**	—	—	(679.3)	(679.3)
Balances as of January 1, 2018	$ 77.4	$ (22.3)	$ 4.4	$ 59.5
Other comprehensive (loss) income, before reclassifications	(112.9)	6.9	(1.4)	(107.4)
Amounts reclassified from Accumulated other comprehensive income	—	2.4	0.3	2.7
Income tax effects	—	(1.8)	—	(1.8)
Other comprehensive (loss) income, net of income taxes	(112.9)	7.5	(1.1)	(106.5)
Balances as of December 31, 2018	$ (35.5)	$ (14.8)	$ 3.3	$ (47.0)

**See Note 1, "Significant Accounting Policies" under "Recent Accounting Pronouncements Adopted"

In 2017, we adopted ASU 2018-02, "Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income," which gave entities the option to reclassify to retained earnings tax effects related to items in Accumulated other comprehensive income ("OCI") that the FASB refers to as having been stranded in Accumulated OCI as a result of the Tax Act. We reclassified the income tax effects of the Tax Act on the remeasurement of our deferred tax liabilities related to our available-for-sale equity securities by increasing OCI and decreasing Retained earnings by $120.1 million.

The increase in 2017 for net unrealized holding gains on available-for-sale investments was primarily from our ownership in the preferred shares of Sartorius.

The amounts reclassified out of Accumulated other comprehensive income into the Consolidated Statements of Income, with presentation location, were as follows:

Components of Comprehensive income	December 31, 2018	2017	Location
Amortization of foreign other post-employment benefit items	$(2.4)	$(2.1)	Selling, general and administrative expense
Net holding (losses) gains on equity securities and available for sale investments	$(0.3)	$0.1	Other (income) expense, net

Reclassification adjustments are calculated using the specific identification method.

9. SHARE-BASED COMPENSATION/EQUITY AWARD AND PURCHASE PLANS

Description of Share-Based Compensation Plans

We believe our share-based compensation plans align the interests of our employees with those of our shareholders.

Equity Award Plans
We have three equity award plans for officers and certain other employees: the 2003 Stock Option Plan (2003 Plan), the 2007 Incentive Award Plan (2007 Plan) and the 2017 Incentive Award Plan (2017 Plan). The 2003 Plan authorized the grant of incentive stock options and non-qualified stock options to employees. The 2007 Plan authorized the grant of stock options, restricted stock, restricted stock units, stock appreciation rights and other types of equity awards to employees. We no longer grant equity under the 2003 Plan or 2007 Plan. From 2007 through 2016, all share-based compensation grants were from the 2007 Plan.

The 2017 Plan authorizes the grant to employees of stock options, stock appreciation rights, restricted stock, restricted stock units, and other types of equity awards. A total of 1,999,714 shares have been reserved for issuance of equity awards under the 2017 Plan and may be of either Class A or Class B common stock. At December 31, 2018, there were 1,584,834 shares available to be granted.

Under the above plans, Class A and Class B options are granted at prices not less than fair market value of the underlying common stock on the date of grant. Generally, options granted have a maximum term of 10 years and vest in increments of 20% per year over a five-year period on the yearly anniversary date of the grant. Stock awards issued under the 2007 Plan and 2017 Plan generally vest in increments of 20% per year over a five-year period on the yearly anniversary date of the grant.

Employee Stock Purchase Plans
Our 2011 Employee Stock Purchase Plan (2011 ESPP) provides that eligible employees may contribute up to 10% of their compensation up to $25,000 annually toward the quarterly purchase of our Class A common stock. The employees' purchase price is 85% of the lesser of the fair market value of the stock on the first business day or the last

business day of each calendar quarter.

The 2011 ESPP includes two components: a Code Section 423 Component that we intend to qualify as an “employee stock purchase plan” under Section 423 of the U.S. Internal Revenue Code of 1986, as amended (the “Code”) and a Non-423 Component, which authorizes the grant of purchase rights that does not qualify as an “employee stock purchase plan” under Section 423 of the Code. We have authorized the sale of 1,300,000 shares of Class A common stock under the 2011 ESPP.

Share-Based Compensation

Included in our share-based compensation expense is the cost related to stock option grants, ESPP stock purchases and restricted stock unit awards. Share-based compensation expense is allocated to Cost of goods sold, Research and development expense, and Selling, general and administrative expense in the Consolidated Statements of Income.

For 2018, 2017 and 2016, we recognized share-based compensation expense of $27.8 million, $23.4 million and $19.7 million, respectively. The income tax benefit related to share-based compensation expense was $4.4 million, $5.8 million and $5.1 million for 2018, 2017 and 2016, respectively. We did not capitalize any share-based compensation expense in inventory.

The tax benefit from share-based compensation vested or exercised during 2018, 2017 and 2016 was $5.4 million, $6.3 million, and $1.5 million, respectively. The actual tax benefit realized for the tax deductions from share-based compensation vested or exercised, including excess tax benefits that were recognized in stockholders' equity, totaled $6.0 million in 2016.

For options and awards, we amortize the fair value on a straight-line basis. All stock compensation awards are amortized over the requisite service periods of the awards, which are generally the vesting periods. With the adoption in 2017 of ASU 2016-09, "Improvements to Employee Share-Based Payment Accounting," we made a policy election to recognize forfeitures as they occur. Prior to 2017, we recognized compensation expense net of estimated forfeitures.

Stock Options

The following table summarizes stock option activity:

	Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in millions)
Outstanding, December 31, 2017	407,480	$ 120.39		
Granted	33,000	$ 326.15		
Exercised	(44,600)	$ 93.63		
Forfeited/expired	(22,240)	$ 169.93		
Outstanding, December 31, 2018	373,640	$ 138.81	4.90	$ 38.0
Unvested, December 31, 2018	99,600	$ 223.91	8.32	$ 3.9
Exercisable, December 31, 2018	274,040	$ 107.88	3.65	$ 34.1

Intrinsic value for stock options is defined as the difference between the current market value and the exercise price. The total intrinsic value on the date of exercise of stock options exercised during 2018, 2017 and 2016 was approximately $8 million, $10 million and $1 million, respectively. The total fair value of options vested during 2018, 2017 and 2016 was $6.0 million, $4.2 million and $2.1 million, respectively.

Cash received from stock options exercised during 2018, 2017 and 2016 was $0.5 million, $1.6 million and $1.2 million, respectively.

As of December 31, 2018, there was $6.3 million of total unrecognized compensation cost from stock options. This amount is expected to be recognized in the future over a weighted-average period of approximately 3 years.

The weighted-average fair value of stock options granted was estimated using a Black-Scholes option-pricing model with the following weighted-average assumptions:

	Year Ended December 31,		
	2018	2017	2016
Expected volatility	22 %	20 %	21 %
Risk-free interest rate	2.85 %	1.87 %	1.35 %
Expected life (in years)	7.6	7.2	7.4
Expected dividend	—	—	—
Weighted-average fair value of options granted	$105.94	$58.65	$42.40

Volatility is based on the historical volatilities of our common stock for a period equal to the stock option's expected life. The risk-free interest rate is based on the U.S. Treasury yield curve in effect at the time of the grant. The expected life represents the number of years that we estimate, based primarily on historical experience, that the options will be outstanding prior to exercise. We do not anticipate paying any cash dividends in the future and therefore use an expected dividend yield of zero.

Restricted Stock Units

Restricted stock units, which are rights to receive shares of company stock, were granted from 2009 through 2016 under the 2007 Plan and since 2017 under the 2017 Plan. The fair value of a restricted stock unit is the market value as determined by the closing price of the stock on the day of grant.

The following table summarizes restricted stock unit activity:

	Restricted Stock Units	Weighted-Average Grant-Date Fair Value	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in millions)
Outstanding, December 31, 2017	473,000	$ 172.76		
Granted	185,755	$ 326.15		
Vested	(128,294)	$ 158.49		
Forfeited	(56,011)	$ 182.15		
Outstanding, December 31, 2018	474,450	$ 235.57	2.11	$ 110.2

The total fair value of restricted stock units vested in 2018, 2017 and 2016 was $40.0 million, $27.7 million and $18.7 million, respectively. As of December 31, 2018, there was approximately $102.4 million of total unrecognized compensation cost related to restricted stock units. This amount is expected to be recognized over a remaining weighted-average period of approximately 4 years.

Employee Stock Purchase Plans

The fair value of the employees' purchase rights under the 2011 ESPP was estimated using a Black-Scholes model with the following weighted-average assumptions:

	Year Ended December 31,		
	2018	2017	2016
Expected volatility	27 %	19 %	20 %
Risk-free interest rate	1.82 %	0.83 %	0.26 %
Expected life (in years)	0.24	0.24	0.25
Expected dividend	—	—	—
Weighted-average fair value of purchase rights	$55.04	$38.86	$27.36

The major assumptions are primarily based on historical data. Volatility is based on the historical volatilities of our common stock for a period equal to the expected life of the purchase rights. The risk-free interest rate is based on the U.S. Treasury yield curve in effect at the time of the grant. We do not anticipate paying any cash dividends in the future and therefore use an expected dividend yield of zero.

We sold 63,464 shares for $13.6 million, 74,409 shares for $13.0 million and 93,605 shares for $11.5 million under the 2011 ESPP to employees in 2018, 2017 and 2016, respectively. At December 31, 2018, 658,248 shares remain authorized and available for issuance under the 2011 ESPP.

We currently issue new shares or treasury shares, if available, to satisfy stock option exercises, restricted stock issuances and ESPP stock purchases.

10. OTHER INCOME AND EXPENSE, NET

Other (income) expense, net includes the following components (in millions):

	Year Ended December 31,		
	2018	2017	2016
Interest and investment income	$(26.6)	$(19.1)	$(14.7)
Net realized gains on investments	(1.6)	(0.1)	(0.8)
Other-than-temporary impairment losses on investments	0.8	7.0	0.6
Gain on sale of land	(4.1)	—	—
Gain on divestiture of product line	(5.1)	—	—
Other expense	—	1.5	1.1
Other (income) expense, net	$(36.6)	$(10.7)	$(13.8)

Prior year amounts have been adjusted (see Note 1 to the consolidated financial statements in regard to ASU 2017-07) for pension and other postretirement benefits.

11. SUPPLEMENTAL CASH FLOW INFORMATION

The reconciliation of net income to net cash provided by operating activities is as follows (in millions):

	Year Ended December 31,		
	2018	2017	2016
Net income	$365.6	$122.2	$26.0
Adjustments to reconcile net income to net cash provided by operating activities			
Depreciation and amortization	138.1	148.7	142.9
Share-based compensation	27.8	23.4	19.7
Gains on dispositions of securities	(1.6)	(0.1)	(0.8)
Other-than-temporary impairment losses on investments	0.8	7.0	0.6
Changes in fair market value of equity securities	(606.2)	—	—
Losses on dispositions of fixed assets	2.0	8.1	0.6
Gain on sale of land	(4.1)	—	—
Gain on divestiture of a product line	(5.1)	—	—
Excess tax benefits from share-based compensation	—	—	(1.5)
Changes in fair value of contingent consideration	(6.2)	(18.1)	(0.4)
Decrease (increase) in accounts receivable, net	59.7	(64.1)	12.5
Increase in inventories, net	(12.9)	(47.7)	(57.1)
Increase in other current assets	(15.3)	(35.7)	(6.8)
(Decrease) increase in accounts payable and other current liabilities	(45.6)	7.8	30.1
(Decrease) increase in income taxes payable	(20.9)	(22.4)	10.7
Increase (decrease) in deferred income taxes	120.9	(82.0)	(51.4)
Decrease in other long term assets	1.1	2.3	12.5
(Decrease) increase in other long term liabilities	(10.0)	38.1	10.4
Impairment losses on goodwill and long-lived assets	292.5	11.5	62.3
Other	4.9	5.1	5.8
Net cash provided by operating activities	$285.5	$104.1	$216.1
Non-cash investing activities:			
Purchased property, plant and equipment	$5.7	$—	$7.2
Purchased marketable securities and investments	$0.8	$2.8	$0.6

12. COMMITMENTS AND CONTINGENT LIABILITIES

Rents and Leases

Rental expense under operating leases was $47.4 million, $43.6 million and $44.4 million in 2018, 2017 and 2016, respectively. Leases are principally for facilities and automobiles.

Annual future minimum lease payments at December 31, 2018 under operating leases are as follows: 2019 - $44.4 million; 2020 - $37.8 million; 2021 - $27.4 million; 2022 - $19.7 million; 2023 - $13.9 million; and 2024 and beyond - $25.6 million.

The total minimum rentals to be received in the future for subleases as of December 31, 2018 were $17.8 million.

Deferred Profit Sharing Retirement Plan

We have a profit sharing plan covering substantially all U.S. employees. Contributions are made at the discretion of the Board of Directors. Bio-Rad has no liability other than for the current year's contribution. Contribution expense was $15.9 million, $16.0 million and $15.1 million in 2018, 2017 and 2016, respectively.

Other Post-Employment Benefits

In several foreign locations we are statutorily required to provide retirement benefits or a lump sum termination indemnity to our employees upon termination for virtually any reason. These plans are accounted for as defined benefit plans and the associated net benefit obligation at December 31, 2018 and 2017 of $70.4 million and $74.9 million, respectively, has been included in Accrued payroll and employee benefits and Other long-term liabilities in the Consolidated Balance Sheets. Most plans are not required to be funded, and as such, there is no trust or other device used to accumulate assets or settle these obligations. However, some of these plans require funding based on local laws in which there is a trust or other device administered by an external plan manager that is used to accumulate assets to assist in settling these obligations. The following disclosures include such plans, which are located in France, Switzerland, Germany, Korea, India, Thailand, Italy, Dubai and Japan.

Obligations and Funded Status

The following table sets forth the change in benefit obligations, fair value of plan assets and amounts recognized in the Consolidated Balance Sheets for the plans (in millions):

Change in benefit obligation:	**2018**	**2017**
Benefit obligation at beginning of year	$136.6	$122.7
Service cost	7.5	6.5
Interest cost	1.1	1.1
Plan participants' contributions	3.1	2.8
Actuarial (gain) loss	(5.4)	3.3
Gross benefits paid	(3.1)	(3.2)
Plan amendments	(0.5)	1.1
Special termination benefits	—	(2.0)
Settlements	—	(5.1)
Change attributable to foreign exchange	(2.0)	9.4
Benefit obligation at end of year	137.3	136.6
Change in plan assets:		
Fair value of plan assets at beginning year	61.7	58.8
Actual return on plan assets	0.3	0.5
Employer contributions	4.0	4.0
Plan participants' contributions	3.1	2.8
Gross benefits paid	(1.5)	(2.3)
Settlements	—	(5.1)
Change attributable to foreign exchange	(0.7)	3.0
Fair value of plan assets at end of year	66.9	61.7
Under funded status of plans	$(70.4)	$(74.9)
Amounts recognized in the consolidated balance sheets:		
Current liabilities (Accrued payroll and employee benefits)	$(1.1)	$(1.1)
Noncurrent liabilities (Other long-term liabilities)	(69.3)	(73.8)
Net liability, end of fiscal year	$(70.4)	$(74.9)

Components of Net Periodic Benefit Cost

	2018	**2017**	**2016**
Service costs	$7.5	$6.5	$6.1
Interest costs	1.1	1.1	1.4
Expected returns on plan assets	(1.1)	(1.1)	(1.0)
Amortization of actuarial losses	1.3	1.4	1.7
Amortization of prior service costs	0.1	—	—
Settlements	—	1.2	0.4
Net periodic benefit costs	$8.9	$9.1	$8.6

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Assumptions

	2018	2017
Discount rate	1.1%	0.8%
Compensation rate increase	1.8%	1.8%

	2018	2017	2016
Discount rate	0.8%	0.9%	1.1%
Expected long-term rate of return on plan assets	1.8%	1.9%	1.6%

Under these plans, the liability at December 31, 2018 and 2017 was $3.1 million and $3.7 million, respectively, and has been included in Accrued payroll and employee benefits and Other long-term liabilities in the Consolidated Balance Sheets.

Purchase Obligations

As of December 31, 2018, we had obligations that have been recognized on our balance sheet of $110.9 million, which include purchases of goods and services that are enforceable and legally binding to Bio-Rad and that specify all significant terms and exclude agreements that are cancelable without penalty. These obligations also include other post-employment benefits in some of our foreign locations as indicated above.

The annual future fixed and determinable portion of our purchase obligations that have been recognized on our balance sheet as of December 31, 2018 are as follows: 2019 - $5.8 million, 2020 - $16.4 million, 2021 - $6.2 million, 2022 - $2.4 million, 2022 - $3.5 million and after 2023 - $76.6 million.

As of December 31, 2018, we had purchase obligations that have not been recognized on our balance sheet of $12.5 million, which include agreements to purchase goods or services that are enforceable and legally binding to Bio-Rad and that specify all significant terms and exclude agreements that are cancelable without penalty.

The annual future fixed and determinable portion of our purchase obligations that have not been recognized on our balance sheet as of December 31, 2018 are as follows: 2019 - $6.5 million, 2020 - $5.3 million, 2021 - $0.1 million, 2022 - $0.2 million, 2022 - $0.2 million and after 2023 - $0.2 million.

Letters of Credit/Guarantees

In the ordinary course of business, we are at times required to post letters of credit/guarantees. The letters of credit/guarantees are issued by financial institutions to guarantee our obligations to various parties. We were contingently liable for $3.1 million of standby letters of credit/guarantees with financial institutions as of December 31, 2018.

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Contingent Consideration

During the first quarter of 2016, we recognized a contingent consideration liability upon our acquisition of a high performance analytical flow cytometer platform from Propel. At the acquisition date, the amount of contingent consideration was determined based on a probability-weighted income approach related to the achievement of sales milestones, ranging from 39% to 20% for the calendar years 2017 through 2020. The sales milestones could potentially range from $0 to an unlimited amount. In the first and third quarters of 2018, we paid $1.3 million and $0.8 million, respectively, per the purchase agreement. Since 2016 we have had a net decrease in the cumulative valuation of the sales milestones of $12.2 million. The contingent consideration was accrued at its estimated fair value of $8.4 million as of December 31, 2018.

Concentrations of Labor Subject to Collective Bargaining Agreements

At December 31, 2018, approximately eight percent of Bio-Rad's approximately 3,265 U.S. employees were covered by a collective bargaining agreement, which will expire on November 7, 2019. Many of Bio-Rad's non-U.S. full-time employees, especially in France, are covered by collective bargaining agreements.

13. LEGAL PROCEEDINGS

On May 27, 2015, our former general counsel, Sanford S. Wadler, filed a lawsuit in the U.S. District Court, Northern District of California, against us and four of our then current directors and one former director. The plaintiff's suit alleged whistleblower retaliation in violation of the Sarbanes-Oxley Act and the Dodd-Frank Act for raising FCPA-related concerns. Mr. Wadler also alleged wrongful termination in violation of public policy, non-payment of wages and waiting time penalties in violation of the California Labor Code. The plaintiff sought back pay, compensatory damages for lost wages, earnings, retirement benefits and other employee benefits, compensation for mental pain and anguish and emotional distress, waiting time penalties, punitive damages, litigation costs (including attorneys' fees) and reinstatement of employment. On July 28, 2015, we filed a motion to dismiss the plaintiff's complaint and specifically requested dismissal of the claims alleged against us under the Dodd-Frank Act and California Labor Code 1102.5 and the claims against the directors under the Sarbanes-Oxley Act and the Dodd-Frank Act. On October 23, 2015, the District Court granted our motion with respect to the alleged violations of the Sarbanes-Oxley Act against all the director defendants except Norman Schwartz with prejudice. The Court denied our motion to dismiss the claims under the Dodd-Frank Act as against both us and the director defendants. The trial commenced on January 17, 2017 and concluded on February 6, 2017. Mr. Wadler was awarded $10.92 million, plus prejudgment interest of $141,608, post-judgment interest, and Mr. Wadler's litigation costs, expert witness fees, and reasonable attorneys' fees as approved by the Court. We have provided for the judgment, interest and Mr. Wadler's litigation costs. On June 6, 2017, we filed a notice of appeal with the United States Court of Appeals for the Ninth Circuit. Oral arguments occurred on November 14, 2018. On February 26, 2019, the United States Court of Appeals for the Ninth Circuit issued its decision, reversing in part, vacating in part, and affirming in part. Specifically, the court: (1) reversed the Dodd-Frank claim, which amounts to about $2.96 million plus interest, and directed the district court to enter judgment in Bio-Rad's favor on that claim; (2) vacated the SOX claim due to instructional error and remanded for further proceedings, including whether a new trial is needed; and (3) affirmed the California public policy claim and the $7.96 million in damages attributable to it. On March 12, 2019 we filed a petition for panel rehearing or rehearing *en banc* with the United States Court of Appeals for the Ninth Circuit.

We are also party to various other claims, legal actions and complaints arising in the ordinary course of business. We cannot at this time reasonably estimate a range of exposure, if any, of the potential liability with respect to these matters. While we do not believe, at this time, that any ultimate liability resulting from any of these other matters will

have a material adverse effect on our results of operations, financial position or liquidity, we cannot give any assurance regarding the ultimate outcome of these other matters and their resolution could be material to our operating results for any particular period, depending on the level of income for the period.

14. SEGMENT INFORMATION

Bio-Rad is a multinational manufacturer and worldwide distributor of its own life science research products and clinical diagnostics products. We have two reportable segments: Life Science and Clinical Diagnostics. These reportable segments are strategic business lines that offer more than 9,000 different products and services and require different marketing strategies. We do not disclose quantitative information about our different products and services as it is impractical to do so based primarily on the numerous products and services that we sell and the global markets that we serve.

The Life Science segment develops, manufactures, sells and services reagents, apparatus and instruments used for biological research. These products are sold to university and medical school laboratories, pharmaceutical and biotechnology companies, food testing laboratories and government and industrial research facilities.

The Clinical Diagnostics segment develops, manufactures, sells and services automated test systems, informatics systems, test kits and specialized quality controls for the healthcare market. These products are sold to reference laboratories, hospital laboratories, state newborn screening facilities, physicians' office laboratories, transfusion laboratories and insurance and forensic testing laboratories.

Other Operations include the remainder of our Analytical Instruments segment.

Segment results are presented in the same manner as we present our operations internally to make operating decisions and assess performance. The accounting policies of the segments are the same as those described in Significant Accounting Policies (see Note 1). Segment profit or loss includes an allocation of corporate expense based upon sales and an allocation of interest expense based upon accounts receivable and inventories. The difference between total segment allocated interest expense, depreciation and amortization, and capital expenditures and the corresponding consolidated amounts is attributable to our corporate headquarters. Segments are expected to manage only assets completely under their control. Accordingly, segment assets include primarily accounts receivable, inventories and gross machinery and equipment. Goodwill balances have been included in corporate for segment reporting purposes.

Information regarding industry segments at December 31, 2018, 2017, and 2016 and for the years then ended is as follows (in millions):

		Life Science	Clinical Diagnostics	Other Operations
Segment net sales	2018	$861.7	$1,411.8	$ 15.9
	2017	785.2	1,360.8	14.2
	2016	730.7	1,323.3	14.2
Allocated interest expense	2018	$7.2	$16.7	$ 0.1
	2017	7.0	14.9	—
	2016	6.9	16.5	—
Depreciation and amortization	2018	$34.1	$72.0	$ 0.5
	2017	36.2	80.2	—
	2016	31.7	80.5	—
Segment profit (loss)	2018	$28.7	$(145.7)	$ 0.2
	2017	(9.9)	114.8	1.4
	2016	(19.1)	58.0	0.9
Segment assets	2018	$450.2	$949.0	$ 5.9
	2017	453.0	1,038.4	4.8
Capital expenditures	2018	$36.7	$60.5	$ 0.5
	2017	12.6	59.0	—

Prior year amounts have been adjusted (see Note 1 to the consolidated financial statements in regard to ASU 2017-07 for pension and other postretirement benefits). Clinical Diagnostics segment loss for 2018 was due to impairment losses taken on goodwill of $276.1 million (see Note 4 to the consolidated financial statements)

Net corporate operating expense consists of receipts and expenditures that are not the primary responsibility of segment operating management and therefore are not allocated to the segments for performance assessment by our chief operating decision maker. The following reconciles total segment profit to consolidated income before taxes (in millions):

	Year Ended December 31,		
	2018	2017	2016
Total segment (loss) profit	$(116.8)	$106.3	$39.8
Foreign currency exchange losses, net	(2.9)	(9.1)	(4.5)
Net corporate operating, interest and other expense not allocated to segments	(10.4)	(10.1)	(7.5)
Change in fair market value of equity securities	606.2	—	—
Other income (expense), net	36.6	10.7	13.8
Consolidated income before income taxes	$512.7	$97.8	$41.6

Prior year amounts have been adjusted (see Note 1 to the consolidated financial statements in regard to ASU 2017-07) for pension and other postretirement benefits.

The following reconciles total segment assets to consolidated total assets (in millions):

	December 31,	
	2018	2017
Total segment assets	$1,405.1	$1,496.2
Cash and other current assets	1,047.2	965.8
Property, plant and equipment, net, excluding segment specific gross machinery and equipment	79.9	57.0
Goodwill, net	219.8	506.1
Other long-term assets	2,859.1	1,247.9
Total assets	$5,611.1	$4,273.0

The following presents net sales to external customers by geographic region based primarily on the location of the use of the product or service (in millions):

	Year Ended December 31,		
	2018	2017	2016
Europe	$792.0	$758.5	$742.2
Pacific Rim	495.5	461.3	427.1
United States	863.6	800.2	770.6
Other (primarily Canada and Latin America)	138.3	140.2	128.3
Total net sales	$2,289.4	$2,160.2	$2,068.2

The following presents Property, plant and equipment, net, Other investments and Other assets, excluding deferred income taxes, by geographic region based upon the location of the asset (in millions):

	December 31,	
	2018	2017
Europe**	$1,571.9	$230.6
Pacific Rim	20.7	18.4
United States	1,582.1	1,305.2
Other (primarily Canada and Latin America)	11.1	13.1
Total Property, plant and equipment, net, Other investments and Other assets, excluding deferred income taxes	$3,185.8	$1,567.3

** The amounts primarily include our investment in the ordinary voting stock of Sartorius AG, of Goettingen, Germany (see Note 3). In 2017 this investment was accounted for under the cost method, and in 2018 it was accounted for at fair value in accordance with ASU 2016-01 (see Note 1).

15. RESTRUCTURING COSTS

Restructuring Costs for European Reorganization

In May 2016, we announced that we would take certain actions in our Europe geographic region designed to better align expenses to our revenue and gross margin profile and position us for improved operating performance. These actions, aligned with creation and evolution of our organization structure and coordinated with the implementation of our global single instance enterprise resource planning ("ERP") platform, are expected to be incurred through 2019. We recorded approximately $(0.2) million, $0.5 million and $12.5 million in restructuring charges and adjustments related to severance and other employee benefits for the years ended December 31, 2018, 2017 and 2016, respectively. From May 2016 to December 31, 2018, total expenses were $12.8 million. The liability of $1.6 million as of December 31, 2018 was recorded in Accrued payroll and employee benefits in the Consolidated Balance Sheets. The amounts recorded were reflected in Cost of goods sold of $(0.1) million, $(0.2) million and $2.1 million, and in Selling, general and administrative expense of $(0.1) million, $0.7 million and $10.4 million in the Consolidated Statements of Income for the years ended December 31, 2018, 2017 and 2016, respectively. The amounts adjusted were primarily for additional positions identified for elimination, partially offset by employees finding other positions within Bio-Rad or leaving prematurely.

The following table summarizes the activity of our European reorganization restructuring reserves for severance (in millions):

	2018			2017		
	Life Science	Clinical Diagnostics	Total	Life Science	Clinical Diagnostics	Total
Balance as of January 1	$2.2	$ 4.1	$6.3	$3.2	$ 5.8	$9.0
Adjustment to expense	(0.1)	(0.1)	(0.2)	0.2	0.3	0.5
Cash payments	(1.5)	(2.9)	(4.4)	(1.5)	(2.7)	(4.2)
Foreign currency translation (gains) losses	—	(0.1)	(0.1)	0.3	0.7	1.0
Balance as of December 31	$0.6	$ 1.0	$1.6	$2.2	$ 4.1	$6.3

Restructuring Costs for Termination of a Diagnostics Research and Development Project and Facility Closures

In December 2017, we announced the termination of a diagnostics research and development project in Europe. From December 2017 to December 31, 2018, total expenses were $21.4 million. We recorded restructuring charges and adjustments related to severance and employee benefits of $0.4 million and $11.0 million, and asset write-offs and exit costs of $(0.1) million and $10.1 million for the years ended December 31, 2018 and 2017, respectively.

In June 2018, we announced the closure of a small manufacturing operation in Munich, Germany. We recorded $1.7 million of expense in restructuring charges related to severance and employee benefits for the year ended December 31, 2018.

In December 2018, we announced the closure of a small manufacturing facility outside Paris, France. We recorded restructuring charges related to severance and employee benefits of $3.9 million and exit costs of $0.2 million for the year ended December 31, 2018.

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Restructuring charges for the termination of a diagnostics research and development project and the facility closures are all included in our Clinical Diagnostics segment's results of operations. The facility closures are a natural evolution from the larger consolidations that began with the 2016 European reorganization activities described above. The amounts recorded were reflected in Cost of goods sold of $5.4 million and $2.3 million, in Selling, general and administrative expense of $0.4 million and $3.3 million, and in Research and development expense of $0.3 million and $15.5 million in the Consolidated Statements of Income for the years ended December 31, 2018 and 2017, respectively. The liability of $11.5 million as of December 31, 2018 consisted of $7.3 million recorded in Accrued payroll and employee benefits, and $4.2 million recorded in Other long-term liabilities in the Consolidated Balance Sheets.

The following table summarizes the activity for the termination of the diagnostics research and development project and the facility closures restructuring reserves for severance and exit costs (in millions):

	2018	2017
Balance as of January 1	$14.1	$—
Charged to expense	5.8	14.0
Adjustment to expense	0.3	—
Cash payments	(8.4)	—
Foreign currency translation (gains) losses	(0.3)	0.1
Balance as of December 31	$11.5	$14.1

Restructuring Costs for GnuBIO, Inc.

In 2014, we acquired GnuBIO, Inc. (GnuBIO) as a business acquisition. It was included in our Clinical Diagnostics segment’s results of operations as a division, and was primarily based in Massachusetts. In September 2017, we announced that we were closing the GnuBIO research program facilities in Massachusetts. We recorded restructuring charges in September 2017 related to severance and employee benefits of $2.9 million and asset write-offs of $5.5 million. The amounts recorded were reflected in Selling, general and administrative expense of $0.8 million and in Research and development expense of $7.6 million in the Consolidated Statements of Income for the year ended December 31, 2017. The liability balance as of December 31, 2017 was $1.4 million and was recorded in Accrued payroll and employee benefits in the Consolidated Balance Sheets. The liability was paid in early 2018.

16. QUARTERLY FINANCIAL DATA (UNAUDITED)

Summarized quarterly financial data for 2018 and 2017 are as follows (in millions, except per share data):

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2018				
Net sales	$551.5	$575.9	$545.1	$616.9
Gross profit	302.2	301.7	286.7	332.6
Net income (loss)	656.8	268.0	269.3	(828.5)
Basic earnings (loss) per share	$22.05	$8.99	$9.02	$(27.73)
Diluted earnings (loss) per share	$21.77	$8.87	$8.89	$(27.73)
2017				
Net sales	$500.1	$504.7	$534.1	$621.3
Gross profit	270.1	273.4	299.0	345.2
Net income	12.4	5.0	22.1	82.7
Basic earnings per share	$0.42	$0.17	$0.74	$2.78
Diluted earnings per share	$0.41	$0.17	$0.73	$2.75

As a result of the net loss for the three months ended December 31, 2018, all potentially issuable common shares have been excluded from the diluted shares used in the computation of earnings per share as their effect was anti-dilutive. The net loss for the three months ended December 31, 2018 was primarily due to an $814.1 million decrease in fair market value of equity securities, primarily due to the adoption of ASU 2016-01 (see Note 1 to the consolidated financial statements) and mostly consisted of holding losses on our investment in Sartorius AG. The net loss for the three months ended December 31, 2018 also included impairment losses on goodwill and long-lived assets in the amount of $292.5 million (see Note 4 to the consolidated financial statements).

Prior year amounts have been adjusted (see Note 1 to the consolidated financial statements in regard to ASU 2017-07) for pension and other postretirement benefits.

17. SUBSEQUENT EVENT

On March 4, 2019, we acquired all the issued and outstanding stock of a small commercial-stage company for approximately $20 million. We believe this acquisition will complement our offerings of life science products. The acquisition will be included in our Life Science segment's results of operations from the acquisition date and will be accounted for as a business acquisition. The amount of acquisition-related costs was minimal as Bio-Rad primarily represented itself during the acquisition process.

We are presently unable to report the purchase price allocation or the evaluation of the transaction, as more time is needed to complete the information transfer from the seller and include all information into a valuation of individual assets and liabilities.

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

Not applicable.

ITEM 9A. CONTROLS AND PROCEDURES

(a) Evaluation of Disclosure Controls and Procedures

We maintain “disclosure controls and procedures”, as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (“Exchange Act”), that are designed to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized, and reported within the time periods specified in Securities and Exchange Commission rules and forms, and that such information is accumulated and communicated to our management, including our Chief Executive Officer ("CEO") and Chief Financial Officer ("CFO"), as appropriate, to allow for timely decisions regarding required disclosure. In designing and evaluating our disclosure controls and procedures, management recognized that disclosure controls and procedures, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the disclosure controls and procedures are met. Additionally, in designing disclosure controls and procedures, our management necessarily was required to apply its judgment in evaluating the cost-benefit relationship of possible disclosure controls and procedures. The design of any disclosure controls and procedures also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions.

Subject to the limitations noted above, our management, with the participation of our CEO and CFO, has evaluated the effectiveness of the design and operation of our disclosure controls and procedures as of the end of the year covered by this Annual Report on Form 10-K. Based on that evaluation, our CEO and CFO concluded that our disclosure controls and procedures were effective to meet the objective for which they were designed and operate at the reasonable assurance level.

(b) Management’s Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting for the Company as defined in Rule 13a-15(f) or 15(d)-15(f) of the Exchange Act. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external purposes in accordance with U.S. generally accepted accounting principles, and 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 Company’s assets; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of consolidated financial statements in accordance with U.S. generally accepted accounting principles, and that our receipts and expenditures are being made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on our consolidated financial statements.

Our management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2018 using the criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). Based on this assessment and those criteria, management concluded that our internal control over financial reporting was effective as of December 31, 2018. Our internal control over financial reporting has been audited by KPMG, LLP, an independent registered public accounting firm, as stated in their report, which appears in Part II, Item 8 of this Form 10-K.

(c) Remediation of Prior Material Weakness

As previously discussed in Item 9A "Controls and Procedures" of our Annual Report for the period ended December 31, 2017, and Item 4 "Controls and Procedures" of our 2018 Form 10-Q's, management identified a material weakness in our internal control over financial reporting resulting from our ERP system conversion and European reorganization leading to the internal control deficiencies described below.

We did not maintain a sufficient complement of personnel in certain European countries with appropriate training and expertise in accounting and reporting in the new ERP system following the system conversion and European reorganization including the implementation of reporting lines, appropriate authorities and responsibilities within and between our accounting and reporting function, information technology and the business operations in these European countries.

We did not conduct continuous risk assessment over changes in our European business operations, IT systems and personnel to identify and assess necessary changes in internal control over financial reporting.

As a result, we did not design effective control activities over the accounting for financial statement amounts, including inventory and revenue, reported by entities impacted by the European reorganization, including management review controls with sufficient precision to identify and investigate potential outliers.

During the fourth quarter of 2017 and throughout 2018 management conducted a global remediation plan with a focus on employees and processes in Europe as well as changes originating from system conversions to address its material weakness. The remediation plan involved enhancing the control environment in the entities impacted by the ERP system conversion and European reorganization by (i) increasing resources with sufficient accounting and reporting expertise within our reorganized business and with expertise in using our new ERP system, (ii) enhancing and monitoring reporting lines and appropriate authorities and responsibilities within the accounting and reporting function, information technology and the business operations and (iii) providing training to our control owners to effectively perform controls in the new environment including training on reconciliation review controls and certain ERP system enhancements. Testing of the operating effectiveness of the remediated controls has demonstrated the efficacy of the enhancements in Europe.

Management enhanced its risk assessment process to continuously assess the potential impact on internal control over financial reporting of changes to business operations, including changes relating to system conversions and operations reorganizations that may occur in the future.

In addition, management designed and implemented additional control activities over financial statement amounts reported by entities impacted by the European reorganization, including inventory, revenue and cost of goods sold.

Implementation of management's remediation plans described above have strengthened our internal control over financial reporting and addressed the material weakness that was identified in 2017. Based on the effectiveness of the changes to our internal controls, management concluded that the material weakness has been remediated as of

December 31, 2018.

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(d) Changes in Internal Control over Financial Reporting

Management continuously reviews disclosure controls and procedures, and internal control over financial reporting, and accordingly may, from time to time, make changes aimed at enhancing their effectiveness to ensure that its systems evolve with its business. Other than with respect to the remediation efforts described above, there were no changes in our internal controls over financial reporting (as defined in Rules 13a-15(f) and 15(d)-15(f) under the Exchange Act) during the year ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

(e) Inherent Limitations on Effectiveness of Internal Controls

Because of its inherent limitations, our 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.

ITEM 9B. OTHER INFORMATION

None.

PART III.

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

Part of the information required to be furnished pursuant to this item is incorporated by reference from portions of Bio-Rad's definitive proxy statement to be mailed to stockholders in connection with our 2019 annual meeting of stockholders (the "2019 Proxy Statement") under "Election of Directors," "Committees of the Board of Directors" and "Section 16(a) Beneficial Ownership Reporting Compliance."

Bio-Rad's Board of Directors has determined that each of Jeffrey L. Edwards, Gregory K. Hinckley and Melinda Litherland is an "audit committee financial expert," as defined in Item 407(d)(5) of Regulation S-K. Each of Jeffrey L. Edwards, Gregory K. Hinckley and Melinda Litherland is also an "independent" director, as determined in accordance with the independence standards set forth in Rule 10A-3 under the Securities Exchange Act of 1934, as amended, and Section 303A.02 of the New York Stock Exchange (NYSE) Listed Company Manual.

We have adopted a code of business ethics and conduct that applies to our principal executive officer, principal financial officer, controller and all other employees and is available through the Corporate Governance section of our website (www.bio-rad.com). We will also provide a copy of the code of ethics to any person, without charge, upon request, by writing to us at "Bio-Rad Laboratories, Inc., Investor Relations, 1000 Alfred Nobel Drive, Hercules, CA 94547." We intend to satisfy any disclosure requirement under Item 5.05 of Form 8-K regarding an amendment to, or waiver from, a provision of the code of ethics by posting such information on the Corporate Governance section of our website (www.bio-rad.com).

ITEM 11. EXECUTIVE COMPENSATION

The information required to be furnished pursuant to this item is incorporated by reference from portions of the 2019 Proxy Statement under “Compensation Discussion and Analysis,” “Summary Compensation Table,” “Grants of Plan-Based Awards,” “Outstanding Equity Awards at Fiscal Year-End,” “Option Exercises and Stock Vested Table,” “Pension Benefits,” “Nonqualified Deferred Compensation Plans,” “Potential Payments on Termination or Change in Control,” “Director Compensation,” “Compensation Committee Interlocks and Insider Participation” and "Pay Ratio Disclosure.” In addition, the information from a portion of the 2019 Proxy Statement under “Compensation Committee Report” is incorporated herein by reference and furnished on this Form 10-K and shall not be deemed “filed” for purposes of Section 18 of the Securities and Exchange Act of 1934, nor shall it be deemed incorporated by reference in any filing under the Securities Act of 1933.

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

Part of the information required to be furnished pursuant to this item is incorporated by reference from a portion of the 2019 Proxy Statement under “Principal and Management Stockholders.”

Equity Compensation Plan Information as of December 31, 2018

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)[3]	(c)
Equity compensation plans approved by security holders [1]	848,090	$ 138.81	2,243,082 [2]
Equity compensation plans not approved by security holders	—	—	—
Total	848,090	$ 138.81	2,243,082

(1) Consists of the Bio-Rad Laboratories, Inc. 2007 Incentive Award Plan, the Bio-Rad Laboratories, Inc. 2017 Incentive Award Plan, and the Bio-Rad Laboratories, Inc. 2011 Employee Stock Purchase Plan.

(2) Consists of 1,584,834 shares available under the Bio-Rad Laboratories, Inc. 2017 Incentive Award Plan and 658,248 shares available under the Bio-Rad Laboratories, Inc. 2011 Employee Stock Purchase Plan.

(3) Excludes Restricted Stock Units.

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

The information required to be furnished pursuant to this item is incorporated by reference from portions of the 2019 Proxy Statement under “Transactions with Related Persons” and “Committees of the Board of Directors.”

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

The information required to be furnished by this item is incorporated by reference from a portion of the 2019 Proxy Statement under “Report of the Audit Committee of the Board of Directors.”

PART IV.

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a)1 Index to Financial Statements – See Item 8 of Part II of this report "Financial Statements and Supplementary Data" on page 41 for a list of financial statements.

2 Schedule II Valuation and Qualifying Accounts

All other financial statement schedules are omitted because they are not required or the required information is included in the consolidated financial statements or the notes thereto.

BIO-RAD LABORATORIES, INC.
SCHEDULE II - VALUATION AND QUALIFYING ACCOUNTS
Years Ended December 31, 2018, 2017, and 2016
(in thousands)

Allowance for doubtful accounts receivable

	Balance at Beginning of Year	Charged to Costs and Expenses	Deductions	Balance at End of Year
2018	$ 25,549	$ 11,527	$ (10,363)	$ 26,713
2017	$ 23,367	$ 11,174	$ (8,992)	$ 25,549
2016	$ 24,418	$ 3,785	$ (4,836)	$ 23,367

Valuation allowance for long-term deferred tax assets

	Balance at Beginning of Year	Additions Charged (Credited) to Income Tax Expense	Deductions	Balance at End of Year
2018	$ 66,356	$ 4,413	$ —	$70,769
2017	$ 66,403	$ (47)	$ —	$66,356
2016	$ 58,277	$ 8,126	$ —	$66,403

3. Index to Exhibits

The exhibits listed below in the accompanying Index to Exhibits are filed or incorporated by reference as part of this report.

BIO-RAD LABORATORIES, INC.
INDEX TO EXHIBITS ITEM 15(a)3

Exhibits 32.1 and 32.2 are furnished herewith and should not be deemed to be "filed under the Securities Exchange Act of 1934."

Exhibit No.	
3.1	Restated Certificate of Incorporation of Bio-Rad Laboratories, Inc. (1)
3.1.1	Certificate of Amendment to Restated Certificate of Incorporation of Bio-Rad Laboratories, Inc. (1)
3.2	Amended and Restated Bylaws of Bio-Rad Laboratories, Inc. (2)
4.1	Indenture dated as of December 9, 2010 for 4.875% Senior Notes due 2020 among Bio-Rad Laboratories, Inc., as Issuer, and Wilmington Trust FSB, as Trustee. (3)
10.1	Credit Agreement, dated as of June 20, 2014, by and among Bio-Rad Laboratories, Inc., the lenders referred to therein, JPMorgan Chase Bank, N.A., as administrative agent, Union Bank of California, N.A. and Wells Fargo Bank, N.A. as co-syndication agents, and Bank of America, N.A. and HSBC Bank USA, National Association, as co-documentation agents. (4)
10.2	Bio-Rad Laboratories, Inc. 2011 Employee Stock Purchase Plan. (5)
10.2.1	First Amendment to the Bio-Rad Laboratories, Inc. 2011 Employee Stock Purchase Plan (6)
10.3	Employees' Deferred Profit Sharing Retirement Plan (Amended and Restated effective January 1, 1997). (7)
10.4	2003 Stock Option Plan. (8)
10.4.1	Amendment to the 2003 Stock Option Plan of Bio-Rad Laboratories, Inc. (9)
10.4.2	Second Amendment to the 2003 Stock Option Plan of Bio-Rad Laboratories, Inc., dated March 1, 2012. (10)
10.5	2007 Incentive Award Plan. (11)
10.5.1	Restricted Stock Unit Award Grant Notice and Restricted Stock Unit Award Agreement under the 2007 Incentive Award Plan. (12)
10.5.2	Amendment to the Bio-Rad Laboratories, Inc. 2007 Incentive Award Plan. (13)
10.6	Bio-Rad Laboratories, Inc. 2017 Incentive Award Plan (14)
10.6.1	Global Restricted Stock Unit Award Grant Notice and Global Restricted Stock Unit Award Agreement under 2017 Incentive Award Plan (15)
10.6.2	Stock Option Grant Notice and Non-Qualified Stock Option Agreement under 2017 Incentive Award Plan (16)

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10.7 Form of Indemnification Agreement. (17)

10.8 Settlement Agreement and General Release. (18)

10.9 Non-Prosecution Agreement effective November 3, 2014 between the U.S. Department of Justice and Bio-Rad Laboratories, Inc. (19)

10.10 Securities and Exchange Commission Order effective November 3, 2014. (19)

Exhibit No.

21.1 Listing of Subsidiaries.

23.1 Consent of Independent Registered Public Accounting Firm.

31.1 Certification of Chief Executive Officer Required by Rule 13a-14(a) (17CFR 240.13a-14(a)).

31.2 Certification of Chief Financial Officer Required by Rule 13a-14(a) (17CFR 240.13a-14(a)).

32.1 Certification of Chief Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.

32.2 Certification of Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.

101.INS The instance document does not appear in the interactive data file because its XBRL tags are embedded within the inline XBRL document.
101.SCH XBRL Taxonomy Extension Schema Document
101.CAL XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF XBRL Taxonomy Extension Definition Linkbase Document
101.LAB XBRL Taxonomy Extension Labels Linkbase Document
101.PRE XBRL Taxonomy Extension Presentation Linkbase Document

(1) Incorporated by reference to the Exhibits to Bio-Rad's Form 10-K filing for the fiscal year ended December 31, 2010.

(2) Incorporated by reference to Exhibit 3.1 to Bio-Rad's Form 8-K filing, dated October 27, 2017.

(3) Incorporated by reference to Exhibit 4.1 to Bio-Rad's Form 8-K filing, dated December 9, 2010.

(4) Incorporated by reference to the Exhibits to Bio-Rad's 8-K filing, dated June 26, 2014.

(5) Incorporated by reference to Exhibit 10.9 to Bio-Rad's June 30, 2011 Form 10-Q filing, dated August 4, 2011.

(6) Incorporated by reference to Exhibit 10.2 to Bio-Rad's Form 10-Q filing, dated May 9, 2017

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(7) Incorporated by reference to Exhibit 10.6 to Bio-Rad's September 30, 1997 Form 10-Q filing, dated November 13, 1997.

(8) Incorporated by reference to Exhibit 10.7 to Bio-Rad's March 31, 2003 Form 10-Q filing, dated May 13, 2003.

(9) Incorporated by reference to Exhibit 10.7.1 to Bio-Rad's March 31, 2007 Form 10-Q filing, dated May 4, 2007.

(10) Incorporated by reference to Exhibit 10.1 to Bio-Rad's June 30, 2012 Form 10-Q filing, dated August 9, 2012.

(11) Incorporated by reference to Exhibit 4.1 to Bio-Rad's Form S-8 filing, dated July 30, 2007.

(12) Incorporated by reference to Exhibit 10.8.1 to Bio-Rad's September 30, 2009 Form 10-Q filing, dated November 4, 2009.

(13) Incorporated by reference to Exhibit 10.1 to Bio-Rad's March 31, 2014 Form 10-Q filing, dated May 8, 2014.

(14) Incorporated by reference to Exhibit 10.1 to Bio-Rad's Form 10-Q filing, dated May 9, 2017

(15) Incorporated by reference to Exhibit 10.1 to Bio-Rad's Form 10-Q filing, dated November 9, 2017

(16) Incorporated by reference to Exhibit 10.2 to Bio-Rad's Form 10-Q filing, dated November 9, 2017

(17) Incorporated by reference to Exhibit 10.1 to Bio-Rad's Form 10-Q filing, dated August 7, 2017.

(18) Incorporated by reference to Exhibit 10.1 to Bio-Rad's Form 10-Q filing, dated November 7, 2014.

(19) Incorporated by reference to the Exhibits to Bio-Rad's Form 10-K filing for the fiscal year ended December 31, 2014.

Item 16. FORM 10-K SUMMARY

Not applicable.

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.

BIO-RAD LABORATORIES, INC.

By: /s/ Christine A. Tsingos
Christine A. Tsingos
Executive Vice President, Chief Financial Officer

Date: March 29, 2019

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.

Principal Executive Officer:		
/s/ Norman Schwartz (Norman Schwartz)	Chairman of the Board, President and Chief Executive Officer	March 29, 2019
Principal Financial Officer:		
/s/ Christine A. Tsingos (Christine A. Tsingos)	Executive Vice President, Chief Financial Officer	March 29, 2019
Principal Accounting Officer:		
/s/ James R. Stark (James R. Stark)	Vice President, Corporate Controller	March 29, 2019
Other Directors:		
/s/ Jeffrey L. Edwards (Jeffrey L. Edwards)	Director	March 29, 2019
/s/ Gregory K. Hinckley (Gregory K. Hinckley)	Director	March 29, 2019
/s/ Melinda Litherland (Melinda Litherland)	Director	March 29, 2019
/s/ Arnold A. Pinkston (Arnold A. Pinkston)	Director	March 29, 2019
/s/ Alice N. Schwartz (Alice N. Schwartz)	Director	March 29, 2019