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, 2019 and 2018, 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, 2019, 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, 2019 and 2018, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2019, 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, 2019, 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 February 28, 2020 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 leases effective January 1, 2019 due to the adoption of Accounting Standard Update (ASU) 2016-02, *Leases*, and related accounting standard updates.

Also as discussed in Note 1 to the consolidated financial statements, the Company has changed its method of accounting for revenue recognition effective January 1, 2018, due to the adoption of Accounting Standards Codification (ASC) 606, *Revenue from Contracts with Customers.*

Also as discussed in Note 1 to the consolidated financial statements, the Company changed its method of accounting for equity instruments effective January 1, 2018 due to the adoption of ASU 2016-01, *Recognition and Measurement of Financial Assets and Financial Liabilities* and ASU 2018-03, *Technical Corrections and Improvements to Financial Instruments - 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.

Critical Audit Matter

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

Assessment of Lease Term for Reagent Rental Arrangements

As discussed in Note 1 to the consolidated financial statements, the Company earns revenue from reagent rental agreements with its customers. Each agreement generally includes lease elements subject to the lease accounting standards and non-lease elements subject to the revenue accounting standards. The classification of the lease component as an operating or sales-type lease can impact the timing of revenue recognition and cost attributable to the underlying lease elements. While most reagent rental arrangements contain an option for a lessee to extend and the option for the lessee to cancel or both, the period in which the contract is enforceable is generally short, and the lease term has been limited to the noncancellable period. The revenue allocated to the reagent rental lease elements is approximately 3% of total revenue and it is included as part of Net Sales in the Consolidated Statement of Income.

We identified the assessment of the lease term for the reagent rental agreements, including the impact from any associated contractual termination penalties, as a critical audit matter. The Company’s determination of lease classification as operating or sales-type lease is primarily dependent on the initial determination of the lease term. The Company’s process is based on the manual examination of a high volume of agreements that are negotiated individually across the world with diverse terms. Testing the determination of the lease term, including consideration of contractual termination penalties, required a high degree of auditor judgment to design and execute the audit procedures.

The primary procedures we performed to address the critical audit matter included the following. We tested certain internal controls over the Company’s process for determining the lease term, including consideration of contractual termination penalties. We assessed the Company’s policies for determining that the lease term of its reagent rental arrangements were in accordance with U.S generally accepted accounting principles. Additionally, for a selection of reagent rental agreements, we read the underlying contract, and compared relevant terms within the contract to the Company’s determination of lease term analysis.

/s/ KPMG LLP

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

Santa Clara, California
February 28, 2020

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, 2019, 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, 2019, 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, 2019 and 2018, 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, 2019, and the related notes and financial statement schedule (collectively, the consolidated financial statements), and our report dated February 28, 2020 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
February 28, 2020

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

	December 31, 2019	December 31, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 660,672	$ 431,526
Short-term investments	453,973	413,270
Restricted investments	5,560	5,560
Accounts receivable, less allowance for doubtful accounts of $20,205 at 2019 and $26,713 at 2018	392,672	392,443
Inventories:		
Raw materials	109,570	108,008
Work in process	146,131	145,051
Finished goods	298,306	330,756
Total inventories	554,007	583,815
Prepaid expenses	102,331	187,249
Other current assets	10,940	9,615
Total current assets	2,180,155	2,023,478
Property, plant and equipment:		
Land and improvements	25,215	25,185
Buildings and leasehold improvements	341,598	331,563
Equipment	1,015,359	970,081
Total property, plant and equipment	1,382,172	1,326,829
Less: accumulated depreciation and amortization	(882,833)	(818,139)
Property, plant and equipment, net	499,339	508,690
Operating lease right-of-use assets	201,868	—
Goodwill, net	264,131	219,770
Purchased intangibles, net	145,525	133,123
Other investments	4,638,205	2,655,709
Other assets	79,636	70,298
Total assets	$ 8,008,859	$ 5,611,068

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, 2019	December 31, 2018
LIABILITIES AND STOCKHOLDERS’ EQUITY		
Current liabilities:		
Accounts payable	$ 107,014	$ 122,450
Accrued payroll and employee benefits	180,084	143,510
Current maturities of long-term debt	426,172	493
Income taxes payable	8,763	27,513
Other taxes payable	27,522	28,675
Current operating lease liabilities	35,365	—
Deferred revenue	33,735	26,936
Other current liabilities	86,840	101,218
Total current liabilities	905,495	450,795
Long-term debt, net of current maturities	13,579	438,937
Deferred income taxes	997,787	553,239
Operating lease liabilities	176,018	—
Other long-term liabilities	160,923	147,766
Total liabilities	2,253,802	1,590,737
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 - 24,966,035 and 24,884,265 at 2019 and 2018, respectively; shares outstanding - 24,835,804 and 24,704,772 at 2019 and 2018, respectively	2	2
Class B common stock, $0.0001 par value; 20,000,000 shares authorized; shares issued - 5,089,532 and 5,096,421 at 2019 and 2018, respectively; shares outstanding - 5,089,532 and 5,095,504 at 2019 and 2018, respectively	1	1
Additional paid-in capital	410,020	394,342
Class A treasury stock at cost, 130,231 shares at 2019 and 179,493 shares at 2018	(38,397)	(49,040)
Class B treasury stock at cost, 0 shares at 2019 and 917 shares at 2018	—	(89)
Retained earnings	5,470,779	3,722,073
Accumulated other comprehensive loss	(87,348)	(46,958)
Total stockholders’ equity	5,755,057	4,020,331
Total liabilities and stockholders’ equity	$ 8,008,859	$ 5,611,068

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,		
	2019	2018	2017
Net sales	$ 2,311,659	$ 2,289,415	$ 2,160,153
Cost of goods sold	1,054,663	1,066,264	972,450
Gross profit	1,256,996	1,223,151	1,187,703
Selling, general and administrative expense	824,625	834,783	806,790
Research and development expense	202,710	199,196	250,157
Impairment losses on goodwill and long-lived assets	—	292,513	11,506
Income (loss) from operations	229,661	(103,341)	119,250
Interest expense	23,416	23,962	23,014
Foreign currency exchange losses, net	2,245	2,861	9,128
Change in fair market value of equity securities	(2,030,987)	(606,230)	—
Other (income) expense, net	(26,094)	(36,593)	(10,697)
Income before income taxes	2,261,081	512,659	97,805
(Provision for) benefit from income taxes	(502,406)	(147,045)	24,444
Net income	$ 1,758,675	$ 365,614	$ 122,249
Basic earnings per share:			
Net income per basic share	$ 58.93	$ 12.25	$ 4.12
Weighted average common shares - basic	29,843	29,836	29,655
Diluted earnings per share:			
Net income per diluted share	$ 58.27	$ 12.10	$ 4.07
Weighted average common shares - diluted	30,184	30,228	30,034

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,		
	2019	2018	2017
Net income	$ 1,758,675	$ 365,614	$ 122,249
Other comprehensive (loss) income:			
Foreign currency translation adjustments	(36,953)	(112,857)	76,050
Foreign other post-employment benefits adjustments, net of income taxes	(7,363)	7,549	(3,767)
Net unrealized holding gains (losses) on available-for-sale (AFS) investments, net of income taxes and effect of adoption of ASU 2018-02*	3,926	(1,187)	248,745
Other comprehensive (loss) income, net of income taxes	(40,390)	(106,495)	321,028
Comprehensive income	$ 1,718,285	$ 259,119	$ 443,277

*ASU 2018-02, "Reclassification of Certain Tax effects from Accumulated Other Comprehensive Income," as disclosed in our December 31, 2017 Form 10-K

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, 2019	2018	2017
Cash flows from operating activities:			
Cash received from customers	$ 2,311,925	$ 2,326,310	$ 2,093,948
Cash paid to suppliers and employees	(1,818,575)	(1,989,685)	(1,916,119)
Interest paid, net	(22,330)	(22,703)	(22,224)
Income tax payments, net	(45,081)	(62,414)	(52,136)
Investment proceeds and miscellaneous receipts, net	31,673	26,383	18,392
Proceeds from (payments for) forward foreign exchange contracts, net	285	7,603	(17,724)
Net cash provided by operating activities	457,897	285,494	104,137
Cash flows from investing activities:			
Capital expenditures	(98,532)	(129,825)	(111,332)
Proceeds from dispositions of property, plant and equipment	129	4,315	86
Proceeds from divestiture of a product line	—	6,964	—
(Payments for) proceeds from acquisitions and long-term investment	(79,386)	266	(76,645)
Recovery of (payments for) purchases of intangible assets	8,818	(3)	(3,795)
Payments for purchases of restricted investment	—	—	(1,000)
Payments for purchases of marketable securities and investments	(371,450)	(371,019)	(282,656)
Proceeds from sales of marketable securities and investments	104,632	77,029	97,523
Proceeds from maturities of marketable securities and investments	226,900	225,295	202,247
Net cash used in investing activities	(208,889)	(186,978)	(175,572)
Cash flows from financing activities:			
Net payments on line-of-credit arrangements and notes payable	—	—	(36)
Payments on long-term borrowings	(643)	(2,961)	(316)
Payments for credit agreement renewal fees	(486)	—	—
Proceeds from issuances of common stock for share-based compensation	13,113	14,133	14,604
Tax payments from net share settlement	(8,096)	(8,862)	(7,310)
Proceeds from reissuances of treasury stock for shared-based compensation, net	3,831	—	—
Payments for purchases of treasury stock	(28,000)	(48,912)	(2,920)
Payments of contingent consideration	(2,477)	(2,078)	(3,681)
Net cash (used in) provided by financing activities	(22,758)	(48,680)	341
Effect of foreign exchange rate changes on cash	2,237	(655)	(1,094)
Net increase (decrease) in cash, cash equivalents and restricted cash	228,487	49,181	(72,188)
Cash, cash equivalents and restricted cash at beginning of year	434,164	384,983	457,171
Cash, cash equivalents and restricted cash at end of year	$ 662,651	$ 434,164	$ 384,983

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, 2019	2018	2017
Cash and cash equivalents	$660,672	$431,526	$383,824
Restricted cash included in Other current assets	93	111	882
Restricted cash included in Other assets	1,886	2,527	277
Total cash, cash equivalents, and restricted cash shown in the Consolidated Statements of Cash Flows	$662,651	$434,164	$384,983

These restricted cash items are primarily related to performance guarantees.
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, 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)
Reissuance 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
Net income	—	—	—	1,758,675	—	1,758,675
Other comprehensive loss, net of tax	—	—	—	—	(40,390)	(40,390)
Issuance of common stock	—	5,017	—	—	—	5,017
Stock compensation expense	—	35,593	—	—	—	35,593
Purchase of treasury stock	—	—	(28,000)	—	—	(28,000)
Reissuance of treasury stock	—	(24,932)	38,732	(9,969)	—	3,831
Balance at December 31, 2019	$ 3	$ 410,020	$ (38,397)	$ 5,470,779	$ (87,348)	$ 5,755,057

* ASU 2016-09, "Improvements to Employee Shared-Based Payment Accounting," as disclosed in our December 31, 2017 Form 10-K

** ASU 2018-02,"Reclassification of Certain Tax effects from Accumulated Other Comprehensive Income," as disclosed in our December 31, 2017 Form 10-K

*** ASU 2016-01, "Recognition and Measurement of Financial Assets and Financial Liabilities, and ASU 2018-03, "Technical Corrections and Improvements to Financial Instruments - Recognition and Measurement of Financial Assets and Financial Liabilities," as disclosed in our December 31, 2018 Form 10-K

**** ASU 2016-16, "Intra-Entity Transfers of Assets Other Than Inventory," as disclosed in our December 31, 2018 Form 10-K

***** See Note 1, "Significant Accounting Policies" under "Revenue Recognition"

The accompanying notes are an integral part of these 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, 2019 and 2018 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, "Recognition and Measurement of Financial Assets and Financial Liabilities." 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).

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, 10-39 years or the term of the leases or life of the improvements, whichever is shorter; reagent rental equipment, 1-5 years; and equipment, 3-12 years.

Leases

We determine if an arrangement is a lease at inception. Operating leases are included in Operating lease right-of-use ("ROU") assets, Current operating lease liabilities, and Operating lease liabilities in our Consolidated Balance Sheet as of December 31, 2019. Finance leases are included in Property, plant and equipment, Current maturities of long-term debt, and Long-term debt, net of current maturities in our Consolidated Balance Sheet as of December 31, 2019.

ROU assets represent our right to use an underlying asset for the lease term and lease liabilities represent our obligation to make lease payments arising from the lease. Operating lease ROU assets and liabilities are recognized at the commencement date based on the present value of lease payments over the lease term. As our leases do not provide an implicit rate, we use our incremental borrowing rate based on the information available at the commencement date in determining the present value of lease payments. The operating lease ROU asset also includes any lease payments made and excludes lease incentives. Our lease terms may include options to extend or terminate the lease. For purposes of determining the lease term used in the measurement of operating lease ROU assets and operating lease liabilities, we include the noncancellable period of the lease together with those periods covered by the option to extend the lease if we are reasonably certain to exercise that option, the periods covered by an option to terminate the lease if we are reasonably certain not to exercise that option, and the periods covered by the option to extend (or to not terminate) the lease in which exercise of the option is controlled by the lessor. Lease expense for lease payments is recognized on a straight-line basis over the lease term. Where we act as lessee, we elected not to separate lease and non-lease components.

Where we act as lessor in our reagent rental arrangements, we allocate the consideration in the contract to the separate lease components and non-lease components. After allocation, the amount of variable payments allocated to lease components will be recognized as income under the lease accounting standard ASC 842, 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 below under the caption "Reagent Rental Agreements."

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.

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.

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 and operating lease right-of-use 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 net operating losses, tax 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 such temporary 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. 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 Tax Act made broad and complex changes to the U.S. tax code, 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. In 2017, we 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. We completed our accounting for the Tax Act under Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (“SAB 118”) in 2018, which resulted in an additional income tax benefit of $49 million.

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. 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.

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 by the estimated amount of product returns.

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. 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 initially determine if a reagent rental arrangement contains a lease at lease commencement. Where we have determined that such an arrangement contains a lease, we next must ascertain its lease classification for purposes of applying appropriate accounting treatment as an operating, sales-type or direct financing lease. In addition, for purposes of determining the lease term used in performing the lease classification test, we include the noncancellable period of the lease together with those periods covered by the option to extend the lease if the customer is reasonably certain to exercise that option, the periods covered by an option to terminate the lease if the customer is reasonably certain not to exercise that option, and the periods covered by the option to extend (or not to terminate) the lease in which exercise of the option is controlled by the company. While most of our reagent rental arrangements contain either the option for a lessee to extend and/or cancel, the period in which the contract is enforceable is a very short period and therefore the lease term has been limited to the noncancellable period. Furthermore, it has historically been very rare for these arrangements to contain an option for the lessee to purchase the underlying asset.

As discussed further above under the caption “Leases” and below under the caption “Recent Accounting Pronouncements Adopted,” as well as in Note 16, Leases, we adopted ASC 842, “Leases,” on a modified retrospective basis effective January 1, 2019 with practical expedients, and did not restate comparative prior periods. We concluded that the use of the instrument (referred to as “lease elements”) is not within the guidance of ASC 606 but rather ASC 842. 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 consideration of any fixed/minimum payments as well as estimates of variable consideration. After allocation, the amount of variable payments allocated to lease components will be recognized as income under ASC 842, while the amount of variable payments allocated to non-lease components will be recognized as income in accordance with ASC 606.

Upon our adoption of ASC 842 in 2019, the maintenance services, along with the reagents, are now allocated to the non-lease elements and will be recognized as income in accordance with ASC 606. This change is in alignment with the requirements of ASC 842, and has resulted in a decrease in the amount of rental income and a corresponding increase in the amount of maintenance service revenue that is included in total reported Net sales in our consolidated income statements. Generally, the terms of the arrangements result in the transfer of control on reagents upon either (i) when the consumables are delivered or (ii) when the consumables are consumed by the customer.

Historically, our reagent rental arrangements have been predominantly comprised of variable lease payments that fluctuate depending on the volume of reagents purchased, as very few of such arrangements contain any fixed/minimum lease payments. As a result, our lease income is heavily variable in nature. Further, our reagent rental arrangements are predominantly classified as operating leases, and any sales-type leases represent in aggregate a very insignificant amount of lease income. Hence, our reported lease income is primarily variable in nature and is recognized as the reagents are consumed by the customer or delivered.

Revenue allocated to the lease elements of these reagent rental arrangements represents approximately 3% and 5% of total revenue for 2019 and 2018, respectively, and is 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 $37.3 million at December 31, 2018 to $45.8 million at December 31, 2019 was primarily driven by $33.1 million, net, of cash payments received or due in advance of satisfying our performance obligations, partially offset by $24.6 million of revenue recognized that were included in our deferred revenue balance as of December 31, 2018.

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):

	2019	2018
January 1	$ 10.1	$ 18.7
Provision for warranty	9.9	25.5
Actual warranty costs	(11.0)	(34.1)
December 31	$ 9.0	$ 10.1

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 780 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.

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 over the requisite service period of the award, which is generally the vesting term of the share-based payment awards. Forfeitures are recognized as they occur. 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,		
	2019	2018	2017
Basic weighted average shares outstanding	29,843	29,836	29,655
Effect of potentially dilutive stock options			
and restricted stock awards	341	392	379
Diluted weighted average common shares	30,184	30,228	30,034
Anti-dilutive stock options and restricted stock awards			
excluded from the computation of diluted EPS	98	84	13

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 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 prospectively adopted ASU 2018-15 effective January 1, 2019. As of December 31, 2019, we capitalized $3.1 million of implementation costs for cloud computing arrangements, net of accumulated amortization, primarily for business analytics software. These costs were recorded in Other current assets and Other assets in the Consolidated Balance Sheet.

In August 2018, the SEC issued Final Rule Release No. 33-10532, "Disclosure Update and Simplification" that extends to interim periods the annual disclosure requirement of presenting the changes in stockholders' equity, which was effective in the first quarter of 2019.

In February 2016, the FASB issued ASU 2016-02, "Leases," and related accounting standard updates, which requires, among other items, lease accounting to recognize most leases as assets and liabilities on the balance sheet. Qualitative and quantitative disclosures are enhanced to better understand the amount, timing and uncertainty of cash flows arising from leases. We adopted ASU 2016-02 on a modified retrospective basis effective January 1, 2019 with practical expedients, and did not restate comparative prior periods. The practical expedients elected in transition included, among other items, for leases that existed prior to January 1, 2019, not reassessing whether any contracts are or contain embedded leases, not reassessing the classification of existing leases, and not reassessing whether previously capitalized initial direct costs qualify for capitalization. Where we act as a lessee, the adoption of the standard resulted in material additions to the balance sheet for right-of-use assets and the associated liabilities. See Note 16, Leases. Where we act as a lessee, we also elected not to separate lease and non-lease components. Where we act as a lessor in reagent rental arrangements, there was an insignificant impact to our Consolidated Financial Statements, which is more fully described above under the caption "Reagent Rental Agreements."

Recent Accounting Pronouncements to be Adopted

In January 2020, the FASB issued ASU 2020-01, Clarifying the Interactions between Topic 321 Investments—Equity Securities, Topic 323 Investments—Equity Method and Joint Ventures, and Topic 815 Derivatives and Hedging. ASU 2020-01 clarifies that a company should consider observable transactions that require a company to either apply or discontinue the equity method of accounting under Topic 323 for the purposes of applying the measurement alternative in accordance with Topic 321 immediately before applying or upon discontinuing the equity method. ASU 2020-01 also clarifies that, when determining the accounting for certain forward contracts and purchased options a company should not consider, whether upon settlement or exercise, if the underlying securities would be accounted for under the equity method or fair value option. ASU 2020-01 is effective January 1, 2021 and early adoption is permitted at the beginning of any interim period on a prospective basis. We are currently evaluating the effect of ASU 2020-01 and the consideration of early adoption.

In December 2019, the FASB issued ASU 2019-12, "Simplifying the Accounting for Income Taxes," which eliminates certain exceptions within ASC 740, Income Taxes, and clarifies other aspects of the current guidance to promote consistency among reporting entities. ASU 2019-12 is effective for fiscal years beginning after December 15, 2020 and early adoption is permitted in any interim or annual period, with any adjustments reflected as of the beginning of the fiscal year of adoption. We are currently evaluating the effect of adopting this pronouncement on our financial statements and disclosures.

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.

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. We are currently evaluating the disclosures 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. We do not expect ASU 2018-13 to have a material impact to our fair value disclosures.

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. 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, however due to the generally short duration of our customers' trade receivables, we do not expect ASU 2016-13 to have a material impact.

2. ACQUISITIONS

In October 2019, we acquired all the issued and outstanding shares of a foreign distributor for approximately $4.2 million, which included cash payments at closing, net of closing cash, of $3.6 million, and $0.6 million in contingent consideration potentially payable to the sellers. In addition, we recorded a net gain of $0.4 million for the settlement of preexisting conditions concurrent with the acquisition that was recorded in Selling, general and administrative expense. The acquisition was included in our Clinical Diagnostics 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. Proforma financial statements are not provided as the acquisition is immaterial to Bio-Rad taken as a whole for the periods presented.

As of December 31, 2019, the preliminary allocation of the payments was $3.4 million to customer relationships; a definite-lived intangible, $0.2 million to deferred tax asset, $0.8 million to deferred tax liability related to the purchased intangible and $1.4 million to acquired net assets.

In August 2019, we acquired all the issued and outstanding membership interests of Exact Diagnostics, LLC for approximately $60.0 million. Cash payments at closing, net of closing cash, were $59.7 million. The acquisition was included in our Clinical Diagnostics 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 deductible for income tax purposes. Proforma financial statements are not provided as the acquisition is immaterial to Bio-Rad taken as a whole for the periods presented.

The final allocation of the payments was $26.8 million to purchased intangibles consisting primarily of customer relationships, developed product technology and tradenames, $4.2 million to acquired net assets, and $28.7 million to goodwill.

We believe that the acquisition will accelerate market penetration in the areas of quality controls and assay verification panels in our Clinical Diagnostics operations.

In March 2019, we completed the acquisition of all the issued and outstanding stock of a small U.S. private company for approximately $20.0 million. Cash payments, net of closing cash, consisted of $4.0 million paid in November 2018 and the remaining $16.0 million paid in March 2019. 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 of the payments was $15.6 million to goodwill that included workforce and time-to-market advantage, $5.5 million to definite-lived intangibles, $0.2 million to in-process research and development, an indefinite-lived intangible asset, and a deferred tax liability of $1.3 million related to the purchased intangibles.

We believe that the acquisition will expand our reagents suite of offerings in our Life Science operations.

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, 2019 are classified in the hierarchy as follows (in millions):

	Level 1	Level 2	Level 3	Total
Financial assets carried at fair value:				
Cash equivalents:				
Commercial paper	$ —	$ 42.9	$ —	$ 42.9
Time deposits	31.2	10.0	—	41.2
Asset-backed securities	—	0.1	—	0.1
Money market funds	69.9	—	—	69.9
Total cash equivalents (a)	101.1	53.0	—	154.1
Restricted investment	5.6	—	—	5.6
Equity Securities (b)	4,664.4	—	—	4,664.4
Available-for-sale investments:				
Corporate debt securities	—	204.5	—	204.5
U.S. government sponsored agencies	—	106.1	—	106.1
Foreign government obligations	—	4.7	—	4.7
Other foreign obligations	—	3.1	—	3.1
Municipal obligations	—	11.6	—	11.6
Asset-backed securities	—	72.9	—	72.9
Total available-for-sale investments (c)	—	402.9	—	402.9
Forward foreign exchange contracts (d)	—	0.9	—	0.9
Total financial assets carried at fair value	$ 4,771.1	$ 456.8	$ —	$ 5,227.9
Financial liabilities carried at fair value:				
Forward foreign exchange contracts (e)	$ —	$ 1.0	$ —	$ 1.0
Contingent consideration (f)	—	—	4.9	4.9
Total financial liabilities carried at fair value	$ —	$ 1.0	$ 4.9	$ 5.9

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:				
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 (a)	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

(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, 2019	December 31, 2018
Short-term investments	$ 51.0	$ 40.2
Other investments	4,613.4	2,632.7
Total	$ 4,664.4	$ 2,672.9

The year-to-date unrealized gains on our equity securities still held as of December 31, 2019 were $2,031.1 million and were primarily due to our investment in Sartorius AG and are recorded in our Consolidated Statements of Income.

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

	December 31, 2019	December 31, 2018
Short-term investments	$ 402.8	$ 373.0
Other investments	0.1	0.2
Total	$ 402.9	$ 373.2

(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, 2019	December 31, 2018
Other current liabilities	$ 3.3	$ 3.2
Other long-term liabilities	1.6	5.2
Total	$ 4.9	$ 8.4

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 Labs. 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 2019, we paid $1.4 million and $1.1 million, respectively, per the purchase agreement. Since 2016 we have had a net decrease in the cumulative valuation of the sales milestones of $13.9 million. The contingent consideration was accrued at its estimated fair value of $4.3 million as of December 31, 2019.

During the fourth quarter of 2019, we recognized a contingent consideration liability for earn-out targets related to our acquisition of a foreign distributor. The first earn-out payment of $0.7 million was paid by the acquisition date and the remaining payment is due in the second quarter of 2020. The maximum earn-out payment due is $1.4 million. The contingent consideration was accrued at its estimated fair value of $0.6 million as of December 31, 2019.

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

December 31, 2018	$ 8.4
Analytical flow cytometer platform:	
Payment of sales milestone	(2.5)
Net decrease in estimated fair value of contingent consideration included in Selling, general and administrative expense	(1.6)
Foreign distributor earn-outs:	
Acquisition of foreign distributor	$ 0.6
December 31, 2019	$ 4.9

The following table provides quantitative information about Level 3 inputs for fair value measurement of our analytical flow cytometer platform contingent consideration liability as of December 31, 2019. 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	11.1%
		Cost of debt	3.9%

To estimate the fair value of Level 2 debt securities, our primary pricing provider used Reuters as of December 31, 2019 and Securities Evaluations as of December 31, 2018 as the primary pricing sources. Our pricing process allowed us to select a hierarchy of pricing sources for securities held. If Reuters or Securities Evaluations did not price a Level 2 security that we held, then the pricing provider utilized our custodian supplied pricing as the secondary pricing source.

For all commercial paper as of December 31, 2019, our primary pricing provider used its leading pricing source in the hierarchy to determine pricing.

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

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

	December 31, 2019			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value
Short-term investments:				
Corporate debt securities	$ 203.2	$ 1.4	$ (0.1)	$ 204.5
Municipal obligations	11.5	0.1	—	11.6
Asset-backed securities	72.7	0.2	(0.1)	72.8
U.S. government sponsored agencies	105.6	0.7	(0.2)	106.1
Foreign government obligations	4.7	—	—	4.7
Other foreign obligations	3.1	—	—	3.1
	400.8	2.4	(0.4)	402.8
Long-term investments:				
Asset-backed securities	0.1	—	—	0.1
	0.1	—	—	0.1
Total	$ 400.9	$ 2.4	$ (0.4)	$ 402.9

The following is a summary of the amortized cost and estimated fair value of our debt securities at December 31, 2019 by contractual maturity date (in millions):

	Amortized Cost	Estimated Fair Value
Mature in less than one year	$ 174.5	$ 174.6
Mature in one to five years	164.2	165.2
Mature in more than five years	62.2	63.1
Total	$ 400.9	$ 402.9

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 investments with gross unrealized losses and the associated fair value (in millions):

	December 31, 2019	December 31, 2018
Fair value of investments in a loss position 12 months or more	$ 19.9	$ 117.9
Fair value of investments in a loss position less than 12 months	$ 97.8	$ 193.0
Gross unrealized losses for investments in a loss position 12 months or more	$ 0.1	$ 1.8
Gross unrealized losses for investments in a loss position less than 12 months	$ 0.3	$ 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, 2019 or at December 31, 2018.

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, 2019 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, 2019
Contracts maturing in January through March 2020 to sell foreign currency:	
Notional value	$ 52.0
Unrealized gain	$ 0.3
Contracts maturing in January through March 2020 to purchase foreign currency:	
Notional value	$ 269.1
Unrealized loss	$ (0.3)

The estimated fair value of our current maturities of long-term debt, excluding leases, as of December 31, 2019 and long-term-debt, excluding all lease and current maturities, as of December 31, 2018 that is not recognized at fair value in the Consolidated Balance Sheets has an estimated fair value based on quoted market prices for the same or similar issues.

The estimated fair value of our debt 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, 2019			December 31, 2018		
	Carrying Amount	Estimated Fair Value	Fair Value Hierarchy Level	Carrying Amount	Estimated Fair Value	Fair Value Hierarchy Level
Total current maturities long-term debt, excluding leases	$ 424.4	$ 435.5	2	$ —	$ —	2
Total long-term debt, excluding leases and current maturities	$ —	$ —	2	$ 423.7	$ 435.8	2

Included in Other Investments in the Consolidated Balance Sheet are investments without readily determinable fair value measured at cost with adjustments for observable price changes in price or impairments. The carrying value of these investments was $0.3 million and $0.6 million as of December 31, 2019 and December 31, 2018, respectively.

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, 2019. 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, 2019, 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.

4. GOODWILL AND OTHER PURCHASED INTANGIBLE ASSETS

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

	2019			2018		
	Life Science	Clinical Diagnostics	Total	Life Science	Clinical Diagnostics	Total
Balances as of January 1:						
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
Acquisitions	15.6	28.7	44.3	—	—	—
Divestiture	—	—	—	—	(1.4)	(1.4)
Impairment	—	—	—	(5.9)	(276.1)	(282.0)
Currency fluctuations	—	—	—	(0.2)	(2.7)	(2.9)
Balances as of December 31:						
Goodwill	250.1	349.2	599.3	234.5	320.5	555.0
Accumulated impairment losses and write-offs	(41.8)	(293.4)	(335.2)	(41.8)	(293.4)	(335.2)
Goodwill, net	$ 208.3	$ 55.8	$ 264.1	$ 192.7	$ 27.1	$ 219.8

In conjunction with the purchase of all the issued and outstanding shares of a foreign distributor in October 2019 (see Note 2, "Acquisitions"), we recorded $3.4 million of Customer relationships, a definite-lived intangible assets.

In conjunction with the purchase of all the issued and outstanding membership interests of Exact Diagnostics, LLC in August 2019 (see Note 2, "Acquisitions"), we recorded $28.7 million of goodwill and $26.8 million of definite-lived intangible assets: $16.1 million of Customer relationships, $8.1 million of Developed product technology, $2.5 million of Tradenames and $0.1 million of Backlog.

In conjunction with the purchase of all the issued and outstanding stock of a small U.S. private company in March 2019 (see Note 2, "Acquisitions"), we recorded $15.6 million of goodwill that included workforce and time-to-market advantage, $5.5 million of Developed product technology, a definite-lived intangible asset, and $0.2 million of In-process research and development, an indefinite-lived intangible asset.

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 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.

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

Information regarding our identifiable purchased intangible assets with definite and indefinite lives is as follows (in millions):

	December 31, 2019			
	Weighted-Average Amortization Period (years)	Purchase Price	Accumulated Amortization	Net Carrying Amount
Customer relationships/lists	6.36	$ 107.2	$ (74.3)	$ 32.9
Know how	5.71	188.5	(162.6)	25.9
Developed product technology	8.31	144.2	(93.9)	50.3
Licenses	8.74	76.0	(44.4)	31.6
Tradenames	8.50	6.4	(3.6)	2.8
Covenants not to compete	6.01	3.2	(1.4)	1.8
Other	—	0.1	(0.1)	—
Total definite-lived intangible assets		525.6	(380.3)	145.3
In-process research and development		0.2	—	0.2
Total purchased intangible assets		$ 525.8	$ (380.3)	$ 145.5

	December 31, 2018			
	Weighted-Average Amortization Period (years)	Purchase Price	Accumulated Amortization	Net Carrying Amount
Customer relationships/lists	3.98	$ 88.7	$ (68.3)	$ 20.4
Know how	6.64	190.6	(159.8)	30.8
Developed product technology	8.34	130.4	(86.6)	43.8
Licenses	9.72	76.3	(40.9)	35.4
Tradenames	3.42	3.9	(3.3)	0.6
Covenants not to compete	7.01	3.2	(1.1)	2.1
Total definite-lived intangible assets		$ 493.1	$ (360.0)	$ 133.1

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, 2019, 2018 and 2017 was $23.5 million, $28.3 million and $30.8 million, respectively. Estimated future amortization expense (based on existing purchased intangible assets) for the years ending December 31, 2020, 2021, 2022, 2023, 2024 and thereafter is $23.5 million, $22.8 million, $19.6 million, $18.7 million, $16.6 million, and $44.1 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 $207.5 million available for borrowing and usage as of December 31, 2019, which was reduced by $4.2 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, 2019	December 31, 2018
4.875% Senior Notes due 2020, net of discount	$ 425.0	$ 425.0
Less unamortized discount and debt issuance costs	(0.6)	(1.3)
Long-term debt less unamortized discount and debt issuance costs	424.4	423.7
Finance leases and other debt	15.4	—
Capital leases and other debt	—	15.7
	439.8	439.4
Less current maturities	(426.2)	(0.5)
Long-term debt	$ 13.6	$ 438.9

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, 2019. 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 April 2019, 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, 2019; however, $0.2 million was utilized for domestic standby letters of credit that reduced our borrowing availability as of December 31, 2019. The Credit Agreement matures in April 2024. If we had borrowed against our Credit Agreement, the borrowing rate would have been 3.035% at December 31, 2019.

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, 2019.

Maturities of long-term debt at December 31, 2019 were as follows: 2020 - $426.8 million; 2021 - $1.6 million; 2022 - $1.5 million; 2023 - $0.4 million; 2024 - $0.4 million; and thereafter - $9.7 million.

6. INCOME TAXES

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

	Year Ended December 31,		
	2019	2018	2017
U.S.	$ 1,034.0	$ 363.4	$ 72.8
International	1,227.1	149.3	25.0
Income before taxes	$ 2,261.1	$ 512.7	$ 97.8

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

	Year Ended December 31,		
	2019	2018	2017
Current tax expense:			
U.S. Federal	$ 13.0	$ 8.8	$ 6.7
State	4.4	2.2	3.4
International	23.5	30.5	32.0
Current tax expense	40.9	41.5	42.1
Deferred tax expense (benefit):			
U.S. Federal	409.7	114.0	(69.8)
State	24.4	6.6	4.3
International	16.1	0.3	(19.3)
Deferred tax expense (benefit)	450.2	120.9	(84.8)
Non-current tax expense (benefit)	11.3	(15.4)	18.3
Provision for (benefit from) income taxes	$ 502.4	$ 147.0	$ (24.4)

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

	Year Ended December 31,		
	2019	2018	2017
U. S. statutory tax rate	21.0 %	21.0 %	35.0 %
Impact of foreign operations	(9.7)	(4.1)	6.0
Research tax credits	(0.2)	(0.7)	(3.8)
Nontaxable subsidies	(0.1)	(0.2)	(2.2)
Goodwill impairment	—	5.6	1.2
Share-based compensation	(0.1)	(1.0)	(5.3)
Nondeductible executive compensation	0.1	0.2	2.0
U.S. taxation of foreign income	10.3	15.5	2.7
Acquisition-related	—	(0.2)	10.1
U.S. tax reform	—	(9.6)	(71.0)
State taxes	1.0	1.7	2.9
Other	(0.1)	0.5	(2.6)
Provision for (benefit from) income taxes	22.2 %	28.7 %	(25.0)%

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, 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. In 2017, we 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. We completed our accounting for the Tax Act under Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (“SAB 118”) in 2018, which resulted in an additional income tax benefit of $49 million.

Our effective income tax rate was 22.2%, 28.7% and (25.0)% in 2019, 2018 and 2017, 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.

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, 2019	December 31, 2018
Deferred tax assets:		
Bad debt, inventory and warranty accruals	$ 23.9	$ 21.7
Other post-employment benefits, vacation and other reserves	23.0	23.0
Tax credit and net operating loss carryforwards	83.7	75.3
Lease obligations	48.6	—
Other	26.0	27.1
Total gross deferred tax assets	205.2	147.1
Valuation allowance	(67.2)	(70.8)
Total deferred tax assets	138.0	76.3
Deferred tax liabilities:		
Property and equipment	38.4	40.1
Lease assets	46.4	—
Investments and intangible assets	1,001.4	540.6
Total deferred tax liabilities	1,086.2	580.7
Net deferred tax liabilities	$ (948.2)	$ (504.4)

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, 2019, 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 decreased by $3.6 million in 2019.

As of December 31, 2019, our foreign and California net operating loss carryforwards were approximately $239.0 million and $52.7 million, respectively. Of our foreign net operating losses, $124.7 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 2028. As of December 31, 2019, our California research tax credit carryforwards were approximately $35.7 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 2012 and forward for the U.S. and 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):

	2019	2018	2017
Unrecognized tax benefits – January 1	$ 29.8	$ 54.9	$ 21.1
Additions to tax positions related to prior years	7.6	0.6	1.3
Reductions to tax positions related to prior years	(0.7)	(20.2)	(1.0)
Additions to tax positions related to the current year	3.0	4.6	34.8
Settlements	—	(6.8)	(0.2)
Lapse of statute of limitations	(0.4)	(1.1)	(3.4)
Currency translation	(0.1)	(2.2)	2.3
Unrecognized tax benefits – December 31	$ 39.2	$ 29.8	$ 54.9

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, 2019, 2018 and 2017, respectively was $11.2 million, $9.5 million and $10.9 million. Bio-Rad accrued interest and penalties of $1.7 million, $(1.4) million, and $(0.9) million in 2019, 2018, and 2017, respectively. The total unrecognized tax benefits and interest and penalties of $50.4 million in 2019 was partially offset by deferred tax assets of $1.4 million and prepaid taxes of $5.4 million, for a net amount of $43.6 million.

As of December 31, 2019, 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 $2.8 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. 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, 2017	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
B to A conversions	24	(24)
Issuance of common stock	58	18
Balance at December 31, 2019	24,966	5,090

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. The share repurchase activity under the share repurchase program through open market transactions in 2018 and 2019 is summarized as follows:

	Number of Shares Purchased	Weighted-Average Price per Share	Total Shares Repurchased To Date	Remaining Authorized Value (in millions)
November 1, 2018 - November 30, 2018	178,911	$ 273.39	193,150	$ 201.1
May 1, 2019 - May 31, 2019	25,421	$ 291.70	218,571	$ 193.7
June 1, 2019 - June 30, 2019	25,977	$ 292.01	244,548	$ 186.1
August 1, 2019 - August 31, 2019	14,745	$ 339.05	259,293	$ 181.1
November 1, 2019 - November 30, 2019	22,343	$ 358.04	281,636	$ 173.1

In 2019, we used 118,910 of the repurchased shares in connection with the vesting of restricted stock units and 19,755 shares in connection with ESPP stock purchases. 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, 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 income (loss), 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)
Other comprehensive (loss) income, before reclassifications	(36.5)	(10.0)	4.8	(41.7)
Amounts reclassified from Accumulated other comprehensive income	—	1.5	(0.4)	1.1
Income tax effects	(0.4)	1.1	(0.5)	0.2
Other comprehensive (loss) income, net of income taxes	(36.9)	(7.4)	3.9	(40.4)
Balances as of December 31, 2019	$ (72.4)	$ (22.2)	$ 7.2	$ (87.4)

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

	December 31,		
Components of Comprehensive income	2019	2018	Location
Amortization of foreign other post-employment benefit items	$ (1.5)	$ (2.4)	Selling, general and administrative expense
Net holding gains (losses) on equity securities and available for sale investments	$ 0.4	$ (0.3)	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 two equity award plans for officers and certain other employees: the 2007 Incentive Award Plan (2007 Plan) and the 2017 Incentive Award Plan (2017 Plan). 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 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 2,095,049 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, 2019, there were 1,507,489 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.

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 2019, 2018 and 2017, we recognized share-based compensation expense of $35.6 million, $27.8 million and $23.4 million, respectively. The income tax benefit related to share-based compensation expense was $5.6 million, $4.4 million and $5.8 million for 2019, 2018 and 2017, respectively. We did not capitalize any share-based compensation expense in inventory.

The tax benefit from share-based compensation vested or exercised during 2019, 2018 and 2017 was $5.4 million, $5.4 million, and $6.3 million, respectively.

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. We recognize forfeitures as they occur.

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, 2018	373,640	$ 138.81		
Granted	34,672	$ 328.48		
Exercised	(55,490)	$ 98.00		
Forfeited/expired	(8,300)	$ 231.71		
Outstanding, December 31, 2019	344,522	$ 162.23	4.76	$ 71.6
Unvested, December 31, 2019	94,172	$ 273.93	8.45	$ 9.1
Exercisable, December 31, 2019	250,350	$ 120.22	3.46	$ 62.5

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 2019, 2018 and 2017 was approximately $12 million, $8 million and $10 million, respectively.

Cash received from stock options exercised during 2019, 2018 and 2017 was $2.6 million, $0.5 million and $1.6 million, respectively.

As of December 31, 2019, there was $7.0 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,		
	2019	2018	2017
Expected volatility	22%	22%	20%
Risk-free interest rate	1.69%	2.85%	1.87%
Expected life (in years)	7.5	7.6	7.2
Expected dividend	—	—	—
Weighted-average fair value of options granted	$ 93.96	$ 105.94	$ 58.65

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, 2018	474,400	$ 235.58		
Granted	174,782	$ 332.38		
Vested	(134,525)	$ 206.44		
Forfeited	(44,715)	$ 243.76		
Outstanding, December 31, 2019	469,942	$ 279.14	2.08	$ 173.9

The total fair value of restricted stock units vested in 2019, 2018 and 2017 was $44.8 million, $40.0 million and $27.7 million, respectively. As of December 31, 2019, there was approximately $119.5 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 3 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,		
	2019	2018	2017
Expected volatility	31%	27%	19%
Risk-free interest rate	2.25%	1.82%	0.83%
Expected life (in years)	0.24	0.24	0.24
Expected dividend	—	—	—
Weighted-average fair value of purchase rights	$ 60.39	$ 55.04	$ 38.86

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 58,717 shares for $14.3 million, 63,464 shares for $13.6 million and 74,409 shares for $13.0 million under the 2011 ESPP to employees in 2019, 2018 and 2017, respectively. At December 31, 2019, 599,531 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,		
	2019	2018	2017
Interest and investment income	$ (30.5)	$ (26.6)	$ (19.1)
Net realized gains on investments	(1.5)	(1.6)	(0.1)
Other-than-temporary impairment losses on investments	5.8	0.8	7.0
Gain on sale of land	—	(4.1)	—
Gain on divestiture of a product line	—	(5.1)	—
Other expense	0.1	—	1.5
Other (income) expense, net	$ (26.1)	$ (36.6)	$ (10.7)

Other-than-temporary impairment losses on equity method investments were recorded in light of the investees' financial condition in the first and fourth quarters of 2019.

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,		
	2019	2018	2017
Net income	$ 1,758.7	$ 365.6	$ 122.2
Adjustments to reconcile net income			
to net cash provided by operating activities			
Depreciation and amortization	134.2	138.1	148.7
Reduction in the carrying amount of right-of-use assets	40.3	—	—
Share-based compensation	35.6	27.8	23.4
Gains on dispositions of securities	(1.5)	(1.6)	(0.1)
Other-than-temporary impairment losses on investments	5.8	0.8	7.0
Changes in fair market value of equity securities	(2,031.0)	(606.2)	—
Losses on dispositions of fixed assets	1.2	2.0	8.1
Gain on sale of land	—	(4.1)	—
Gain on divestiture of a product line	—	(5.1)	—
Payments for operating lease liabilities	(38.6)	—	—
Changes in fair value of contingent consideration	(1.6)	(6.2)	(18.1)
Decrease (increase) in accounts receivable, net	1.6	59.7	(64.1)
Decrease (increase) in inventories, net	24.2	(12.9)	(47.7)
Decrease (increase) in other current assets	61.8	(15.3)	(35.7)
Increase (decrease) in accounts payable			
and other current liabilities	10.6	(45.6)	7.8
Decrease in income taxes payable	(4.2)	(20.9)	(22.4)
Increase (decrease) in deferred income taxes	450.2	120.9	(82.0)
(Increase) decrease in other long term assets	(1.7)	1.1	2.3
Increase (decrease) in other long term liabilities	13.4	(10.0)	38.1
Impairment losses on goodwill and long-lived assets	—	292.5	11.5
Other	(1.1)	4.9	5.1
Net cash provided by operating activities	$ 457.9	$ 285.5	$ 104.1
Non-cash investing activities:			
Purchased property, plant and equipment	$ 8.1	$ 5.7	$ —
Purchased marketable securities and investments	$ 1.4	$ 0.8	$ 2.8
Sold marketable securities and investments	$ 1.3	$ —	$ 0.3

12. COMMITMENTS AND CONTINGENT LIABILITIES

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 $16.1 million, $15.9 million and $16.0 million in 2019, 2018 and 2017, respectively.

Purchase Obligations

As of December 31, 2019, we had purchase obligations that have not been recognized on our balance sheet of $35.8 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. Recognition of purchase obligations occurs when products or services are delivered to Bio-Rad.

The annual future fixed and determinable portion of our purchase obligations that have not been recognized on our balance sheet as of December 31, 2019 are as follows: 2020 - $34.0 million, 2021 - $1.0 million, 2022 - $0.2 million, 2023 - $0.2 million, 2024 - $0.2 million and after 2024 - $0.2 million.

Long-Term Liabilities

As of December 31, 2019, we had obligations that have been recognized on our balance sheet of $118.4 million, which primarily represent recognized long-term obligations for other post-employment benefits as indicated below that are mostly due in more than 5 years, and long-term deferred revenue. Excluded are tax liabilities for uncertain tax positions and contingencies. We are not able to reasonably estimate the timing of future cash flows of these tax liabilities, therefore, our income tax obligations are excluded.

The annual future fixed and determinable portion of our obligations that have been recognized on our balance sheet as of December 31, 2019 were as follows: 2020 - $5.2 million, 2021 - $12.8 million, 2022 - $4.5 million, 2023 - $4.3 million, 2024 - $3.3 million and after 2024 - $88.3 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 $4.2 million of standby letters of credit/guarantees with financial institutions as of December 31, 2019.

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, 2019 and 2018 of $81.5 million and $70.4 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:	2019	2018
Benefit obligation at beginning of year	$137.3	$136.6
Service cost	6.9	7.5
Interest cost	1.5	1.1
Plan participants' contributions	3.5	3.1
Actuarial (gain) loss	11.9	(5.4)
Gross benefits paid	(2.1)	(3.1)
Plan amendments	0.2	(0.5)
Settlements	(3.8)	—
Change attributable to foreign exchange	(1.6)	(2.0)
Benefit obligation at end of year	153.8	137.3
Change in plan assets:		
Fair value of plan assets at beginning year	66.9	61.7
Actual return on plan assets	0.9	0.3
Employer contributions	4.7	4.0
Plan participants' contributions	3.8	3.1
Gross benefits paid	(0.8)	(1.5)
Settlements	(3.8)	—
Change attributable to foreign exchange	0.6	(0.7)
Fair value of plan assets at end of year	72.3	66.9
Under funded status of plans	$(81.5)	$(70.4)
Amounts recognized in the consolidated balance sheets:		
Current liabilities (Accrued payroll and employee benefits)	$(1.1)	$(1.1)
Noncurrent liabilities (Other long-term liabilities)	(80.4)	(69.3)
Net liability, end of fiscal year	$(81.5)	$(70.4)

Components of Net Periodic Benefit Cost

The following sets forth the net periodic benefit cost (income) for the periods indicated (in millions):

	2019	2018	2017
Service costs	$6.9	$7.5	$6.5
Interest costs	1.5	1.1	1.1
Expected returns on plan assets	(1.2)	(1.1)	(1.1)
Amortization of actuarial losses	1.0	1.3	1.4
Amortization of prior service costs	—	0.1	—
Settlements	0.9	—	1.2
Net periodic benefit costs	$9.1	$8.9	$9.1

Assumptions

The weighted-average assumptions used in computing the benefit obligations are as follows:

	2019	2018
Discount rate	0.5%	1.1%
Compensation rate increase	1.7%	1.8%

The weighted-average assumptions used in computing the net periodic benefit costs are as follows:

	2019	2018	2017
Discount rate	1.1%	0.8%	0.9%
Expected long-term rate of return on plan assets	1.8%	1.8%	1.9%

In some foreign locations we have service award plans that are paid based upon the number of years of employment. Under these plans, the liability at December 31, 2019 and 2018 was $3.5 million and $3.1 million, respectively, and has been included in Accrued payroll and employee benefits and Other long-term liabilities in the Consolidated Balance Sheets.

Concentrations of Labor Subject to Collective Bargaining Agreements

At December 31, 2019, approximately seven percent of Bio-Rad's approximately 3,180 U.S. employees were covered by a collective bargaining agreement, which will expire on November 14, 2023. 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 previously accrued 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, and this petition was denied on April 8, 2019. On September 24, 2019, Mr. Wadler filed a dismissal with prejudice of all remaining claims under the lawsuit with the U.S. District Court, Northern District of California as a result of a Confidential Settlement Agreement and Satisfaction of Judgment that the parties entered into that was last executed on September 6, 2019. This matter did not have a material impact on our 2019 results of operations and is now closed.

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, 2019, 2018, and 2017 and for the years then ended is as follows (in millions):

		Life Science		Clinical Diagnostics		Other Operations
Segment net sales	2019	$	885.9	$	1,412.0	$	13.8
	2018		861.7		1,411.8		15.9
	2017		785.2		1,360.8		14.2
Allocated interest expense	2019	$	7.4	$	15.9	$	0.1
	2018		7.2		16.7		0.1
	2017		7.0		14.9		—
Depreciation and amortization	2019	$	29.4	$	71.7	$	0.9
	2018		34.1		72.0		0.5
	2017		36.2		80.2		—
Segment profit (loss)	2019	$	72.1	$	148.5	$	(1.5)
	2018		28.7		(145.7)		0.2
	2017		(9.9)		114.8		1.4
Segment assets	2019	$	496.1	$	1,075.8	$	9.2
	2018		450.2		949.0		5.9
Capital expenditures	2019	$	16.6	$	58.9	$	0.6
	2018		36.7		60.5		0.5

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).

Segment assets at December 31, 2019 increased from December 31, 2018 balances due to inclusion of operating lease right-of-use assets in segment assets (see Note 16 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,		
	2019	2018	2017
Total segment profit (loss)	$ 219.1	$ (116.8)	$ 106.3
Foreign currency exchange losses, net	(2.2)	(2.9)	(9.1)
Net corporate operating, interest and other expense not allocated to segments	(12.9)	(10.4)	(10.1)
Change in fair market value of equity securities	2,031.0	606.2	—
Other income (expense), net	26.1	36.6	10.7
Consolidated income before income taxes	$ 2,261.1	$ 512.7	$ 97.8

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

	December 31, 2019	December 31, 2018
Total segment assets	$ 1,581.1	$ 1,405.1
Cash and other current assets	1,233.5	1,047.2
Property, plant and equipment, net, and operating lease right-of-use assets, excluding segment specific balances	66.8	79.9
Goodwill, net	264.1	219.8
Other long-term assets	4,863.4	2,859.1
Total assets	$ 8,008.9	$ 5,611.1

Other long-term assets at December 31, 2019 increased from December 31, 2018 balance due to increase in fair market value of equity securities (see Note 3 to the consolidated financial statements).

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, 2019	2018	2017
Europe	$ 770.3	$ 792.0	$ 758.5
Asia	505.0	495.5	461.3
United States	899.1	863.6	800.2
Other (primarily Canada and Latin America)	137.3	138.3	140.0
Total net sales	$ 2,311.7	$ 2,289.4	$ 2,160.2

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

	December 31, 2019	December 31, 2018
Europe	$ 198.3	$ 129.1
Asia	51.5	20.7
United States	468.7	369.2
Other (primarily Canada and Latin America)	12.7	11.1
Total Property, plant and equipment, net, Operating lease right-of-use assets and Other assets, excluding deferred income taxes	$ 731.2	$ 530.1

Prior year amounts have been adjusted to exclude Other investments.

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, were incurred through and completed in December 2019. We recorded approximately $(0.1) million, $(0.2) million and $0.5 million in restructuring charges and adjustments related to severance and other employee benefits for the years ended December 31, 2019, 2018 and 2017, respectively. From May 2016 to December 31, 2019, total expenses were $12.7 million. The amounts recorded were reflected in Cost of goods sold of $(0.1) million, $(0.1) million and $(0.2) million, and in Selling, general and administrative expense of zero, $(0.1) million and $0.7 million in the Consolidated Statements of Income for the years ended December 31, 2019, 2018 and 2017, 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):

	2019			2018		
	Life Science	Clinical Diagnostics	Total	Life Science	Clinical Diagnostics	Total
Balance as of January 1	$ 0.6	$ 1.0	$ 1.6	$ 2.2	$ 4.1	$ 6.3
Adjustment to expense	—	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)
Cash payments	(0.3)	(0.5)	(0.8)	(1.5)	(2.9)	(4.4)
Reserve transferred to European and North American Reorganization restructuring costs reserve (see below)	(0.3)	(0.4)	(0.7)	—	—	—
Foreign currency translation gains	—	—	—	—	(0.1)	(0.1)
Balance as of December 31	$ —	$ —	$ —	$ 0.6	$ 1.0	$ 1.6

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. We recorded restructuring charges and adjustments related to severance and employee benefits of less than $(0.1) million, $0.4 million and $11.0 million and asset write-offs and exit costs of zero, $(0.1) million and $10.1 million for the years ended December 31, 2019, 2018 and 2017, respectively. From December 2017 to December 31, 2019, total expenses were $21.4 million. This restructuring plan was completed in December 2019.

In June 2018, we announced the closure of a small manufacturing operation in Munich, Germany. We recorded restructuring charges and adjustments related to severance and employee benefits of $(0.3) million and $1.7 million for the years ended December 31, 2019 and 2018, respectively. From June 2018 to December 31, 2019, total expenses were $1.4 million. This restructuring plan was completed in November 2019.

In December 2018, we announced the closure of a small manufacturing facility outside Paris, France. We recorded restructuring charges and adjustments related to severance and employee benefits of $(0.1) million and $3.9 million and exit costs of zero and $0.2 million for the years ended December 31, 2019 and 2018, respectively. From December 2018 to December 31, 2019, total expenses were $4.0 million.

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 amounts recorded were reflected in Cost of goods sold of $(0.3) million, $5.4 million and $2.3 million, in Selling, general and administrative expense of zero, $0.4 million and $3.3 million, and in Research and development expense of $(0.1) million, $0.3 million and $15.5 million in the Consolidated Statements of Income for the years ended December 31, 2019, 2018 and 2017, respectively. The liability of $3.2 million as of December 31, 2019 consisted of $1.8 million recorded in Accrued payroll and employee benefits, $0.2 million recorded in Other current liabilities, and $1.2 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):

	2019	2018
Balance as of January 1	$ 11.5	$ 14.1
Charged to expense	—	5.8
Adjustment to expense	(0.4)	0.3
Cash payments	(7.7)	(8.4)
Foreign currency translation gains	(0.2)	(0.3)
Balance as of December 31	$ 3.2	$ 11.5

Restructuring Costs for European and North American Reorganization

In November 2019, we announced our strategy-driven restructuring plan. We expect that a significant portion of the net savings resulting from this restructuring plan will be repurposed in alignment with our portfolio strategy.
The restructuring plan includes a workforce reduction in Europe, the United States and Canada, and is expected to be incurred through 2020. We recorded $25.3 million of expense in restructuring charges related to severance and employee benefits for the year ended December 31, 2019. The liability of $25.3 million as of December 31, 2019 was recorded in Accrued payroll and employee benefits in the Consolidated Balance Sheets. The amounts recorded were reflected in Cost of goods sold of $4.8 million, in Selling, general and administrative expense of $14.4 million and in Research and development expense of $6.1 million in the Consolidated Statements of Income for the year ended December 31, 2019.

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

	2019		
	Life Science	Clinical Diagnostics	Total
Balance as of January 1	$ —	$ —	$ —
Charged to expense	6.2	19.1	25.3
Cash payments	(0.4)	(0.7)	(1.1)
Reserve transferred from European Reorganization restructuring costs reserve (see above)	0.3	0.4	0.7
Foreign currency translation losses	0.1	0.3	0.4
Balance as of December 31	$ 6.2	$ 19.1	$ 25.3

16. LEASES

We have operating leases and to a lesser extent finance leases, for buildings, vehicles and equipment. Our leases have remaining lease terms of 1 year to 19 years, which includes our determination to exercise renewal options.

The components of lease expense were as follows (in millions):

Twelve Months Ended December 31,	**2019**
Operating lease cost	$ 51.4
Finance lease cost:	
Amortization of right-to-use assets	$ 0.6
Interest on lease liabilities	0.9
Total finance lease cost	$ 1.5
Sublease income	$ 3.0

The sublease is for a building with a term that ends in 2025, with no options to extend or renew.

Operating lease cost includes original reduction in the carrying amount of right-of-use assets, the impact of remeasurements, modifications, impairments and abandonments.

Historically, our short-term leases, reflecting leases with a lease term of one year or less, are predominantly comprised of leases with a lease term of one month or less, which are not significant. Operating lease variable cost is primarily comprised of reimbursed actual common area maintenance, property taxes and insurance, which are immaterial.

Supplemental cash flow information related to leases was as follows (in millions):

Twelve Months Ended December 31,	**2019**
Cash paid for amounts included in the measurement of lease liabilities:	
Operating cash flows from operating leases	$ 47.2
Operating cash flows from finance leases	$ 0.9
Financing cash flows from finance leases	$ 0.6
Right-of-use assets obtained in exchange for lease obligations:	
Operating leases	$ 28.7
Finance leases	$ 0.2

Supplemental balance sheet information related to leases was as follows (in millions):

		December 31, 2019
Operating Leases		
Operating lease right-of-use assets	$	201.9
Current operating lease liabilities	$	35.4
Operating lease liabilities		176.0
Total operating lease liabilities	$	211.4

		December 31, 2019
Finance Leases		
Property, plant and equipment, gross	$	11.4
Less: accumulated depreciation and amortization		(4.2)
Property, plant and equipment, net	$	7.2
Current maturities of long-term debt and notes payable	$	0.5
Long-term debt, net of current maturities		11.2
Total finance lease liabilities	$	11.7

	December 31, 2019
Weighted Average Remaining Lease Term	
Operating leases - in years	9
Finance leases - in years	18
Weighted Average Discount Rate	
Operating leases	4.2%
Finance leases	6.5%

Maturities of lease liabilities were as follows (in millions):

Year Ending December 31,		Operating Leases		Finance Leases
2020	$	41.0	$	1.1
2021		35.8		1.3
2022		28.6		1.2
2023		24.5		1.1
2024		21.8		1.1
Thereafter		103.7		15.2
Total lease payments		255.4		21.0
Less imputed interest		(44.0)		(9.3)
Total	$	211.4	$	11.7

The value of our operating lease portfolio is principally for facilities with longer durations than the lesser value vehicles and other equipment with shorter terms and higher-turn over.

As of December 31, 2019, we have an additional lease for a facility in Texas that has not commenced of $1.6 million. The operating lease will commence in either the second or third quarter of 2020 with a lease term of four years.

Operating and Capital Lease Commitments Under ASC 840, Leases

Rents and Leases

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

Annual future minimum lease payments at December 31, 2018 under operating leases were 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 the sublease as of December 31, 2018 were $17.8 million and ends in 2025.

Maturities of our capital lease obligations at December 31, 2018 were as follows: 2019 - $0.5 million; 2020 - $0.2 million; 2021 - $0.5 million; 2022 - $0.4 million; 2023 - $0.4 million; and thereafter - $9.9 million.

17. QUARTERLY FINANCIAL DATA (UNAUDITED)

Summarized quarterly financial data for 2019 and 2018 are as follows (in millions, except per share data):

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2019				
Net sales	$ 554.0	$ 572.6	$ 560.6	$ 624.5
Gross profit	311.8	307.8	307.0	330.4
Net income (loss)	865.2	598.8	(258.8)	553.5
Basic earnings (loss) per share	$ 29.03	$ 20.08	$ (8.68)	$ 18.50
Diluted earnings (loss) per share	$ 28.74	$ 19.86	$ (8.68)	$ 18.31
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)