UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

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

FOR THE FISCAL YEAR ENDED December 28, 2019

OR

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

FOR THE TRANSITION PERIOD FROM TO

Commission File No. 001-15943



CHARLES RIVER LABORATORIES INTERNATIONAL, INC.

(Exact Name of Registrant as Specified in Its Charter)

Delaware			**06-1397316**
(State or Other Jurisdiction of Incorporation or Organization)			(I.R.S. Employer Identification No.)
251 Ballardvale Street	**Wilmington**	**Massachusetts**	**01887**
(Address of Principal Executive Offices)			(Zip Code)

(Registrant's telephone number, including area code): **(781) 222-6000**

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

Title of each class	**Ticker symbol(s)**	**Name of each exchange on which registered**
Common stock, $0.01 par value	CRL	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: Yes ☐ No ☒

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

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

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

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

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

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

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

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

On June 29, 2019, the aggregate market value of the registrant's voting common stock held by non-affiliates of the registrant was approximately $6,796,882,148. As of January 24, 2020, there were 48,959,576 shares of the registrant's common stock outstanding, $0.01 par value per share.

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DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement for its 2020 Annual Meeting of Shareholders scheduled to be held on May 6, 2020, which will be filed with the Securities and Exchange Commission (SEC) not later than 120 days after December 28, 2019, are incorporated by reference into Part III of this Annual Report on Form 10-K. With the exception of the portions of the 2020 Proxy Statement expressly incorporated into this Annual Report on Form 10-K by reference, such document shall not be deemed filed as part of this Form 10-K.

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
ANNUAL REPORT ON FORM 10-K
FOR FISCAL YEAR 2019

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PART I

Item 1. Business

General

This Annual Report on Form 10-K contains forward-looking statements regarding future events and the future results of Charles River Laboratories International, Inc. that are based on our current expectations, estimates, forecasts and projections about the industries in which we operate and the beliefs and assumptions of our management. Words such as “expect,” “anticipate,” “target,” “goal,” “project,” “intend,” “plan,” “believe,” “seek,” “estimate,” “will,” “likely,” “may,” “designed,” “would,” “future,” “can,” “could” and other similar expressions that are predictions, indicate future events and trends or which do not relate to historical matters are intended to identify such forward-looking statements. These statements are based on our current expectations and beliefs and involve a number of risks, uncertainties and assumptions that are difficult to predict. For example, we may use forward-looking statements when addressing topics such as: trends in our business and industry; goodwill and asset impairments still under review; future demand for drug discovery and development products and services, including the outsourcing of these services; our expectations regarding stock repurchases, including the number of shares to be repurchased, expected timing and duration, the amount of capital that may be expended and the treatment of repurchased shares; present spending trends and other cost reduction activities by our clients; future actions by our management; the outcome of contingencies; changes in our business strategy, business practices and methods of generating revenue; the development and performance of our services and products; market and industry conditions, including competitive and pricing trends; our strategic relationships with leading pharmaceutical companies and venture capital limited partnerships, and opportunities for future similar arrangements; our cost structure; the impact of completed acquisitions; our expectations with respect to revenue growth and operating synergies (including the impact of specific actions intended to cause related improvements); the impact of specific actions intended to improve overall operating efficiencies and profitability (and our ability to accommodate future demand with our infrastructure), including gains and losses attributable to businesses we plan to close, consolidate or divest; changes in our expectations regarding future stock option, restricted stock, performance share units and other equity grants to employees and directors; expectations with respect to foreign currency exchange; assessing (or changing our assessment of) our tax positions for financial statement purposes; and our liquidity. In addition, these statements include the impact of economic and market conditions on us and our clients, the effects of our cost-saving actions and the steps to optimize returns to shareholders on an effective and timely basis.

Forward-looking statements are predictions and are subject to risks, uncertainties and assumptions that are difficult to predict. Therefore, actual results may differ materially and adversely from those expressed in any forward-looking statements. You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this document or, in the case of statements incorporated by reference, on the date of the document incorporated by reference. Factors that might cause or contribute to such differences include those discussed in this Form 10-K under the sections entitled “Our Strategy,” “Risk Factors,” “Management's Discussion and Analysis of Financial Condition and Results of Operations,” in our press releases and other financial filings with the SEC. We have no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or risks. New information, future events or risks may cause the forward-looking events we discuss in this report not to occur.

Corporate History

We began operating in 1947 and, since then, we have undergone several changes to our business structure. Charles River Laboratories International, Inc. was incorporated in 1994 and we completed our initial public offering in 2000. Our stock is traded on the New York Stock Exchange under the symbol “CRL” and is included in the Standard & Poor’s 1000, MidCap 400 and Composite 1500 indices, the Dow Jones U.S. Health Care Index, the NYSE Arca Biotechnology Index, the NYSE Composite and many of the Russell indices, among others. We are headquartered in Wilmington, Massachusetts. Our headquarters mailing address is 251 Ballardvale Street, Wilmington, MA, 01887, and the telephone number at that location is (781) 222-6000. Our Internet site is www.criver.com. Material contained on our Internet site is not incorporated by reference into this Form 10-K. Unless the context otherwise requires, references in this Form 10-K to “Charles River,” “we,” “us,” “the Company” or “our” refer to Charles River Laboratories International, Inc. and its subsidiaries.

This Form 10-K, as well as all other reports filed with the SEC, is available free of charge through the Investor Relations section of our Internet site (www.criver.com) as soon as practicable after we electronically file such material with, or furnish it to, the SEC. The SEC maintains an Internet site (http://www.sec.gov) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC.

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Overview

We are a full service, early-stage contract research organization (CRO). We have built upon our original core competency of laboratory animal medicine and science (research model technologies) to develop a diverse portfolio of discovery and safety assessment services, both Good Laboratory Practice (GLP) and non-GLP, which is able to support our clients from target identification through non-clinical development. We also provide a suite of products and services to support our clients' manufacturing activities. Utilizing our broad portfolio of products and services enables our clients to create a more flexible drug development model, which reduces their costs, enhances their productivity and effectiveness and increases speed to market.

The development of new drugs requires a steadily increasing investment of time and money. Various studies and reports estimate that it takes between 10 to 15 years, up to $2.0 billion excluding time costs and exploration of between 10,000 and 15,000 drug molecules to produce a single Food and Drug Administration (FDA)-approved drug.

Discovery represents the earliest stages of research in the life sciences, directed at the identification, screening, and selection of a lead molecule for future drug development. Discovery activities typically extend anywhere from 4 to 6 years in conventional pharmaceutical research and development (R&D) timelines.

Development activities, which follow, and which can take up to 7 to 10 years, are directed at demonstrating the safety, tolerability and clinical efficacy of the selected drug candidates. During the non-clinical stage of the development process, a drug candidate is tested *in vitro* (non-animal, typically on a cellular or sub-cellular level in a test tube or multi-well petri plate) and *in vivo* (in research models) to establish drug safety prior to and in support of human clinical trials.

For over 70 years, we have been in the business of providing the research models required in the research and development of new drugs, devices and therapies. Over this time, we have built upon our core competency of *in vivo* biology to develop a diverse and expanding portfolio of products and services, which now encompasses the broader early-stage drug research process. We are positioned to leverage our leading portfolio in early-stage drug research in an efficient and cost-effective way to aid our clients in bringing their drugs to market faster.

Our client base includes global pharmaceutical companies, a broad range of biotechnology companies, and many government agencies, hospitals and academic institutions around the world. In recent years, we have focused our efforts on improving the efficiency of our global operations to enhance our ability to support our clients. Our pharmaceutical and biotechnology clients are increasingly seeking full service, "one-stop" global partners to whom they can outsource more of their drug discovery and development efforts. It is estimated that the market for regulated safety assessment services is over 55% outsourced, while emerging growth areas such as discovery and certain research model services are currently believed to be less outsourced.

We currently operate in over 90 facilities and in over 20 countries worldwide (excluding our Insourcing Solutions sites). Our products and services, supported by our global infrastructure and deep scientific expertise, enable our clients to overcome many of the challenges of early-stage life sciences research. In 2019, our total revenue was $2.6 billion and our operating income from continuing operations, before income taxes, was $304.1 million.

We have three reporting segments: Research Models and Services (RMS), Discovery and Safety Assessment (DSA) and Manufacturing Support (Manufacturing).

Through our RMS segment, we have been supplying research models to the drug development industry since 1947. With over 150 different stocks and strains, we continue to maintain our position as a global leader in the production and sale of the most widely used rodent research model strains and purpose-bred rats and mice. We also provide a variety of related services that are designed to support our clients in the use of research models in drug discovery and development. We maintain multiple production centers, including barrier rooms and/or isolator facilities, on three continents (North America, Europe, and Asia). In 2019, RMS accounted for 20.5% of our total revenue and approximately 3,600 of our employees, including approximately 170 science professionals with advanced degrees. In addition, in January 2020, we acquired HemaCare Corporation (HemaCare), a leading global provider of human-derived cellular materials used in the development and production of cell therapies, as part of our Research Products business.

Our DSA business segment provides services that enable our clients to outsource their innovative drug discovery research, their related drug development activities, and their regulatory-required safety testing of potential new drugs, industrial and agricultural chemicals, consumer products, veterinary medicines and medical devices. The demand for these services is driven by the needs of large global pharmaceutical companies that have exceeded their internal capacity or that continue to transition to an outsourced drug development model, as well as by the needs of small biotechnology companies, chemical companies and non-governmental organizations that rely on outsourcing for most of their discovery, development and safety testing programs. These entities may choose to outsource their discovery, development and safety activities to reduce fixed costs and to gain

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access to additional scientific expertise and capabilities.

We are the largest provider of drug discovery, non-clinical development and safety testing services worldwide. We have extensive expertise in the discovery of clinical candidates and in the design, execution and reporting of safety assessment studies for numerous types of compounds including small and large molecule pharmaceuticals, industrial and agricultural chemicals, consumer products, veterinary medicines, cell and gene therapies, biocides and medical devices. We currently provide discovery and safety assessment services at multiple facilities located in the United States (U.S.), Canada, and Europe. In 2019, our DSA segment represented 61.8% of our total revenue and employed approximately 10,900 of our employees including approximately 1,500 science professionals with advanced degrees.

Through our Manufacturing segment, we help ensure the safe production and release of products manufactured by our clients. Our Manufacturing Segment is comprised of three businesses: Microbial Solutions, Biologics Testing Solutions and Avian Vaccine Services. Our Microbial Solutions products and services businesses provide *in vitro* methods for conventional and rapid quality control testing of sterile and non-sterile pharmaceuticals and consumer products. Our Biologics Testing Solutions business provides specialized testing of biologics frequently outsourced by global pharmaceutical and biotechnology companies. Our Avian Vaccine Services business provides specific-pathogen-free (SPF) fertile chicken eggs, SPF chickens and diagnostic products used to manufacture vaccines. In 2019, Manufacturing accounted for 17.7% of our total revenue from continuing operations and approximately 1,900 of our employees, including approximately 150 science professionals with advanced degrees.

Research Models and Services. Our RMS segment is comprised of three businesses: Research Models, Research Model Services and Research Products.

Research Models. Our Research Models business is comprised of the production and sale of research models. A significant portion of this business involves the commercial production and sale of research models, principally purpose-bred rats and mice for use by researchers. The FDA and foreign regulatory agencies typically require that the safety and efficacy of new drug candidates be tested on research models like ours prior to testing in humans. As a result, our research models are an essential part of the drug discovery and development process.

We provide our rodent models to numerous clients around the world, including most pharmaceutical companies, a broad range of biotechnology companies, other contract research organizations and many government agencies, hospitals, and academic institutions. We have a global footprint with production facilities strategically located in 8 countries, in close proximity to our clients. Our research models include commonly used laboratory strains, disease models and specialized strains with compromised immune systems, which are in demand as early-stage tools in the drug discovery and development process.

Our rodent species have been, and continue to be, some of the most extensively used research models in the world, largely as a result of our geographic footprint and continuous commitment to innovation and quality. Our research models are bred and maintained in controlled environments, which are designed to ensure that the models are free of specific viral and bacterial agents and other contaminants that can disrupt research operations and distort scientific results. With our production capabilities, we are able to deliver consistently high-quality research models worldwide.

Our research models include:

- inbred, which are bred to be homogeneous;
- hybrid, which are the offspring of parents from two different genotypes;
- outbred, which are purposefully bred for heterogeneity;
- spontaneous mutant, whose genotype results in a naturally occurring genetic mutation (such as immune deficiency); and
- other genetically modified research models, such as knock-out models with one or more disabled genes and transgenic models.

Certain of our research models are proprietary rodent models used to research treatments in several therapeutic areas, such as diabetes, obesity, cardiovascular, cancer, central nervous system (CNS) and kidney disease.

We are also a premier provider of high quality, purpose bred, SPF large research models to the biomedical research community.

Research Model Services. RMS offers a variety of services designed to support our clients' use of research models in basic research and screening non-clinical drug candidates. These services address the need among pharmaceutical and biotechnology

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companies to outsource the non-core aspects of their drug discovery activities. Our services include those related to the maintenance and monitoring of research models, and managing research operations for government entities, academic organizations, and commercial clients. We currently have three service offerings in research models services: Genetically Engineered Models and Services (GEMS), Insourcing Solutions and Research Animal Diagnostic Services (RADS).

Genetically Engineered Models and Services. We create, breed and maintain research models required by our clients for biomedical research activities. The creation of a genetically engineered model (GEM) is a critical scientific event, but it is only the first step in the discovery process, and our scientists can advise clients on how to efficiently create custom models utilizing in-licensed technologies and approaches to modify the genome. Through our phenotyping platforms, we can also design and conduct the relevant studies and tests allowing characterization of the generated models. Productive utilization of GEMs requires significant additional technical expertise in order to properly support basic and early discovery research. We provide breeding expertise and colony development, quarantine, health and genetic testing and monitoring, germplasm cryopreservation and rederivation, including assisted reproduction and model creation. Our team of project managers is supported by a proprietary, technologically advanced Internet Colony Management (ICM™) system that allows for real-time data exchange. We provide these services to clients around the world, including pharmaceutical and biotechnology companies, hospitals, universities, and government agencies.

Insourcing Solutions. We manage the research operations of government entities, academic organizations and commercial clients (including recruitment, training, staffing and management services) in our clients' facilities utilizing our Charles River Accelerator and Development Lab (CRADL™) option, in which we lease space to our clients. Some research institutions prefer to retain certain elements of their research in-house, while outsourcing staffing and management, thus driving demand for our services. We believe that our expertise in early-stage drug research, and in particular research model care, scientific and technical support, facility operations, and discovery and development services, enhances the productivity and quality of our clients' research programs.

Research Animal Diagnostic Services. We monitor and analyze the health profiles of our clients' research models and research biologics by providing infectious agents and pathology assessment. We developed this capability internally to address the quality control of our research model business. We can serve as our clients' sole-source testing laboratory, or as an alternative source supporting our clients' internal laboratory capabilities. We believe we are the reference laboratory of choice for health assessment of laboratory research models and an industry leader in the field of laboratory animal diagnostics.

Research Products. In January 2020, we acquired HemaCare, a leading global provider of human-derived cellular materials used in the development of production of cell therapies, as part of our Research Products business. The business supplies controlled, consistent, customized primary cells and blood components derived from normal and mobilized peripheral blood, bone marrow, and cord blood. Research Products supports biotechnology and pharmaceutical companies, academic institutions and other research organizations who rely on high-quality, viable and functional human primary cells and blood components for biomedical and drug discovery research and cell therapy development.

Discovery and Safety Assessment

Our DSA segment is comprised of two businesses: Discovery Services and Safety Assessment. We currently offer regulated and non-regulated DSA services, including *in vitro* and *in vivo* studies, laboratory support services, and strategic non-clinical consulting and program management to support product development.

Discovery Services. We offer a full spectrum of discovery services from identification and validation of novel targets and chemical compounds with actual or potential intellectual property value through delivery of non-clinical drug and therapeutic candidates ready for safety assessment. Our Discovery Services include Early Discovery, *In Vitro* Discovery and *In Vivo* Discovery businesses to streamline and enhance the integrated support we can provide for clients' integrated drug discovery programs. This seamless discovery organization also allows us to better engage with clients at any stage of their drug discovery and support their complex scientific needs. Our discovery services business unit focuses on several therapeutic areas, including oncology, CNS, immunology, inflammation and metabolic diseases. We also provide expertise in the growing area of rare and orphan diseases, which are typically diseases of high unmet medical need in smaller patient populations. We believe there are emerging opportunities to assist our clients in a variety of drug discovery applications and platforms from target discovery to candidate selection and across a range of modalities, including small molecules and large molecules (including oligonucleotides, antibodies, proteins) and cell and gene therapy drug candidates.

Early Discovery. We are a global leader in integrated drug discovery services, with a predominant focus on the integration of *in vitro* biology, medicinal chemistry and *in vivo* pharmacology capabilities. Our full suite of service offerings, together with our knowledge and expertise, allows us to support our clients at the earliest stages of their research, including the design and

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implementations of their research programs, and to stay with them through the entire drug discovery process. Our Early Discovery service capabilities include:

- target discovery and validation;
- hit identification and optimization to deliver candidate molecules;
- early nonclinical pharmacokinetic and pharmacodynamic studies, transporter-mediated drug-drug interaction, and *in vitro* and *in vivo* assays to assess mechanism, bioavailability and metabolism as required for regulatory approval of new drugs; and
- target engagement biomarker development to support non-clinical and potentially downstream clinical studies.

Additionally, we offer ion channel and drug transporter testing for both discovery and non-clinical purposes, as well as genome editing services.

We provide many of these services at our clients' laboratories with Charles River scientists as part of an insourcing service model. Through strategic partnerships we also offer an ultra-high throughput screening laboratory, a human antibody discovery and development platform, an artificial intelligence drug design platform and a human stem cell model platform.

In Vivo Discovery Services. *In Vivo* Discovery Services are essential in early stage, non-clinical discovery research, and are directed at the identification, screening, optimization and selection of effective therapeutic agents for drug development. These *in vivo* activities typically extend anywhere from 2 to 4 years in conventional pharmaceutical R&D timelines. We offer R&D expertise, capabilities and services globally to accelerate our clients' drug discovery pipelines from lead generation to candidate selection and on occasion, complete *in vivo* studies in support of clinical efforts or post-marketing work. We complement and extend clients' capabilities and expertise to improve their decision-making, increase their flexibility, and reduce their internal costs and product development timelines. In addition, we provide *in vitro* assays in support of lead optimization to candidate selection activities. Examples of this include early pharmacokinetic and pharmacodynamic studies and *in vitro* and *in vivo* assays to assess mechanism, bioavailability, metabolism, efficacy, pharmacology and safety.

In recent years, we have made key acquisitions designed to augment our Discovery Services offerings, including businesses that provide critical data to advance novel therapeutics for the treatment of CNS diseases, immune (including oncology), inflammatory and infectious diseases, as well as drug transporter assays and kits.

Safety Assessment. We offer a full range of safety assessment studies required for regulatory submission on a global basis. Our safety assessment business also provides expertise in several therapeutic areas, including respiratory, fibrotic, cardiovascular, gastrointestinal, genitourinary diseases, anti-infectives and ophthalmology indications, as well as the development of surgically implanted medical devices.

Bioanalysis, Drug Metabolism and Pharmacokinetics. In support of non-clinical drug safety testing and new chemical development, our clients are required to demonstrate appropriate stability in the collected biological sample, pharmacokinetics of their drug or compound in circulation, the presence of metabolites and, in the case of biologics, the presence or absence of anti-drug antibodies. We have scientific expertise in the sophisticated bioanalytical techniques required to satisfy these requirements for many drugs and chemicals. Once analysis is complete, our scientists evaluate the data to provide information on the pharmacokinetics and/or toxicokinetics of the drug or chemical and complete an evaluation of the biologic disposition of the drug or chemical and its potential metabolites. Pharmacokinetics refers to the understanding of what the body does to a drug or compound administered at therapeutic dose levels, including the process by which the drug is absorbed, distributed in the body, metabolized and excreted. Toxicokinetics refers to the same understanding as applied at higher doses that may result in adverse effects. These studies are required for the full non-clinical assessment of the disposition of the drug or chemical and the results are used in the safety evaluation of the compound. After performing sample analysis in support of non-clinical studies, we also support the clinical bioanalysis required in clinical trials for drug development.

Safety Pharmacology. Our clients are also required to conduct an assessment of Safety Pharmacology. This suite of studies is used to determine any effects on the vital organ systems of the body - cardiovascular, respiratory and CNS. Along with heart rate and blood pressure measurements, the cardiovascular assessment will also assess if the test article has the potential to alter cardiac ion channel currents and prolong the cardiac QT interval of the electrocardiogram. Additionally, effects on the central nervous system (CNS) and respiratory systems are assessed to complete the battery of studies to evaluate the vital organ systems of the body. Supplemental studies can also be performed to assess the renal, gastrointestinal and autonomic nervous systems, as well as, dependency potential. We have assays (both *in vitro* and *in vivo*) and can perform the screening prior to the

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commencement of first-in-human clinical trials. Our capabilities can also be used to investigate the mode of action behind an adverse effect found in a safety assessment study.

Toxicology. We have expertise in the design and execution of development programs in support of a broad diversity of therapeutic modalities, including small organics, peptides, proteins, oligonucleotides, antibody-based platforms, and many other innovative pharmaceutical products. We also support safety studies to test industrial chemical, agrochemicals, consumer products, veterinary medicines and medical devices. For human pharmaceutical candidates, once a lead molecule is selected, toxicology studies are required to support clinical trials in humans and for new drug registration. These toxicology studies focus on assessing the safety of the potential therapeutic to determine if administration to humans might cause any unintended harmful effects. For new chemicals, industrial chemicals, agrochemicals and medical devices, safety studies are performed to identify potential hazards to humans and the environment and are required for regulatory registration. Toxicology studies performed for any of these compounds are typically performed using *in vitro* and *in vivo* research models to identify any potential adverse effects that a compound has on an organism over a variety of doses and over various time periods of exposure.

Our toxicology services feature:

- a broad offering of *in vitro* and *in vivo* capabilities and study types designed to identify possible safety risks;
- a broad offering of *in vitro* and *in vivo* studies in support of general toxicology (acute, sub-acute and chronic studies), genetic toxicology, safety pharmacology and carcinogenicity bioassays that are required for regulatory submissions supporting “first-in-human” to “first-to-the-market” strategies for potential human therapeutics;
- a broad offering of *in vitro* and *in vivo* studies in support of general toxicology (acute, sub-acute and chronic studies), genetic toxicology, reproductive and developmental toxicology, environmental toxicology and carcinogenicity bioassays that are required for regulatory submissions supporting the registration of industrial chemicals, agrochemicals and biocides;
- expertise in standard and specialty routes of administration (e.g., infusion, intravitreal, intrathecal and inhalation) that are important not only for the testing of potential pharmaceuticals and biopharmaceuticals, but also for the safety testing of medical devices, nutraceuticals, animal health products and other materials;
- expertise in the conduct and assessment of reproductive, developmental and juvenile toxicology studies (in support of larger-scale and later-stage human clinical trials or chemical registration);
- expertise in environmental toxicology (aquatic and terrestrial) and regulatory submissions required for chemical and agrochemical registration;
- services in important specialty areas such as ocular, bone, juvenile/neonatal, immune-toxicology, ototoxicology, photobiology, inhalation, drug abuse liability, seizure liability testing, radiation biology, surgery, genomic analysis, imaging capabilities and dermal testing;
- expertise in determining the potential for abuse of human pharmaceuticals (Drug Abuse Liability Testing);
- expertise in testing of medical devices in the assessment of those devices and surrounding tissues;
- expertise in immunology and immunotoxicology, including cell therapy products;
- expertise in all major therapeutic areas, particularly in cell and gene therapy, and orphan drugs;
- study design and strategic advice to our clients based on our wealth of experience and scientific expertise in support of drug development and chemical registration; and
- a strong history of assisting our clients in achieving their regulatory and/or internal milestones for the safety testing of numerous therapy types including cell-based therapies, vaccines, gene therapies, proteins, antibodies, drug conjugates, oligonucleotide biotherapeutics, small molecules, medical devices, chemicals and agrochemicals.

Our safety assessment facilities comply with GLP to the extent required by the FDA, Environmental Protection Agency, USDA, European Medicines Agency, European Chemicals Agency and the Organization for Economic Co-operation and Development (OECD), as well as other international regulatory agencies. Furthermore, our early-stage discovery work, which is not subject to GLP standards, is typically carried out under a quality management system such as ISO 9100 or similarly constructed internally developed quality systems. Our facilities are regularly inspected by U.S. and other regulatory compliance monitoring authorities, our clients’ quality assurance departments and our own internal quality assessment program.

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Pathology Services. The ability to identify and characterize clinical and anatomic pathologic changes is critical in determining the safety and efficacy of potential new therapeutics, industrial and agriculture chemicals and medical devices. Key "go/no-go" decisions regarding continued product development are typically dependent on the identification, characterization and evaluation of fluid, tissue and cellular changes that our experts identify and interpret for our clients. We employ many highly trained veterinary anatomic and clinical pathologists and other scientists who use state-of-the-art techniques to identify potential test compound-related changes. In addition to all standard anatomic and clinical pathology techniques, we provide specialized evaluations such as cytology, platelet function, assay development, immunohistochemistry, in situ hybridization, electron microscopy, image analysis, tissue morphometry and stereology services.

Manufacturing Support

Our Manufacturing Support segment is comprised of three businesses: Microbial Solutions, Biologics Testing Solutions and Avian Vaccine Services.

Microbial Solutions. Our Microbial Solutions business provides *in vitro* methods for conventional and rapid quality control testing of sterile and non-sterile biopharmaceutical and consumer products, and includes our Endosafe®, Celsis® and Accugenix® businesses. Our Endosafe® business provides lot release testing of medical devices and injectable drugs for endotoxin contamination. Our Celsis® business provides rapid microbial detection systems for quality control testing in the pharmaceutical and consumer products industries. Our Accugenix® business provides state-of-the-art microbial identification services for manufacturing in the biopharmaceutical, medical device, nutraceutical and consumer care industries. We expect our comprehensive portfolio to drive increased adoption of our quality control testing solutions across both sterile and non-sterile applications.

Endosafe®. We are a market leader in endotoxin testing products and services, which are used for FDA-required quality control testing of injectable drugs and medical devices, their components, and the processes by which they are manufactured. Endotoxin testing is an *in vitro* process which uses a processed extract from horseshoe crabs, known as limulus amebocyte lysate (LAL). The LAL test is the first and most successful FDA-validated alternative to an *in vivo* test to date. The extraction of the raw materials for LAL does not harm the crabs, which are subsequently returned to their natural ocean environment. Our Microbial Solutions business produces and distributes a comprehensive portfolio of endotoxin testing, microbial detection and identification kits, reagents, software, accessories, instruments and associated microbial quality control laboratory services to a broad range of companies manufacturing and releasing products from the pharmaceutical, biotechnology and consumer products industries, including the dairy, food and beverage markets through a strategic partnership. We are a market leader in endotoxin testing products and services, which are used for FDA-required quality control testing of injectable drugs and medical devices, their components, and the processes by which they are manufactured.

One of the primary growth drivers in our Microbial Solutions business is our FDA-approved line of next-generation endotoxin testing products. This line is based on the Endosafe Portable Testing System (Endosafe ® -PTS™) technology, which allows rapid endotoxin testing in the central laboratory or manufacturing environment. In recent years, we expanded the PTS product portfolio to include a multiple sample testing system known as the Endosafe®-MCS™ (multi-cartridge system) and the first fully automated robotic system developed specifically for high-volume endotoxin testing, Endosafe®-Nexus, to satisfy the demand of our clients who require higher sample throughput. We have seen expanded use of this rapid endotoxin testing technology as clients transition from traditional methods to our rapid cartridge technology.

Celsis®. Celsis' systems are principally used for product-release testing to help ensure the safe manufacture of pharmaceutical and consumer products, including the Celsis Advance II™ and Celsis Accel™ systems for rapid microbial detection applications. In 2019, we launched a suite of products focused on sterility testing. Sterility testing is required prior to the release of sterile injectable products. The legacy method required a 14-day sample incubation period and was subjective. Using the Celsis® protocol and instrumentation, clients can detect contamination within 6 days and make definitive product release decisions.

Accugenix®. Our Accugenix® global lab network is the premier provider of ISO17025-accredited contract microbial identification services. Accugenix® is an industry leader in species-level identification and strain typing of bacteria and fungi that are recovered from manufacturing facilities. Utilizing state-of-the-art and proprietary technologies, coupled with scientific expertise and analysis, Accugenix® excels in providing accurate, timely, and cost-effective microbial identification services required to meet internal quality standards and government regulations.

Biologics Testing Solutions. We perform specialized testing of biologics frequently outsourced by pharmaceutical and biotechnology companies globally. Our laboratories in the U.S., Germany, Scotland, Ireland and France provide timely and regulatory-compliant services in the areas of analytical, molecular biology, virology, cell-based bioassays, bioanalysis,

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immunochemistry, microbiology, cell biology, *in vivo* studies and related services. We provide analytical characterization, lot release and safety testing support for chemistry, manufacturing and controls and investigational new drug (IND) filings and confirm that biomanufacturing of clinical drug candidates and commercial drugs are consistent, correctly defined, stable and essentially contaminant free. This testing is required by the FDA, EMA and other international regulatory authorities for our clients to obtain new drug approvals, to maintain government-licensed manufacturing facilities and to manufacture and release market-approved therapeutic products for patient treatment.

Our cGMP manufacturing services facilities grow and store well-characterized early-stage client cell lines for later development or manufacture of therapeutic proteins and vaccines for clinical trials. We further design and provide viral clearance programs for Phase I, II and III human clinical studies in our German and U.S. facilities.

To meet growing demand, we are currently expanding our Biologics Testing Solutions service offerings and facilities in the U.S. and Europe.

Avian Vaccine Services. We are the global leader for the supply of SPF fertile chicken eggs and chickens. SPF chicken embryos are used by vaccine producers as self-contained "bioreactors" for the manufacture of live viruses. These viruses are used as a raw material for human and veterinary vaccine applications. The production of SPF eggs is performed under biosecure conditions, similar in many ways to our research model production. We have a worldwide presence, with several SPF egg production facilities in the U.S., and contracted production capabilities in Hungary. We also operate a specialized avian laboratory in the U.S., which provides quality control test reagents for our SPF flocks, offers testing services to vaccine companies and commercial poultry operations and manufactures poultry diagnostics and bulk antigens for poultry vaccines.

Our Strategy

Our objective is to be the preferred strategic global partner for our clients. Our strategy is to deliver a comprehensive and integrated portfolio of drug discovery and non-clinical development products, services and solutions to support our clients' discovery and early-stage drug research, process development, scale up and manufacturing efforts, and enable them to bring new and improved therapies to market faster and more cost effectively. Separately, through our various Manufacturing segment businesses, we aim to be the premier provider of products and services that ensure our clients produce and release their products safely.

We believe we have certain competitive advantages in executing this strategy because of our continuing focus on the following:

Integrated Early-Stage Portfolio. We are the only large, global CRO with a portfolio of products, services and solutions that focuses on drug discovery and early-stage development. We provide research models and associated services, discovery research studies and services and comprehensive safety assessment studies in both regulated and non-regulated environments. As such, we can collaborate with clients from target discovery through candidate selection. When critical decisions are made regarding which therapeutics will progress from discovery to development, we continue to work alongside our clients as the drug candidates move downstream. Our recognized expertise in early-stage drug research and pharmacology provides us with a competitive advantage and enables our clients to make critical drug development decisions more quickly. We understand our clients' therapies and the challenges they face during the discovery and development process, including mechanism of action, efficacy, drug metabolism, safety assessment and toxicological testing critical for making "go/no-go" decisions.

Pharmaceutical Manufacturing Support Portfolio. We also offer a portfolio of products, services and solutions that supports the process development, scale up and quality control efforts of the biopharmaceutical industry. We provide products and services that support the development and release of commercialized biologics products. In particular, we are an industry leader in the areas of microbial detection and microbial identification to support process development and ongoing commercial production. Our portfolio spans a broad range of traditional and rapid methods, which provide the highest testing quality, enhance productivity and reduce cycle time.

*Deep Scientific Expertis*e. We provide a breadth and depth of scientific expertise across a broad range of therapeutic areas which may be too costly for our clients to build and/or maintain in-house. We provide essential capabilities, including biomarkers, biologics, medicinal chemistry, *in vitro* screening, *in vivo* pharmacology, immunology, pathology, biologics process development testing, microbial detection and identification and other specialty service areas that have high infrastructure costs or are cost-prohibitive for clients to maintain independently. We continue to expand our portfolio in key therapeutic and pharmacology areas to align with our clients' internal drug discovery and development areas of focus. These areas of disease focus and expertise include oncology, metabolism and obesity, immunology, respiratory, bone and musculoskeletal, diabetes, cardiovascular, otology, ophthalmology and CNS. In the

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areas of functional expertise, it includes synthetic and medicinal chemistry, cell line development, *in vitro* and *in vivo* assay development screening, non-clinical imaging, structural biology, process chemistry, reproductive and general toxicology, safety pharmacology, veterinary pathology, bioanalysis, scale up and formulation development, cell and gene therapy, drug abuse liability and medical device testing. We also continue to enhance our small molecule and biologics manufacturing portfolio in areas of greatest industry need, where outsourcing provides major benefits for our clients and where we could provide significant benefits given our unique early development portfolio and global footprint.

Commitment to Animal Welfare. We are committed to being the worldwide leader in the humane care of laboratory animals and implementation of the "3Rs" initiative (Replacement, Reduction and Refinement). As researchers, we are responsible to our clients, our animals and the public for the health and well-being of the animals in our care. We work closely with the scientific community to understand how living conditions, handling procedures and reduction of stress play an important role in the quality and efficiency of research.

Superior Quality and Client Support. We maintain scientific rigor and high-quality standards through management of key performance indicators and an intense focus on biosecurity and quality. These standards allow clients to access our global portfolio of products and services with the confidence that they will obtain consistent results no matter where they choose to obtain their products or conduct their research.

Flexible and Customized Environment to Provide the Right Solutions. Each of our clients is different, with unique needs and specific requirements. We understand the importance of flexibility, and leverage the expertise embedded in our integrated early-stage portfolio to provide customized solutions tailored to the specific need or therapeutic area for a particular client. By utilizing our streamlined and efficient facilities, we help clients create a flexible and integrated infrastructure in order to improve their workload and staffing requirements. This allows our clients to reduce internal capacity and/or staff while ensuring the conduct of effective quality research for their projects. We provide enhanced value to clients who use us as a full-service integrated partner over a longer period of time.

Large, Global Partner. We believe there is an important advantage in being a full service, high-quality provider of research models and associated services, discovery and non-clinical *in vivo* and *in vitro* services and manufacturing support on a global scale. Many of our clients, especially large biopharmaceutical companies, have decided to limit the number of suppliers with which they work. They frequently chose to partner with large Tier 1 CROs like Charles River, who can offer clients support across the early-stage drug research process as a result of broader portfolios and experience in project management. This includes extensive scientific, technical and therapeutic area expertise, real-time access to data through secure portals, provision of data in sponsor-specific formats for data warehousing needs, accelerated reporting, reduced standard reporting timelines and industry-leading Standard Exchange of Non-Clinical Data (SEND) capabilities, a global footprint and streamlined and simplified processes and communications, including professional project and relationship management. We are focused on leveraging our competitive advantages to ensure we are recognized as the premier preferred provider, thereby enabling us to build broader and deeper long-term strategic relationships with our clients.

Our clients' R&D needs continue to evolve. These clients are increasingly emphasizing studies that have greater translation to the clinic so that they can make appropriate decisions regarding the progression of potential therapeutic entities earlier in the development process. The result is a greater focus on discovery services, including *in vivo* pharmacology studies consisting of efficacy and non-GLP DMPK (drug metabolism and pharmacokinetics) studies. Second, these clients are choosing to outsource additional discovery and safety assessment services to increase the efficiency and effectiveness of their drug selection processes.

We believe that this changing environment will provide enhanced outsourcing opportunities for us in the future. We remain optimistic that our clients are increasingly receptive to partnering with CROs as a means of meeting their discovery and non-clinical support needs. We believe that the successful development of new therapies and outsourcing by the pharmaceutical industry will continue to be positive drivers of demand for our products and services.

Global biopharmaceutical companies are continuing to make the decision to outsource more significant tranches of their drug discovery, development and manufacturing processes. Over the past few years we have entered into strategic relationships with leading global biopharmaceutical companies and expanded existing preferred provider agreements with other leading global biopharmaceutical companies. We also continue to broaden and extend our relationships with other research institutions across the portfolio.

We believe that larger biopharmaceutical companies will increasingly focus on efficiencies and execution. They will continue to

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reassess their core differentiators from R&D to commercialization, and which aspects of their drug discovery, development and manufacturing processes they will choose to outsource. We expect they will also continue to be conservative in re-building infrastructure and expertise. This should lead to more opportunities for strategic outsourcing as larger pharmaceutical clients choose to utilize external resources rather than invest in internal infrastructure. By partnering with a CRO like Charles River, they can take advantage of efficiencies in their early-stage research activities that can result in months or years saved in getting a drug to market. In the aggregate, we believe that the evolving large biopharmaceutical R&D business model will make our essential products and services even more relevant to our clients, and allow them to leverage our integrated offerings and expertise to drive their research, non-clinical development and manufacturing efficiency and cost effectiveness.

We believe it is critical to participate in the strategic partnering process because these relationships are likely to extend for lengthy periods of time - three to five years. Furthermore, both the client and the CRO invest heavily in the initial phases of the relationship to successfully transfer work streams and establish governance processes. Given this investment, clients are less likely to change CROs at the conclusion of the initial relationship. Because of this strategy, we have been successfully renewing the majority of our strategic partnerships.

The evolving biopharmaceutical R&D business model, coupled with a robust funding environment, have also led to the emergence of a significant number of new biotechnology companies in recent years that are discovering innovative new therapies. We believe that our portfolio provides flexible solutions that meet the customized needs for virtual and small biotechnology companies, which have limited or no infrastructure. These clients also value our ability to provide a broad range of services where we work hand in hand with our clients to design, plan and manage integrated projects and programs. This includes classically outsourced services, “insourced” services and hybrid offerings blending resources from both our clients and our staff.

Our strategic imperatives are centered around our intense focus on initiatives designed to allow us to drive profitable growth, enhance our operating efficiency and better position ourselves to operate successfully in the current and future business environment, which we believe will collectively enable us to maximize value for our shareholders.

We intend to continue to broaden the scope of the products and services that we provide across the drug discovery and early-stage development continuum primarily through internal development, and, as needed, through focused acquisitions and alliances. Acquisitions, such as our acquisitions of CTL International (Citoxlab) in April 2019 and HemaCare in January 2020, are an integral part of our growth strategy, both to expand our portfolio and broaden our geographic footprint. We believe the acquisition of Citoxlab enhanced our position as a leading global early stage CRO by strengthening our ability to partner with clients across the drug discovery and development continuum. Further, we believe the acquisition of HemaCare enhances our ability to provide a comprehensive cell therapy solution from discovery through commercialization, which we believe will enhance our clients’ efficiency and accelerate their speed-to-market. We are committed to a disciplined approach that seeks to target businesses that are a sound strategic fit and that offer the prospect of enhancing shareholder value, typically including the achievement of a hurdle rate for return on invested capital above our weighted average cost of capital.

In addition to conventional mergers and acquisitions, our long-term strategy includes growth through establishing relationships and exploring other opportunities and areas that have the potential to strengthen our broad-based portfolio of products and services. In particular, our focus has been to drive differentiation through technologies that enhance the speed to develop a clinical candidate and allow biopharmaceutical companies to make earlier go/no-go decisions. Among other arrangements, these relationships may include entering into license agreements, strategic partnerships or joint ventures that will allow us to access cutting-edge or nascent technologies with a modest investment component. Our ability to thoroughly assess these nascent technologies and market opportunities may later result in an acquisition.

We also partner with a diverse set of leading venture capital firms around the world primarily investing in life sciences, health care and therapeutics with an emphasis on early-stage companies. Through these partnerships and close relationships, we gain insight into their company and asset portfolios and are thus able to promote our contract research services for discovery, safety assessment and biologics testing. Thus, we have the opportunity to establish ourselves as a provider of choice for a unique client group that has emerged as biopharmaceutical companies rationalize and prioritize their development pipelines.

Clients

Our clients consist primarily of all of the major biopharmaceutical companies; many biotechnology, agricultural and industrial chemical, life science, veterinary medicine, medical device, diagnostic and consumer product companies; contract research and contract manufacturing organizations; and other commercial entities, as well as leading hospitals, academic institutions and government agencies. We have stable, long-term relationships with many of our clients. During 2019, no single commercial

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client accounted for more than 2% of our total revenue and no single client accounted for more than 10% of the revenue of any of our three business segments.

We continue to pursue a goal of expanding our relationships with our large biopharmaceutical clients, and with many of our larger mid-market clients. These relationships take different forms, from preferred provider arrangements to strategic partnerships. The structure of these relationships incentivizes clients to purchase more products and services across our early-stage portfolio. Because of the strength of these relationships, we have better insight into our clients' planning processes and, therefore, better visibility than in the past. For information regarding revenue attributable to each of our business segments for the last three fiscal years, please see Note 4, "Segment and Geographic Information" included in the Notes to Consolidated Financial Statements included elsewhere in this Form 10-K. For information regarding revenue and long-lived assets attributable to operations in the United States, Europe, Canada, Asia Pacific and other countries for each of the last three fiscal years, please review Note 4, "Segment and Geographic Information" included in the Notes to Consolidated Financial Statements included elsewhere in this Form 10-K.

Sales, Marketing and Customer Support

Our marketing efforts are focused on stimulating demand for further outsourcing across our entire services portfolio. We believe that our ability to provide solutions that address all aspects of early-stage drug research are increasingly attractive to our clients, and we continue to design and market our commercial activities to deliver flexible, customized programs designed by segment to meet our clients' global and site-specific needs.

Our go-to-market approach employs a number of sales and marketing strategies, including dedicated sales teams for each of our major lines of business. We also maintain several sales specialists that either have specific technical expertise (often degreed scientists) or cover unique markets.

In addition to our field sales teams and related specialists, we also have a team of alliance managers who are organized by key client within our market segments (global biopharmaceutical, small and mid-sized pharmaceutical and biotechnology companies, and academic and government institutions). This enhances our ability to meet client needs by offering customized, tailored solutions across our entire portfolio. In addition, our clients benefit by additional support from a combination of technical specialists with specific scientific and therapeutic area expertise. We also apply the use of dedicated sales specialists for certain technical product lines, such as in our Manufacturing businesses.

We sell our products and services principally through our direct sales and business development teams who work in North America, Europe and Asia. In addition to interactions with our direct sales force, our primary promotional activities include organizing scientific symposia, publishing scientific papers and newsletters, hosting webinars and seminars and making presentations at, and participating in, scientific conferences and trade shows in North America, Europe and Asia. We supplement these scientifically based marketing activities with digital marketing, advertising and direct mail. In certain areas, our direct sales force is supplemented by international distributors and agents.

Our internal marketing/product management teams support the field sales and business development teams while developing and implementing programs to create close working relationships with our clients in the biomedical research industry. We maintain client engagement, digital experience, inbound client support, technical assistance, and consulting service departments (in addition to project managers for our service businesses), which address both our clients' routine and more specialized needs and generally serve as a scientific resource for them. We frequently assist our clients in solving problems related to animal husbandry, health and genetics, biosecurity, non-clinical study design, regulatory consulting, protocol development and other areas in which our expertise is widely recognized as a valuable resource by our clients.

Competition

Our goal is to be a leader in each of the markets in which we participate. We compete in the marketplace on the basis of our therapeutic and scientific expertise in early-stage drug research, quality, reputation, flexibility, responsiveness, pricing, innovation and global capabilities. We are able to offer a unique portfolio of early-stage products and services to support drug discovery and development.

We encounter a broad range of competitors of different sizes and capabilities in each of our three businesses segments. We also face competition from the internal discovery and development resources of our clients.

- For RMS, we have four main competitors of which one is a government funded, not-for-profit entity; one is privately held in Europe and two are privately held in the U.S.

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- For DSA, both our Discovery Services and Safety Assessment businesses have numerous competitors. Discovery Services has hundreds of competitors, but three main competitors: two are public companies in China and one is a public company in Europe. Safety Assessment has dozens of competitors of varying size, but one main competitor that is a division of a large public company in the U.S. Our DSA segment also competes with in-house departments of pharmaceutical and biotechnology companies, universities and teaching hospitals.
- For Manufacturing, each of our underlying businesses has several competitors. Microbial Solutions has four main competitors, of which three are public companies in Europe and one is a private company in the U.S. In addition to many smaller competitors, Biologics has five main competitors, of which four are public companies in Europe and one is a public company in China. Avian has one main competitor to its SPF eggs business, which is a private company in Europe, and numerous competitors for specialized avian laboratory services.

Industry Support and Animal Welfare

One of our core values is a concern for, and commitment to, animal welfare. Laboratory animals are an important resource that further our knowledge of living systems and contribute to the discovery of life-saving drugs and procedures. We work hand-in-hand with the scientific community to understand how living conditions, handling procedures and stress play a role in the quality and efficiency of research. As researchers, we are responsible to our clients and the public for the health and well-being of the animals in our care.

We have been in the forefront of animal welfare improvements in our industry, and continue to show our commitment with special recognition programs for employees who demonstrate an extraordinary commitment in this critical aspect of our business. We created our own Humane Care Imperative (HCI), which is directed by our Global Animal Welfare and Training Group. The goal of HCI is to ensure that we continue as a worldwide leader in the humane care of laboratory animals and implementation of the 3Rs (Replacement, Reduction and Refinement).

We are firmly committed to the 3Rs and to reducing the number of animals used by emphasizing health, research animal behavioral management programs and genetic integrity to decrease study data variability. Whenever possible, we use technological advances such as new diagnostic tests for screening pathogens in laboratory rodents, microsampling and *in vitro* assays. We support a wide variety of organizations and individuals working to further animal welfare and the 3Rs, as well as the interests of the biomedical research community. We also partner with clients to develop study designs decreasing the number of animals needed and suggesting pilot studies where appropriate. We maintain a quarterly award recognizing our employees' efforts to continually implement the 3Rs at our sites globally.

We fund scholarships for training in laboratory animal science, provide financial support to non-profit organizations that educate the public about the benefits of animal research and provide awards and prizes to outstanding leaders in the laboratory animal science field and the supporters of 3Rs.

Employees

As of December 28, 2019 (prior to the acquisition of HemaCare), we had approximately 17,100 employees (including approximately 1,900 science professionals with advanced degrees, including Ph.D.s, D.V.M.s and M.D.s). Our employees are not unionized in the U.S. Employees at some of our European facilities are represented by works councils, employee representative groups and/or unions, which is consistent with local customs for our industry. We believe we have good relationships with our employees, based on a number of factors including employee retention.

Backlog

Our backlog for our RMS, DSA and Manufacturing reportable segments was $128.7 million, $1.0 billion and $65.4 million, respectively, as of December 28, 2019 (prior to the acquisition of HemaCare), as compared to $106.5 million, $900.8 million and $74.4 million, respectively, as of December 29, 2018. Related services are performed over varying durations, from short to extended periods of time, which may be as long as several years. We maintain an order backlog to track anticipated revenue from studies and projects that either have not started, but are anticipated to begin in the near future, or are in process and have not been completed. We only recognize a study or project in backlog after we have received written evidence of a client's intention to proceed. Canceled studies or projects are removed from backlog.

We believe our aggregate backlog as of any date is not necessarily a meaningful indicator of our future results for a variety of reasons. First, studies vary in duration (i.e., some studies or projects that are included in December 28, 2019 backlog may be completed in 2020, while others may be completed in later years). Second, the scope of studies or projects may change, which may either increase or decrease their value. Third, studies or projects included in backlog may be subject to bonus or penalty

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payments. Fourth, studies or projects may be terminated or delayed at any time by the client or regulatory authorities for a number of reasons, including the failure of a drug to satisfy safety and efficacy requirements, or a sponsor making a strategic decision that a study or service is no longer necessary. Delayed contracts remain in our backlog until a determination of whether to continue, modify or cancel the study has been made. We may not be able to realize all or most of the net revenues included in backlog or estimate the portion to be filled in the current year.

Regulatory Matters

As our business operates in a number of distinct operating environments and in a variety of locations worldwide, we are subject to numerous, and sometimes overlapping, regulatory environments.

The Animal Welfare Act (AWA) governs the care and use of certain species of animals used for research in the U.S. other than laboratory rats, mice and chickens bred for use in research. As a result, most of our U.S. small animal research models activities and our avian vaccine services operations are not subject to regulation under the AWA. For regulated species, the AWA and the associated Animal Care regulations require producers and users of regulated species to provide veterinary care and to utilize specific husbandry practices such as cage size, shipping conditions, sanitation and environmental enrichment to ensure the welfare of these animals. Separately, facilities using live vertebrate animals in research funded by the U.S. Public Health Service (PHS) must also adhere to the PHS Policy on Humane Care and Use of Laboratory Animals and follow the Guide for the Care and Use of Laboratory Animals produced by the Institute for Laboratory Animal Research.

We comply with licensing and registration requirement standards set by the United States Department of Agriculture (USDA) and similar agencies in other countries such as Europe, China and Japan for the care, handling and use of regulated species and birds bred for research. All of our DSA and RMS facilities in North America and Europe are either accredited or in the process of initiating accreditation by AAALAC International, a private, nonprofit, international organization that promotes the humane treatment of animals in science through voluntary accreditation and assessment programs.

Our import and export of animals and our operations in foreign countries are subject to international agreements and conventions, as well as a variety of national, regional and local laws and regulations, which establish the standards for the humane treatment, care, handling and transport of animals by dealers and research facilities.

We conduct non-clinical safety assessment studies to support the submissions for approval or licensing of our clients' products throughout the world. Many of these studies must comply with national statutory or regulatory requirements for GLP. GLP regulations describe a quality system for the scientific, operational and quality process and the conditions under which non-clinical studies are planned, performed, monitored, recorded, reported and archived. GLP compliance is required by such regulatory agencies as the FDA, United States Environmental Protection Agency, European Medicines Agency, Medicines and Healthcare Products Regulatory Agency in the United Kingdom (U.K.), Health Products Regulatory Authority in Ireland, Health Canada and other similar monitoring authorities in the countries where we operate. GLP requirements are significantly harmonized throughout the world and our laboratories are capable of conducting studies in compliance with all necessary requirements.

Regulatory monitoring authorities such as the FDA, Medicines and Healthcare Products Regulatory Agency and OECD countries have indicated an increased emphasis on the management of electronic records generated by computerized systems to ensure data integrity under newly issued guidance. We have established a formal program to manage regulatory and client expectations regarding data integrity within our regulated businesses. Although each business has a different impact on patient safety, all are expected to generate data with integrity. We recognize the importance of generating quality, reliable, sustainable data and have instituted several processes and established a global governance team with oversight responsibilities for our Data Integrity Compliance Plans to ensure we are consistent in our approach. To ensure that we have proper regulatory oversight over our electronic records, a dedicated quality function reviews our computerized system practices to ensure that appropriate record controls are in place and that a robust audit strategy confirms requirements for compliance.

At a global level, retention of data and controls for electronic systems, proprietary data and quality standards are covered by global policies. We also have controls in place such as quality manuals, policies and procedures, work instructions, document control processes, training, quality assurance and quality control processes and personnel, validated computerized systems and archiving requirements. Within businesses, procedures govern performance of activities to ensure data integrity throughout its life cycle.

Our Manufacturing businesses produce endotoxin test kits, reagents, cell banks used in research and biopharmaceutical production, clinical trial vaccines and vaccine support products. Additionally, several of our laboratories conduct biosafety and analytical testing such as identity, stability, sterility and potency testing in support of our clients' manufacturing programs and

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to fulfill their validation requirements, as applicable. These activities are subject to regulation and consequently require these businesses to be inspected by the FDA and other national regulatory agencies under their respective cGMP regulations. These regulations require that we manufacture our products or perform testing in a prescribed manner with respect to cGMP compliance, and maintain records of our manufacturing, testing and control activities. In addition, the specific activities of some of our businesses require us to hold specialized licenses for the manufacture, distribution and/or marketing of particular products.

All of our sites are subject to licensing and regulation, as appropriate under international treaties and conventions, including national, regional and local laws relating to:

- the surface and air transportation of chemicals, biological reagents and laboratory specimens;
- the handling, use, storage and disposal of chemicals (including narcotics and psychotropic drugs), biological reagents, laboratory specimens, hazardous waste and radioactive materials;
- the procurement, handling, use, storage and disposal of human cells, tissues and cellular and tissue-based products for research purposes;
- the safety and health of employees and visitors to our facilities; and
- protection of the environment and general public.

Global regulatory compliance programs are managed by a dedicated group responsible for regulatory affairs and compliance. Our compliance programs are also managed by global quality systems, such as vendor supplier programs, quality management systems and global computer system validation. Within each regulated business, we have established Quality Assurance Units (QAUs) responsible for risk based internal audit programs to manage regulatory requirements and client expectations. The QAUs operate independently from those individuals that direct and conduct studies, manufacturing or analytical testing. Our Data Integrity Compliance Program ensures that management has proper oversight with QAUs of our electronic records, inclusive of quality function reviews of our computerized system practices to ensure that appropriate record controls are in place and that a robust audit strategy confirms requirements for compliance.

Intellectual Property

We develop and implement computer software and technically derived procedures and products intended to maximize the quality and effectiveness of our services. Although our intellectual property rights are valuable to our success, we believe that such factors as the technical expertise, proprietary know-how, ability and experience of our professionals are more important, and that, overall, these technological capabilities provide significant benefits to our clients. Where we consider it appropriate, steps are taken to protect our know-how through confidentiality agreements and registrations. In addition, we in-license technology and products from other companies when it enhances our product and services businesses. In the future, in-licensing may become a larger initiative to enhance our offerings, particularly as we focus on innovative technologies to enhance our portfolio. With the exception of technology related to our Microbial Solutions testing business, we have no patents, trademarks, licenses, franchises, or concessions that are material and upon which any of our products or services are dependent.

Corporate Governance

We are committed to operating our business with integrity and accountability. We strive to meet or exceed all of the corporate governance standards established by the New York Stock Exchange, the SEC and the U.S. Federal government as implemented by the Sarbanes-Oxley Act of 2002, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 and other applicable laws, rules and regulations. Each member of our Board of Directors, other than our Chief Executive Officer, is independent and has no significant financial, business or personal ties to us or management. All of our board committees (except our Executive Committee and Strategic Planning and Capital Allocation Committee) are composed entirely of independent directors. The Board adheres to our Corporate Governance Guidelines and a Code of Business Conduct and Ethics that has been communicated to employees and posted on our website. We are diligent in complying with established accounting principles and are committed to providing financial information that is transparent, timely and accurate. We have a Related Person Transactions Policy designed to promote the timely identification of such transactions and to ensure we give appropriate consideration to any real or perceived conflicts in our commercial arrangements. We have established global process through which employees, either directly or anonymously, can notify management (and the Audit Committee of the Board of Directors) of alleged accounting and auditing concerns or violations including fraud. Our internal Disclosure Committee meets regularly and operates pursuant to formal disclosure procedures and guidelines to help ensure that our public disclosures, including our periodic reports filed with the SEC, earnings releases and other written information that we disclose to the investment

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community are complete, accurate and timely. We continually monitor developments in the law and stock exchange regulations, as well as overall corporate governance trends and intend to adopt new procedures consistent with such developments to the extent applicable to and appropriate for our Company. Copies of our Corporate Governance Guidelines, Code of Business Conduct and Ethics and Related Person Transactions Policy are available on our website at http://ir.criver.com under the “Investor Relations - Corporate Governance” caption.

Information about Our Executive Officers

Below are the names, ages and principal occupations of each of our current executive officers. All such persons have been elected to serve until their successors are elected and qualified or until their earlier resignation or removal.

James C. Foster, age 69, joined us in 1976 as General Counsel. During his tenure, Mr. Foster has held various staff and managerial positions, and was named Chief Executive Officer and President in 1992 and our Chairman in 2000.

William D. Barbo, age 59, joined us in 1982 as a laboratory technician. Between 1982 and 2005, Mr. Barbo served in a variety of positions of increasing responsibilities. He was named Corporate Vice President of Research Models and Services in 2005, Corporate Senior Vice President of Global Sales and Marketing in 2010, and Corporate Executive Vice President and Chief Commercial Officer in October 2016.

Birgit Girshick, age 50, joined us in 1989 and originally held positions of increasing responsibility in our RMS Germany and RMS Avian Vaccine businesses. In 2004, Ms. Girshick was promoted to General Manager of the RMS Avian Vaccine Services business. She was named Executive Director, RMS Process Improvement in 2009, and Corporate Vice President, Global Biopharmaceutical Services in 2010. In 2013, Ms. Girshick was promoted to Corporate Senior Vice President, Research Models and Biologics Testing Solutions. In 2016, Ms. Girshick was tasked with leading the integration of WIL Research into our Safety Assessment business. Also in 2016, Ms. Girshick assumed the role of Corporate Senior Vice President, Global Discovery Services. In February 2018, Ms. Girshick was appointed Corporate Executive Vice President, Global Discovery and Safety Assessment and in August 2018, additionally took on responsibility for our Biologics Testing Solutions and Avian Vaccine Services business.

David P. Johst, age 58, joined us in 1991 as Corporate Counsel and was named Vice President, Human Resources in 1995. He became Vice President, Human Resources and Administration in 1996, a Senior Vice President in 1999, and a Corporate Executive Vice President in 2005. He currently serves as our General Counsel and Chief Administrative Officer and is responsible for overseeing our corporate legal function and several other corporate staff departments. Prior to joining us, Mr. Johst was in private practice at the law firm of Hale and Dorr (now WilmerHale). On August 2, 2019, we announced that Mr. Johst will retire in May 2020.

Joseph W. LaPlume, age 46, joined us in 2005 as Senior Corporate Counsel. He became Deputy General Counsel in 2010, Vice President, Corporate Development in 2011, Senior Vice President in 2014 and Corporate Executive Vice President, Corporate Development and Strategy in January 2019. In his current role, he oversees all aspects of strategic planning and corporate development activities across business segments and geographies. Prior to joining us, Mr. LaPlume was a corporate lawyer at GTECH Corporation and in private practice at the law firms of Mintz Levin and Goulston & Storrs.

David R. Smith, age 54, has served as our Corporate Executive Vice President and Chief Financial Officer since August 2015. He joined us as Corporate Vice President, Discovery Services through our acquisition of Argenta and BioFocus from Galapagos NV in March 2014 and was promoted to Corporate Senior Vice President, Global Discovery Services, in October 2014. At Galapagos, he served in various capacities, including as Chief Executive Officer of its Galapagos Services division and as Chief Financial Officer. Mr. Smith served as Chief Financial Officer for Cambridge University Hospitals from 2007 to 2013. Mr. Smith spent eight years at PricewaterhouseCoopers prior to joining AstraZeneca in 1997, where he spent the next nine years in various finance and business roles of increasingly greater responsibility.

Item 1A. Risk Factors

Set forth below, elsewhere in this Form 10-K and in other documents we file with the SEC are risks and uncertainties that could cause actual results to differ materially from the results contemplated by the forward-looking statements contained in this Form 10-K. We note that factors set forth below, individually or in the aggregate, as well as additional risks and uncertainties either not presently known or that are currently believed to not be material to the business, may cause our actual results to differ materially from expected and historical results. You should understand that it is not possible to predict or identify all such factors. Consequently, you should not consider the following to be a complete discussion of all potential risks or uncertainties and the risks described below should be carefully considered together with the other information set forth in this report and in future documents we file with the SEC.

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A reduction in demand may adversely affect our business.

Our business could be adversely affected by any significant decrease in drug R&D expenditures by pharmaceutical and biotechnology companies, as well as by academic institutions, government laboratories or private foundations. Similarly, economic factors and industry trends that affect our clients in these industries also affect their R&D budgets and, consequentially, our business as well.

Our clients include researchers at pharmaceutical and biotechnology companies. Our ability to continue to grow and win new business is dependent in large part upon the ability and willingness of the pharmaceutical and biotechnology industries to continue to spend on molecules in the non-clinical phases of R&D (and in particular discovery and safety assessment) and to outsource the products and services we provide. Furthermore, our clients (particularly larger biopharmaceutical companies) continue to search for ways to maximize the return on their investments with a focus on lowering R&D costs per drug candidate. Fluctuations in the expenditure amounts in each phase of the R&D budgets of these researchers and their organizations could have a significant effect on the demand for our products and services. R&D budgets fluctuate due to changes in available resources, mergers of pharmaceutical and biotechnology companies, spending priorities (including available resources of our biotechnology clients, particularly those that are cash-negative, who may be highly focused on rationing their liquid assets in a challenging funding environment), general economic conditions, institutional budgetary policies and the impact of government regulations, including potential drug pricing legislation. Available funding for biotechnology clients in particular may be affected by the capital markets, investment objectives of venture capital investors and priorities of biopharmaceutical industry sponsors.

For additional discussion of the factors that we believe have recently been influencing R&D budgets at our clients, please see the sections entitled “Our Strategy” and "Management’s Discussion and Analysis of Financial Condition and Results of Operations" included elsewhere in this Form 10-K.

Further, our Research Products operations are structured to produce particular blood products based on customers’ existing demand, and perceived potential changes in demand, for these products. Sudden or unexpected changes in demand for these products could have an adverse impact on our profitability. Increasing demand could harm relationships with customers if we are unable to alter production capacity, or purchase products from other suppliers, to fill orders adequately. This could result in a decrease in overall revenue and profits. Decreases in demand may require us to make sizable investments to restructure operations away from declining products to the production of new products. Lack of access to sufficient capital, or lack of adequate time to properly respond to such a change in demand, could result in declining revenue and profits, as customers transfer to other suppliers.

A reduction or delay in government funding of R&D may adversely affect our business.

A portion of revenue, predominantly in our RMS segment, is derived from clients at academic institutions and research laboratories whose funding is partially dependent on both the level and timing of funding from government sources such as the U.S. National Institutes of Health (NIH) and similar domestic and international agencies, which can be difficult to forecast. We also sell directly to the NIH and these other agencies. Government funding of R&D is subject to the political process, which is inherently fluid and unpredictable. Our revenue may be adversely affected if our clients delay purchases as a result of uncertainties surrounding the approval of government budget proposals, included reduced allocations to government agencies that fund R&D activities. Government proposals to reduce or eliminate budgetary deficits have sometimes included reduced allocations to the NIH and other government agencies that fund R&D activities, or NIH funding may not be directed towards projects and studies that require the use of our products and services, both of which could adversely affect our business and our financial results.

Several of our product and service offerings are dependent on a limited source of supply, which if interrupted could adversely affect our business.

We depend on a limited international source of supply for certain products, such as large research models. Disruptions to their continued supply may arise from health problems (including as a result of the spread of diseases, such as coronavirus), export or import laws/restrictions or embargoes, tariffs, international trade regulations, foreign government or economic instability, severe weather conditions, increased competition among suppliers for models, disruptions to the air travel system, activist campaigns, commercial disputes, supplier insolvency or other ordinary course or unanticipated events. Any disruption of supply could materially harm our business if we cannot remove the disruption or are unable to secure an alternative or secondary supply source on comparable commercial terms. While we continue to take steps to find alternative supply channels and lock in supply with preferred sources through multi-year and/or minimum commitment contracts, such mitigating efforts may not prove successful at ensuring a steady and timely supply or may require us to pay significantly higher prices for such products

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during periods of global shortage or restrictions on the transportation of products. In addition, limited global supply or regional restrictions on transportation for certain products may require us to source products from non-preferred vendors.

Further, our Research Products business depends on the availability of appropriate donors. If the level of donor participation declines, we may not be able to reduce costs sufficiently to maintain profitability of the Research Products business. For example, regulations intended to reduce the risk of introducing infectious diseases in the blood supply (including coronavirus) could also result in a decreased pool of potential donors. Due to any pandemic, epidemic or outbreak in one or more regions in which our Research Products business operates, the portion of the public that typically donates may be unable, or unwilling to donate, thereby significantly reducing the availability of research products upon which we rely. In addition, even if suspected diseases prove to be no more virulent than other more common disease, the heightened fear among the public resulting from widespread media coverage may result in a dramatic decline in donations.

We have in the past experienced and in the future could experience an unauthorized access into our information systems.

We operate large and complex information systems that contain significant amounts of client data. As a routine element of our business, we collect, analyze and retain substantial amounts of data pertaining to the non-clinical studies we conduct for our clients. Unauthorized third parties could attempt to gain entry to such information systems to steal data or disrupt the systems. While we have taken measures to protect them from intrusion, in March 2019, we detected evidence that an unauthorized third party, who we believe was well resourced and highly sophisticated, accessed certain of our information systems and copied data. We worked with a leading cyber security firm to assist in our investigation and coordinated with law enforcement authorities. Our investigation indicated that the affected information included client information.

In December 2019, we disclosed that we had completed our remediation of the incident identified in March of 2019. While we have implemented additional security safeguards, including:

- remediation of the March 2019 incident;
- cooperation with U.S. Federal authorities' investigation into the incident and established an ongoing relationship to better understand the ever-changing nature of cybersecurity related threats;
- additional visibility into our network and environment;
- additional monitoring of our environment;
- active threat hunting in our environment;
- a reduction of our footprint of externally facing technology;
- enhanced protection for externally facing web applications;
- the addition of Multi-Factor Authentication to ingress points;
- the addition of denial of service attack protection; and
- increased network segmentation,

such efforts may not be successful, in which case we could suffer significant harm.

Our contracts with our clients typically contain provisions that require us to keep confidential the information generated from the studies we conduct. In the event the confidentiality of such information is compromised, whether by unauthorized access or other breaches, we could be exposed to significant harm, including termination of customer contracts, damage to our customer relationships, damage to our reputation and potential legal claims from customers, employees and other parties. In addition, we may face investigations by government regulators and agencies as a result of a breach.

Further, we are required to comply with the data privacy and security laws in many jurisdictions. For example, we are required to comply with the European Union (EU) General Data Protection Regulation (GDPR), which became effective on May 25, 2018 and imposes heightened obligations and enhanced penalties for noncompliance (including up to four percent (4%) of global revenue). The cost of compliance, and the potential for fines and penalties for non-compliance, with GDPR may have a significant adverse effect on our business and operations. Also, the California legislature passed the California Consumer Privacy Act (CCPA), which became effective January 1, 2020. The CCPA creates new transparency requirements and grants California residents several new rights with regard their personal information. Failure to comply with the CCPA may result in, among other things, significant civil penalties and injunctive relief, or potential statutory or actual damages. We have made changes to, and investments in, our business practices and will continue to monitor developments and make appropriate

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changes to help attain compliance with these evolving and complex regulations. Additionally, while collecting research products from donors, we may collect, use, disclose, maintain and transmit patient information in ways that will be subject to many of the numerous state, federal and international laws and regulations governing the collection, use, disclosure, storage, transmission or confidentiality of patient-identifiable health information.

Contaminations in our animal populations can damage our inventory, harm our reputation for contaminant-free production, result in decreased sales and cause us to incur additional costs.

Our research models and fertile chicken eggs must be free of certain infectious agents, such as certain viruses and bacteria, because the presence of these contaminants can distort or compromise the quality of research results and could adversely impact human or animal health. The presence of these infectious agents in our animal production facilities and certain service operations could disrupt our contaminant-free research model and fertile egg production as well as our animal services businesses, including GEMS, harm our reputation for contaminant-free production and result in decreased sales. There also exists a risk that contaminations from models that we produce may affect our client's facilities, with similar impact to them for which we could be liable for damages. In some cases, we may produce or import animals carrying infectious agents capable of causing disease in humans; and in the case of such a contamination or undiagnosed infection, there could be a possible risk of human exposure and infection and liability for damages to infected persons.

We are also subject to similar contamination risks with respect to our large research models. While some of these models are owned by us and maintained at our facilities, others are reserved for us and maintained at sites operated by the original provider. Accordingly, risk of contamination may be outside of our control, and we depend on the practices and protocols of third parties to ensure a contamination-free environment. A contamination may require extended CDC quarantine with subsequent reduced sales as a result of lost client orders, as well as the potential for complete inventory loss and disinfection of the affected quarantine rooms. Furthermore, while we often negotiate for contractual risk indemnification, the third party may refuse to fulfill its indemnification obligation or may be unable to as a result of insolvency or other impediments.

Contaminations are unanticipated and difficult to predict and could adversely impact our financial results. If they occur, contaminations typically require cleaning up, renovating, disinfecting, retesting and restarting production or services. Such clean-ups result in inventory loss, clean-up and start-up costs, and reduced sales as a result of lost client orders and potentially credits for prior shipments. In addition to microbiological contaminations, the potential for genetic mix-ups or mis-matings also exists and may require us to restart the applicable colonies, and would likely result in inventory loss, additional start-up costs and possibly reduced sales. Contaminations also expose us to risks that clients will request compensation for damages in excess of our contractual indemnification requirements.

Further, many of our operations are comprised of complex mechanical systems that are subject to periodic failure, including aging fatigue. Such failures are unpredictable, and while we have made significant capital expenditures designed to create redundancy within these mechanical systems, strengthen our biosecurity, improve our operating procedures to protect against such contaminations, and replace impaired systems and equipment in advance of such events, failures and/or contaminations may still occur.

Any failure by us to comply with applicable regulations and related guidance could harm our reputation and operating results, and compliance with new regulations and guidance may result in additional costs.

Any failure on our part to comply with applicable regulations could result in the termination of ongoing research or the disqualification of data for submission on behalf of our clients to regulatory authorities. This could harm our reputation, our prospects for future work and our operating results. For example, the issuance of a notice of objectionable observations or a warning letter from the FDA based on a finding of a material violation affecting data integrity by us for GLP or cGMP requirements that are not addressed to the regulatory monitoring authorities' satisfaction could materially and adversely affect us. If our operations are found to violate any applicable law or other governmental regulations, we might be subject to civil and criminal penalties, damages and fines. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses, divert our management's attention from the operation of our business and damage our reputation.

In recent years FDA has issued guidance that now requires submissions to be presented in a format that conforms with the FDA's SEND (Standardization for Exchange of Nonclinical Data) standards that apply to our clients' NDA and IND submissions and require us to provide electronic data in specific formats that will allow for more efficient, higher quality regulatory reviews. Accordingly, our clients expect us to timely deliver their nonclinical data compliant with SEND. Notwithstanding, some of these standards require additional operating and capital expenses that will impact not only us and our industry competitors, but clients in the biomedical research community. Non-compliance with any of these expectations

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could lead to official action by a government authority, damage to our reputation and a potential loss of business.

In addition, regulations and guidance worldwide concerning the production and use of laboratory animals for research purposes continue to evolve. Similarly, guidance has been and continues to be developed for other areas that impact the biomedical research community on both a national and international basis including transportation, mandated contingency planning, euthanasia guidance, import and export requirements of biological materials, health monitoring requirements and the use of disinfectants.

Our Research Products business is subject to extensive and complex regulation by federal, state and local governments in the U.S. and in the other countries in which it operates. This business requires us to obtain many licenses, permits, authorizations, approvals, certificates and other types of governmental permissions and to comply with various regulations in every jurisdiction in which we operate. Federal, state and local regulations change often, and new regulations are frequently adopted. Changes in the regulations could require us to change the way in which we operate our business and the cost of compliance with new or changed regulations could be significant.

Our donor collection centers are registered with the FDA and the FDA periodically conducts inspections of those facilities and operations. At the conclusion of each inspection, the FDA provides us with a list of observations of regulatory issues discovered during the inspection that could result in additional regulatory action. Failure to comply with the regulations of the FDA could result in sanctions and/or remedies and have a material adverse effect on us.

The outsourcing trend in non-clinical (discovery and safety assessment) stages of drug discovery and development may decrease, which could impair our growth.

Over the past decade, pharmaceutical and biotechnology companies have generally increased their outsourcing of non-clinical research support activities, such as discovery and safety assessment. While many industry analysts expect the outsourcing trend to continue to increase for the next several years (although with different growth rates for different phases of drug discovery and development), decreases in such outsourcing may result in a diminished growth rate in the sales of any one or more of our service lines and may adversely affect our financial condition and results of operations. For additional discussion of the factors that we believe have recently influenced outsourcing demand from our clients, please see the section entitled "Our Strategy" included elsewhere in this Form 10-K.

Changes in government regulation or in practices relating to the pharmaceutical or biotechnology industries, including potential healthcare reform, could decrease the need for the services we provide.

Governmental agencies throughout the world strictly regulate the drug development process. Our business involves helping our customers navigate these regulatory processes. Accordingly, many regulations, and often new regulations, are expected to result in higher regulatory standards and often additional revenues for companies that service these industries. However, some changes in regulations, such as a relaxation in regulatory requirements or the introduction of streamlined or expedited drug approval procedures, or an increase in regulatory requirements that we have difficulty satisfying or that make our services less competitive, could eliminate or substantially reduce the demand for our services.

Although we believe we are currently in compliance in all material respects with applicable national, regional and local laws, as well as other accepted guidance used by oversight bodies (including the USDA, the standards set by the International Air Transport Association, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, U.S. Fish and Wildlife Service, The Centers for Disease Control, the Department of Transportation, the Department of State, the office of Laboratory Animal Welfare of NIH, the Drug Enforcement Agency, as well as numerous other oversight agencies in the jurisdictions in which we operate), failure to comply could subject us to denial of the right to conduct business, fines, criminal penalties and other enforcement actions. In addition, if regulatory authorities were to mandate a significant reduction in safety assessment procedures that utilize laboratory animals (as has been advocated by certain groups), certain segments of our business could be materially adversely affected.

In March 2010, the U.S. Congress enacted healthcare reform legislation, the Patient Protection and Affordable Care Act (ACA), which includes provisions impacting drug manufacturers, such as (1) the expansion of access to health insurance coverage, (2) the expansion of the Medicaid program, (3) the enactment of an industry fee on pharmaceutical companies and (4) the imposition of an excise tax on the sale of medical devices. In addition, the Tax Cuts and Jobs Act, enacted in 2017, repeals the ACA's individual health insurance mandate, which is considered a key component of the ACA. Since the ACA and its implementation continue to face challenges in Congress and federal courts, and from certain state governments, opposition advocacy groups and some small business organizations, the ultimate effects of this legislation are unclear on our business and are unable to predict what legislative proposals will be adopted in the future.

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Implementation of healthcare reform legislation may have certain benefits, but also may contain costs that could limit the profits that can be made from the development of new drugs. This could adversely affect R&D expenditures by pharmaceutical and biotechnology companies, which could in turn decrease the business opportunities available to us both in the U.S. and abroad. In addition, new laws or regulations may create a risk of liability, increase our costs or limit our service offerings. Furthermore, if health insurers were to change their practices with respect to reimbursements for pharmaceutical products, our clients may spend less or reduce their growth in spending on R&D.

While it is not possible to predict whether and when any such changes will occur, changes at the local, state or federal level, or in laws and regulations in effect in foreign jurisdictions in which we operate or have business relationships, may significantly impact our domestic and foreign businesses and/or those of our clients. Furthermore, modifications to international trade policy, public company reporting requirements, environmental regulation and antitrust enforcement may have a materially adverse impact on us, our suppliers or our clients.

We bear financial risk for contracts that may be terminated or reduced in scope, underpriced, subject to cost overruns or delayed.

Many of our agreements, including those which underlie our strategic relationships with some of our more significant clients, provide for termination or reduction in scope with little or no notice. In addition, we sell our products and services to our competitors, and similarly they sell products and services to us. For instance, we have historically entered into, and currently are party to, contracts with certain of our competitors to distribute specialty research models in locations where our competitors may not have distribution capabilities.

Our counterparties (including our clients who are competitors) may elect to terminate their agreements with us for various reasons including:

- the products being tested fail to satisfy safety requirements;
- unexpected or undesired study results;
- production problems resulting in shortages of the drug being tested;
- a client's decision to forego or terminate a particular study;
- our competitors' establishment of alternative distribution channels;
- dissatisfaction with our performance under the agreement;
- the loss of funding for the particular research study; or
- general convenience/counterparty preference.

If a counterparty terminates a contract with us, we are typically entitled under the terms of the contract to receive revenue earned to date as well as certain other costs and, in some cases, termination fees. Cancellation of a large contract or proximate delay, cancellation or conclusion of multiple contracts could materially adversely affect our business and, therefore, may adversely affect our operating results.

Furthermore, many of our contracts provide for services on a fixed price or fee-for-service with a cap basis and, accordingly, we bear the financial risk if we initially underprice our contracts or otherwise overrun our cost estimates. Such underpricing or significant cost overruns could have an adverse effect on the our business, results of operations, financial condition and cash flows.

If we are not successful in selecting and integrating the businesses and technologies we acquire, or in managing our current and future divestitures, our business may be adversely impacted.

During the last two decades, we have steadily expanded our business through numerous acquisitions, including our recent acquisitions of Citoxlab and HemaCare. We plan to continue to acquire businesses and technologies and form strategic alliances. However, businesses and technologies may not be available on terms and conditions we find acceptable. We risk spending time and money investigating and negotiating with potential acquisition or alliance partners, but not completing transactions.

Acquisitions and alliances involve numerous risks which may include:

- difficulties in achieving business and financial success;

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- difficulties and expenses incurred in assimilating and integrating operations, services, products, technologies or pre-existing relationships with our clients, distributors and suppliers;
- challenges with developing and operating new businesses, including those that are materially different from our existing businesses and that may require the development or acquisition of new internal capabilities and expertise;
- potential losses resulting from undiscovered liabilities of acquired companies that are not covered by the indemnification we may obtain from the seller or the insurance we acquire in connection with the transaction;
- loss of key employees;
- the presence or absence of adequate internal controls and/or significant fraud in the financial systems of acquired companies;
- diversion of management's attention from other business concerns;
- a more expansive regulatory environment;
- acquisitions could be dilutive to earnings, or in the event of acquisitions made through the issuance of our common stock to the shareholders of the acquired company, dilutive to the percentage of ownership of our existing shareholders;
- differences in foreign business practices, customs and importation regulations, language and other cultural barriers in connection with the acquisition of foreign companies;
- new technologies and products may be developed that cause businesses or assets we acquire to become less valuable; and
- disagreements or disputes with prior owners of an acquired business, technology, service or product that may result in litigation expenses and diversion of our management's attention.

If an acquired business, technology or an alliance does not meet our expectations, our results of operations may be adversely affected.

Some of the same risks exist when we decide to sell a business, site or product line. In addition, divestitures could involve additional risks, including the following:

- difficulties in the separation of operations, services, products, and personnel;
- diversion of management's attention from other business concerns; and
- the need to agree to retain or assume certain current or future liabilities in order to complete the divestiture.

We continually evaluate the performance and strategic fit of our businesses (including specific product lines and service offerings) to determine whether any divestitures are appropriate. Any divestitures may result in significant write-offs, including those related to goodwill and other intangible assets and which could have an adverse effect on our results of operations and financial condition. In addition, we may encounter difficulty in finding buyers or alternative exit strategies at acceptable prices and terms, and in a timely manner. We may not be successful in managing these or any other significant risks that we encounter in divesting a business, site or product line or service offering and, as a result, we may not achieve some or all of the expected benefits of the divestiture.

Impairment of goodwill or other intangible assets may adversely impact future results of operations.

We have intangible assets, including goodwill, on our balance sheet due to our acquisitions of businesses. The initial identification and valuation of these intangible assets and the determination of the estimated useful lives at the time of acquisition involve use of management judgments and estimates. These estimates are based on, among other factors, projections of cash flows that arise from identifiable intangible assets of acquired businesses and discount rates based on an analysis of our weighted average cost of capital, adjusted for specific risks associated with the assets. Disruptions in global financial markets and deterioration of economic conditions could, among other things, impact the discount rate. Other assumptions used in the valuations and actual cash flows arising from a particular intangible asset could vary from projected cash flows, which could imply different carrying values from those established at the dates of acquisition and which could result in impairment of such assets.

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If the future growth and operating results of our business are not as strong as anticipated, overall macroeconomic or industry conditions deteriorate and/or our market capitalization declines, this could impact the assumptions used in establishing the carrying value of goodwill or other intangible assets. To the extent goodwill or other intangible assets are impaired, their carrying value will be written down to their implied fair values and a charge will be made to our income from continuing operations. Such an impairment charge could materially and adversely affect our operating results. As of December 28, 2019, the carrying amount of goodwill and other intangibles on our consolidated balance sheet was $2.2 billion.

Our business is subject to changes in foreign currency exchange rates and other risks relating to operating internationally.

A significant part of our revenue is derived from operations outside the U.S. We expect that international revenue will continue to account for a significant percentage of our total revenue for the foreseeable future.

Changes in foreign currency exchange rates, could materially adversely impact our results. Foreign currencies we receive for sales and in which we record expenses outside the U.S. could be subject to unfavorable exchange rates with the U.S. dollar, resulting in a reduction in the amount of revenue and cash flow (and an increase in the amount of expenses) that we recognize and causing fluctuations in reported financial results. We also carry foreign currency exposure associated with differences between where we conduct business. For example, certain contracts are frequently denominated in currencies other than the currency in which we incur expenses related to those contracts. Where expenses are incurred in currencies other than those in which contracts are priced, fluctuations in the relative value of those currencies could have a material adverse effect on our results of operations.

Our exposure to currency exchange rate fluctuations results from the currency translation exposure associated with the preparation of our consolidated financial statements, as well as from the exposure associated with transactions of our subsidiaries that are denominated in a currency other than the respective subsidiary's functional currency. While our financial results are reported in U.S. Dollars, the financial statements of many of our subsidiaries outside the U.S. are prepared using the local currency as the functional currency. During consolidation, these results are translated into U.S. Dollars by applying appropriate exchange rates. As a result, fluctuations in the exchange rate of the U.S. Dollar relative to the local currencies in which our foreign subsidiaries report could cause significant fluctuations in our reported results. Moreover, as exchange rates vary, revenue and other operating results may differ materially from our expectations. Adjustments resulting from financial statement translations are included as a separate component of shareholders' equity.

Other risks associated with our international business include:

- potentially negative consequences from changes in U.S. and/or foreign tax laws, or interpretations thereof, notably tax regulations issued and to-be-issued with respect to U.S. Tax Reform and the EU Anti-Tax Avoidance Directives I and II;
- general economic and political conditions in the markets in which we operate, including possible implications of Brexit;
- potential international conflicts, including terrorist acts;
- exchange controls, adverse tax consequences and legal restrictions on the repatriation of funds into the U.S.;
- difficulties and costs associated with staffing and managing foreign operations, including risks of work stoppages and/or strikes, as well as violations of local laws or anti-bribery laws such as the U.S. Foreign Corrupt Practices Act (FCPA), the U.K. Bribery Act and the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions;
- unexpected changes in regulatory requirements;
- the difficulties of compliance with a wide variety of foreign laws and regulations;
- unfavorable labor regulations in foreign jurisdictions;
- longer accounts receivable cycles in certain foreign countries; and
- compliance with export controls, import requirements and other trade regulations, including those relating to certain products of which there is limited supply.

These risks, individually or in the aggregate, could have an adverse effect on our results of operations and financial condition. For example, as mentioned above, we are subject to compliance with the FCPA and similar anti-bribery laws, which generally prohibit companies and their third-party intermediaries from making improper payments to foreign government officials for the

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purpose of obtaining or retaining business. While our employees, distributors and agents are required to comply with these laws, we cannot be sure that our internal policies and procedures will always protect us from violations of these laws despite our commitment to legal compliance and corporate ethics. The occurrence or allegation of these types of risks may adversely affect our business, performance, prospects, value, financial condition and results of operations.

Our operations might be affected by the occurrence of a natural disaster or other catastrophic event.

We depend on our customers and facilities for the continued operation of our business. While we maintain disaster recovery plans, they might not adequately protect us. Despite any precautions we take for natural disasters or other catastrophic events, these events, including terrorist attack, a pandemic, epidemic or outbreak of a disease (including coronavirus), hurricanes, fire, floods and ice and snow storms, could result in damage to and closure of our or our customers' facilities or the infrastructure on which such facilities rely. Such disruptions could significant delays in the shipments of our products, reduce our capacity to provide services, eradicate unique manufacturing capabilities, result in our customers' inability to pay for our products or services and, ultimately, result in the loss of revenue and clients. Although we carry business interruption insurance policies and typically have provisions in our contracts that protect us in certain events, our coverage might not be adequate to compensate us for all losses that may occur. Any natural disaster or catastrophic event affecting us or our customers could have a significant negative impact on our operations and financial performance.

Failure to comply with U.S., state, local or international environmental, health and safety laws and regulations, including regulations issued by the Occupational Safety and Health Administration, Environmental Protection Agency, Nuclear Regulatory Agency and Department of Transportation, could result in fines and penalties and loss of licensure, and have a material adverse effect upon the Company's business.

We are subject to licensing and regulation under laws and regulations relating to the protection of the environment and human health and safety, including laws and regulations relating to the handling, transportation and disposal of medical specimens, infectious and hazardous waste and radioactive materials, as well as regulations relating to the safety and health of laboratory employees. Failure to comply with these laws and regulations could subject us to denial of the right to conduct business, fines, criminal penalties and/or other enforcement actions that could have a material adverse effect on our business. In addition, compliance with future legislation could impose additional requirements on us that may be costly.

New technologies may be developed, validated and increasingly used in biomedical research, which could reduce demand for some of our products and services.

The scientific and research communities continue to explore methods to develop improved cellular and animal model systems that would increase the translation to human studies and vice-versa and possibly replace or supplement the use of traditional living animals as test platforms in biomedical research. Some companies have developed techniques in these areas that may have scientific merit to improve translation between species. In addition, technological improvements to existing or new processes, such as imaging and other translational biomarker technologies, could result in the refinement and utility for the number of animal research models necessary to improve the translation from non-clinical to clinical studies. There is an increasing push to focus on *in vitro* technologies such that employ human biospecimens, stem cell technologies and genome editing.

It is our strategy to explore these *in vitro* technologies to refine and potentially reduce the utilization of animal models as these new methods become validated. For example, our Discovery and Safety Assessment businesses have programs to evaluate the utility of induced pluripotent stems cells, advanced *in vitro* models, artificial intelligence and machine learning in discovery and preclinical development. Successful commercialization of alternatives to traditional research models may not be sufficient to fully offset reduced sales or profits from research models. In addition, alternative research methods could decrease the need for future research models, and we may not be able to develop new products effectively or in a timely manner to replace any lost sales. Lastly, other companies or entities may develop research models with characteristics different than the ones that we produce, and which may be viewed as more desirable by some of our clients.

Negative attention from special interest groups may impair our business.

The products and services that we provide our clients are essential to the drug discovery, development and manufacturing processes, and a significant amount are mandated by law. Notwithstanding, certain special interest groups categorically object to the use of animals for valid research purposes. Historically, our core research model activities with rats, mice and other rodents have not been the subject of significant animal rights media attention. However, research activities with animals have been the subject of adverse attention, including shareholder proposals and attempts to disrupt air carriers from transporting research models, impacting the industry. This has included periodic demonstrations near facilities operated by us and at our

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annual meetings, as well as shareholder proposals we received for some of our past Annual Meetings of Shareholders. Any negative attention, threats or acts of vandalism directed against either our animal research activities or our third-party service providers, such as our airline carriers, in the future could impair our ability to operate our business efficiently.

Our debt level could adversely affect our business and growth prospects.

As of December 28, 2019, we had $1.9 billion of debt. Our debt could have significant adverse effects on our business, including making it more difficult for us to obtain additional financing on favorable terms; requiring us to dedicate a substantial portion of our cash flows from operations to the repayment of debt and the interest on this debt; limiting our ability to capitalize on significant business opportunities; and making us more vulnerable to rising interest rates. For additional information regarding our debt, please see Note 9, "Long-Term Debt and Finance Lease Obligations", included in the Notes to Consolidated Financial Statements included elsewhere in this Form 10-K.

The interest rate on our $2.3 billion credit facility (Credit Facility), which matures in fiscal year 2023, is linked to LIBOR. As of December 28, 2019, amounts outstanding on our Credit Facility were $193.8 million on our term loan and $676.1 million on our revolving credit facility, for which there is an aggregate available borrowing capacity of $2.05 billion. In 2017, the Financial Conduct Authority (FCA) in the U.K. announced that it would phase out LIBOR as a benchmark by the end of 2021. It is unclear whether new methods of calculating LIBOR will be established such that it continues to exist after 2021, or whether different benchmark rates used to price indebtedness will develop. If LIBOR ceases to exist, the method and rate used to calculate our interest rates and/or payments on our debt in the future may result in interest rates and/or payments that are higher than, or that do not otherwise correlate over time with, the interest rates and/or payments that would have been applicable to our obligations if LIBOR was available in its current form, which could have a material adverse effect on our financial position, results of operations and liquidity. While we continue to take steps to mitigate the impact of the phase-out or replacement of LIBOR, such efforts may not prove successful. In addition, the overall financial market may be disrupted as a result of the phase-out or replacement of LIBOR. Disruption in the financial market could also have a material adverse effect on our financial position, results of operations and liquidity.

Costs increasing more rapidly than market prices could reduce profitability.

The cost of collecting, processing and testing blood products has risen significantly in recent years and will likely continue to increase. These cost increases are related to new and improved testing procedures, increased regulatory requirements related to blood safety, and higher staff and supply costs related to collecting and processing blood products. Competition and fixed price contracts may limit our ability to maintain existing operating margins. Some competitors have greater resources than us to sustain periods of marginally profitable or unprofitable sales. Costs increasing more rapidly than market prices may reduce profitability and may have a material adverse impact on our business and results of operations.

The industries in which we operate are highly competitive.

The industries in which we operate are highly competitive. We compete for business with other CROs and blood product and therapeutic services companies, as well as internal discovery and development departments within our larger clients, who may have greater resources than ours. We also compete with universities and teaching hospitals for outsourced services. We compete on a variety of factors, including:

- reputation for on-time quality performance;
- reputation for regulatory compliance;
- expertise and experience in multiple specialized areas;
- scope and breadth of service and product offerings across the drug discovery and development spectrum;
- scope and breadth of service and product offerings across the manufacturing support spectrum;
- ability to provide flexible and customized solutions to support our clients' drug discovery, non-clinical development, and manufacturing support needs;
- broad geographic availability (with consistent quality);
- price/value, spend and flexibility;
- technological and scientific expertise and efficient drug development processes;
- quality of facilities;

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- financial stability;
- size;
- ability to acquire, process, analyze and report data in an accurate manner; and
- accessibility of client data through secure portals.

If we do not compete successfully, our business will suffer. Increased competition might lead to price and other concessions that could adversely affect our operating results. The drug discovery and development services industry has continued to see a trend towards consolidation, particularly among the biotechnology companies, which are targets for each other and for large pharmaceutical companies. If this trend continues, it is likely to produce more competition among the larger companies and CROs generally, with respect to both clients and acquisition candidates. In addition, small, specialized entities considering entering the CRO industries will continue to find lower barriers to entry, and private equity firms may determine that there are opportunities to acquire and consolidate these companies, thus further increasing possible competition. More generally, our competitors or others might develop technologies, services or products that are more effective or commercially attractive than our current or future technologies, services or products, or that render our technologies, services or products less competitive or obsolete. If competitors introduce superior technologies, services or products and we cannot make enhancements to ours to remain competitive, our competitive position, and in turn our business, revenue and financial condition, would be materially and adversely affected. In the aggregate, these competitive pressures may affect the attractiveness of our technologies, services or products and could adversely affect our financial results.

Changes in U.S. and International Tax Law.

In 2017, significant U.S. tax law changes from the Tax Cuts and Jobs Act of 2017 (U.S. Tax Reform) went into effect and reduced the U.S. federal statutory tax rate, broadened the corporate tax base through the elimination or reduction of deductions, exclusions and credits, limited the ability of U.S. corporations to deduct interest expense and allowed for the repatriation of foreign earnings to the U.S. with a 100% federal dividends received deduction prospectively. In addition, U.S. Tax Reform required a one-time transitional tax on foreign cash equivalents and previously unremitted earnings. Several of the new provisions enacted as part of U.S. Tax Reform still require clarification and guidance from the Internal Revenue Service (IRS) and Treasury Department. These or other changes in U.S. tax laws could impact our profits, effective tax rate and cash flows.

Additionally, the OECD, the European Commission (EC) and individual taxing jurisdictions have recently focused on issues related to the taxation of multinational corporations. The OECD released its comprehensive plan to create an agreed set of rules to address concerns regarding base erosion and profit shifting (BEPS). This initiative resulted in proposed and enacted changes to tax laws in various countries including France, Germany, Luxembourg, Netherlands and the U.K. In addition, the OECD and EC and individual countries are examining how taxing rights should be allocated among countries considering the digital economy. Future changes to tax laws or interpretation of tax laws resulting from enacted laws could increase our effective tax rate, which would affect our profitability.

We receive substantial tax credits in Canada, from both the Canadian federal and Quebec governments, France and the U.K. Any reduction in the availability or amount of these tax credits or increase to tax rates due to tax law changes or outcomes of tax controversies could have a material adverse effect on our profits, cash flows and effective tax rate.

Contract research services create a risk of liability.

As a CRO, we face a range of potential liabilities, which may include:

- risks associated with errors or omissions in reporting of study detail in non-clinical studies that may lead to inaccurate reports, which may undermine the usefulness of a study or data from the study, or which may potentially advance studies absent the necessary support or inhibit studies from proceeding to the next level of testing;
- risks associated with our possible failure to properly care for our clients' property, such as research models and samples, study compounds, records, work in progress, other archived materials or goods and materials in transit, while in our possession;
- risks that models in our breeding facilities or in facilities that we manage may be infected with diseases that may be harmful and even lethal to them or humans, despite preventive measures for the quarantine and handling of imported animals;
- risks that we may have errors and omissions and/or product liabilities related to our products designed to conduct

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lot release testing of medical devices, injectable drugs, food, beverages and home and beauty products (primarily through our Microbial Solutions business), or in the testing of biologics and other services performed by our Biologics business, which could result in us or our clients failing to identify unsafe or contaminated materials; and

- risk of transmitting dangerous infectious diseases, as a result of the failure of our screening and testing processes, or new pathogens that may be undetected by such processes.

While we attempt to mitigate these risks through a variety of methods, it is impossible to completely eradicate such risks. In our RMS business, we mitigate these risks to the best of our abilities through our regimen of animal testing, quarantine procedures and veterinary staff vigilance, through which we seek to control the exposure of animal related disease or infections. In our DSA and Manufacturing businesses, we attempt to reduce these risks by contractual risk transfer provisions entitling us to be indemnified by our clients and subject to a limitation of liability, by insurance maintained by our clients and/or by us and by various regulatory requirements we must follow in connection with our business.

Contractual risk transfer indemnifications generally do not protect us against liability arising from certain of our own actions, such as negligence or misconduct. We could be materially and adversely affected if we are required to pay damages or bear the costs of defending any claim that is outside any contractual indemnification provision, or if a party does not fulfill its indemnification obligations or the damage is beyond the scope or level of insurance coverage. We also often contractually indemnify our clients (subject to a limitation of liability), similar to the way they indemnify us, and we may be materially adversely affected if we have to fulfill our indemnity obligations. Furthermore, either we or a party required to indemnify us may not be able to maintain such insurance coverage (either at all or on terms acceptable to us).

Upgrading and integrating our business systems could result in implementation issues and business disruptions.

In recent years, we have been updating and consolidating systems and automating processes in many parts of our business with a variety of systems, including in connection with the integration of acquired businesses. The expansion and ongoing implementation of the systems may occur at a future date based on value to the business. In general, the process of planning and preparing for these types of integrated, wide-scale implementations is extremely complex and we are required to address a number of challenges, including information security assessment and remediation, data conversion, network and system cutover and user training. Problems in any of these areas could cause operational problems during implementation including delayed shipments, missed sales, billing errors and accounting errors.

The failure to successfully obtain, maintain and enforce intellectual property rights and defend against challenges to our intellectual property rights could adversely affect us.

Many of our services, products and processes rely on intellectual property. In some cases, that intellectual property is owned by another party and licensed to us, sometimes exclusively. To protect our intellectual property rights, we primarily rely upon trade secret law, confidentiality agreements and policies, invention assignments and other contractual arrangements, along with patent, copyright and trademark laws. Existing laws of certain countries outside of the United States in which we operate offer only limited protection, and these are subject to change at any time. In addition, the agreements upon which we rely to protect our intellectual property might be breached, or might not be fully enforceable. Our intellectual property rights might not prevent our competitors from independently developing intellectual property that is similar to or duplicative of ours. Also, enforcing our intellectual property rights might also require substantial time, money and oversight, and we might not be successful in enforcing our rights. If we are unable to obtain or maintain the proprietary rights to our intellectual property, if we are unable to prevent attempted infringement against our intellectual property, or if we are unable to defend against claims that we are infringing on another party’s intellectual property, we could be adversely affected. These adverse effects could include us having to abandon, alter or delay the deployment of products, services or processes that rely on such intellectual property; having to procure and pay for licenses from the holders of intellectual property rights that we seek to use; and having to pay damages, fines, court costs and attorney's fees in connection with intellectual property litigation.

Further, the drug discovery and development industry has a history of patent and other intellectual property litigation and these lawsuits will likely continue. Legal proceedings relating to intellectual property are expensive, take significant time, and divert management’s attention from other business concerns, whether we win or lose. If we do not prevail in an infringement lawsuit brought against us, we may have to pay substantial damages, including treble damages, and we could be required to stop the infringing activity or obtain a license to use technology on unfavorable terms.

We may not be able to successfully develop and market new services and products.

We may seek to develop and market new services and products that complement or expand our existing business or service offerings. We believe our ability to in-license new technologies from third parties will be critical to our ability to offer new

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products and services to our clients. Our ability to gain access to technologies that we need for new products and services depends, in part, on our ability to convince inventors and their agents or assignees that we can successfully commercialize their inventions. We cannot guarantee that we will be able to identify new technologies of interest to our clients. Even if we are able to identify new technologies of interest, we may not be able to negotiate license agreements on acceptable terms, or at all. If we are unable to develop new services and products and/or create demand for those newly developed services and products, our future business, results of operations, financial condition and cash flows could be adversely affected.

The decision by British voters to exit the European Union may adversely affect our business.

The first stage of the U.K.'s withdrawal from the European Union ("Brexit") took place on January 31, 2020, when the U.K. left the European Union and entered a transition phase. During the transition phase, the U.K. needs to negotiate the terms of its future trading and other relationships with the European Union. The scope and timing of these negotiations have created significant uncertainty and continue to do so. The U.K. Prime Minister has said that a trade agreement needs to be reached by December 31, 2020. There is currently no mechanism to automatically extend the transition period, but there is a possibility that the transition period may be extended by agreement between the U.K. and the European Union.

Given the continuing uncertainty concerning the terms of the U.K.'s future relationship with the European Union, including the possibility that there may still be no negotiated agreement despite the results of the December 2019 general election, we have formed a committee (comprised of senior managers across our business functions) to address key risks among four main themes: (1) trade and customs, (2) employees and immigration, (3) strategy and business planning and (4) legislative changes. That committee will continue until the situation is clarified.

In the absence of a trade deal in the short to medium term, the U.K.'s trade with the European Union and the rest of the world would be subject to tariffs and duties set by the World Trade Organization. Additionally, the movement of goods between the U.K. and the remaining member states of the European Union will be subject to additional inspections and documentation checks, leading to possible delays at ports of entry and departure. These changes to the trading relationship between the U.K and European Union would likely result in increased cost of goods imported into and exported from the U.K. and may decrease the profitability of our U.K. and other operations. Additional currency volatility could drive a weaker British pound, which increases the cost of goods imported into our U.K. operations and may decrease the profitability of our U.K. operations. A weaker British pound versus the U.S. dollar also causes local currency results of our U.K. operations to be translated into fewer U.S. dollars during a reporting period. Although we are undertaking efforts to mitigate those risks within our control, a failure to adequately mitigate such risks or other factors outside our control could adversely affect our business, business opportunities, results of operations, financial condition and cash flows.

We depend on key personnel and may not be able to retain these employees or recruit additional qualified personnel, which would harm our business.

Our success depends to a significant extent on the continued services of our senior management and other members of management. James C. Foster, our Chief Executive Officer and President since 1992 and Chairman since 2000, has held various positions with us for four decades. While we entered into an employment agreement with Mr. Foster in 2018, most members of our senior management do not have employment agreements. If Mr. Foster or other members of senior management do not continue in their present positions, our business may be adversely impacted.

Because of the specialized scientific nature of our business, we are highly dependent upon attracting and retaining qualified scientific, technical and managerial personnel. While we have a strong record of employee retention, and we strive to reduce the impact of the potential loss of existing employees by having an established organizational talent review process that identifies successors and potential talent needs, there is still significant competition for qualified personnel in the veterinary, pharmaceutical and biotechnology fields. Therefore, we may not be able to attract and retain the qualified personnel necessary for the development of our business. The loss of the services of existing personnel, as well as the failure to recruit additional key scientific, technical and managerial personnel in a timely manner, could harm our business.

Our quarterly operating results may vary, which could negatively affect the market price of our common stock.

Our results of operations in any quarter may vary from quarter to quarter and are influenced by the risks discussed above, as well as:

- changes in the general global economy;
- changes in the mix of our products and services;
- cyclical buying patterns of our clients;

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- the financial performance of our venture capital investments; and
- the occasional extra week ("53rd week") that we recognize in a fiscal year (and fourth fiscal quarter thereof) due to our fiscal year ending on the last Saturday in December.

We believe that operating results for any particular quarter are not necessarily a meaningful indication of future results. Nonetheless, fluctuations in our quarterly operating results could negatively affect the market price of our common stock.

Since we do not expect to pay any cash dividends for the foreseeable future, our shareholders will benefit from an investment in our common stock only if it appreciates in value.

We have not declared or paid any cash dividends on our common stock, and do not anticipate that we will pay any dividends to holders of our common stock for the foreseeable future. Any payment of cash dividends will be at the discretion of our Board of Directors and will depend on our financial condition, capital requirements, legal requirements, earnings and other factors. Consequently, our shareholders should not rely on dividends to receive a return on their investment.

Item 1B. Unresolved Staff Comments

There are no unresolved comments to be reported in response to Item 1B.

Item 2. Properties

We own or lease the land and buildings where we have facilities. We own large facilities (facilities over 50,000 square feet) for our DSA businesses in Canada, Denmark, France, Hungary, Ireland, Netherlands, Scotland and the U.S. and lease large facilities in England and the U.S. We own large RMS facilities in Canada, France, Germany, Italy, Japan, England and the U.S. We lease large RMS facilities in China. We own large Manufacturing facilities in the U.S. and China. None of our leases is individually material to our business operations. Many of our leases have an option to renew, and we believe that we will be able to successfully renew expiring leases on terms satisfactory to us. We believe that our facilities in each of our reportable segments are adequate for our operations and that suitable additional space will be available when needed. For additional information, see Note 16, "Leases" included in Item 8, "Financial Statements and Supplementary Data" in this Form 10-K.

We track room utilization on an ongoing basis and, depending on the needs of our clients at given times, we may need to execute on contingency plans for expansion, which average between six and fifteen months to complete.

We may also expand at specific sites in order to accommodate needs resulting from any consolidation strategy. We continue to employ a master site planning strategy to proactively evaluate our real estate needs. Sites and leases added to the portfolio by way of acquisition are integrated into our overall real estate strategy. In certain circumstances, we dispose of or consolidate operations, which could result in impairment charges. In situations where the associated real estate is leased, and depending on the resolution of these situations, we may be encumbered with the remaining real estate lease obligations.

Item 3. Legal Proceedings

We are not party to any legal proceedings that are material to our business or financial condition.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

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

Our common stock began trading on the New York Stock Exchange on June 23, 2000 under the symbol "CRL." There were no equity securities that were not registered under the Securities Act of 1933, as amended, sold during fiscal year 2019.

Shareholders

As of January 24, 2020, there were 90 registered shareholders of the outstanding shares of common stock.

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Issuer Purchases of Equity Securities

The following table provides information relating to our purchases of shares of our common stock during the fourth quarter of fiscal 2019:

	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares That May Yet Be Purchased Under the Plans or Programs
				(in thousands)
September 29, 2019 to October 26, 2019	174	$ 128.16	—	$ 129,105
October 27, 2019 to November 23, 2019	48	129.98	—	129,105
November 24, 2019 to December 28, 2019	168	145.25	—	129,105
Total	390		—	

In July 2010, our Board of Directors authorized a $500.0 million stock repurchase program, and subsequently approved increases to the program of $250.0 million in fiscal year 2010, $250.0 million in fiscal year 2013, $150.0 million in fiscal year 2014, and $150.0 million in fiscal year 2017, for an aggregate authorization of $1.3 billion. During the fourth quarter of fiscal year 2019, we did not repurchase any shares of common stock under our stock repurchase program or in open market trading. As of December 28, 2019, we had $129.1 million remaining on the authorized stock repurchase program.

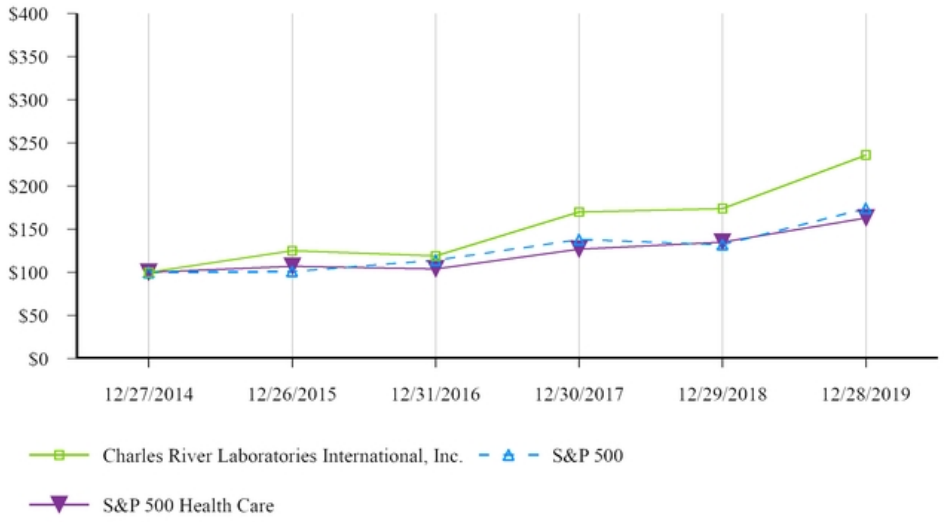
Additionally, our stock-based compensation plans permit the netting of common stock upon vesting of restricted stock, restricted stock units, and performance share units in order to satisfy individual statutory tax withholding requirements.

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Comparison of 5-Year Cumulative Total Return

The following stock performance graph compares the annual percentage change in the Company's cumulative total shareholder return on its Common Stock during a period commencing on December 27, 2014 and ending on December 28, 2019 (as measured by dividing (1) the sum of (A) the cumulative amount of dividends for the measurement period, assuming dividend reinvestment, and (B) the difference between the Company's share price at the end and the beginning of the measurement period; by (2) the share price at the beginning of the measurement period) with the cumulative total return of the S&P 500 Index and the S&P 500 Health Care Index during such period. The Company has not paid any dividends on the Common Stock, and no dividends are included in the representation of the Company's performance. The stock price performance on the graph below is not necessarily indicative of future price performance. The graph is not "soliciting material," is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference in any filing of the Company under the Securities Act of 1933 or the Securities Exchange Act of 1934 whether made before or after the date hereof and irrespective of any general incorporation language in any such filing. Information used in the graph was obtained from Standards & Poor's Institutional Market Services, a source believed to be reliable, but the Company is not responsible for any errors or omissions in such information.

COMPARISON OF 5-YEAR CUMULATIVE TOTAL RETURN
Among Charles River Laboratories International, Inc., The S&P 500 Index and
The S&P 500 Health Care Index



	Fiscal Year					
	2014	2015	2016	2017	2018	2019
Charles River Laboratories International, Inc.	$ 100	$ 125	$ 119	$ 170	$ 174	$ 236
S&P 500	100	101	114	138	132	174
S&P 500 Health Care	100	107	104	127	135	163

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Item 6. Selected Consolidated Financial Data

The selected financial data presented below for the fiscal years ended 2019, 2018, and 2017 and as of the fiscal years ended 2019 and 2018, is derived from our audited consolidated financial statements and should be read in conjunction with "Management's Discussion and Analysis of Financial Condition and Results of Operations" contained in Item 7 and "Financial Statements and Supplementary Data" contained in Item 8 of this Annual Report on Form 10-K. The selected financial data presented below for the fiscal years ended 2016 and 2015 and as of the fiscal years ended 2017, 2016 and 2015, is derived from our audited consolidated financial statements within previously filed Annual Reports on Form 10-K. Our fiscal year is typically based on 52-weeks, with each quarter composed of 13 weeks ending on the last Saturday on, or closest to, March 31, June 30, September 30, and December 31. A 53rd week was included in the fourth quarter of fiscal year 2016, which is occasionally necessary to align with a December 31 calendar year-end.

	Fiscal Year				
	2019	2018	2017	2016	2015
	(in thousands, except per share amounts)				
Statement of Income Data					
Total revenue	$ 2,621,226	$ 2,266,096	$ 1,857,601	$ 1,681,432	$ 1,363,302
Income from continuing operations, net of income taxes	254,061	227,218	125,586	156,086	152,037
Income (loss) from discontinued operations, net of income taxes	—	1,506	(137)	280	(950)
Common Share Data					
Earnings per common share from continuing operations attributable to common shareholders:					
Basic	$ 5.17	$ 4.69	$ 2.60	$ 3.28	$ 3.23
Diluted	$ 5.07	$ 4.59	$ 2.54	$ 3.22	$ 3.15
Other Data					
Depreciation and amortization	$ 198,095	$ 161,779	$ 131,159	$ 126,658	$ 94,881
Capital expenditures	140,514	140,054	82,431	55,288	63,252
Balance Sheet Data (as of period end)					
Cash and cash equivalents	$ 238,014	$ 195,442	$ 163,794	$ 117,626	$ 117,947
Total assets	4,692,790	3,855,879	2,929,922	2,711,800	2,068,497
Long-term debt, net and finance leases	1,849,666	1,636,598	1,114,105	1,207,696	845,997
Redeemable noncontrolling interests	28,647	18,525	16,609	14,659	28,008

Refer to the following included in Item 8, "Financial Statements and Supplementary Data" in this Annual Report on Form 10-K for additional information:

- Note 2, "Business Combinations and Divestiture" concerning the impact of our recent acquisitions, including revenue, operating income, assets acquired and liabilities assumed, and related acquisition and integration costs;
- Note 9, "Long-Term Debt and Finance Lease Obligations" concerning the impact of debt related activities in connection with our recent acquisitions;
- Note 11, "Income Taxes" concerning the impact of U.S. Tax Reform in fiscal year ended 2017; and
- Note 16, "Leases" concerning the impact of adopting Accounting Standards Codification 842, "Leases" beginning in fiscal year 2019.

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

The following discussion should be read in conjunction with our consolidated financial statements and related notes appearing in Item 8, "Financial Statements and Supplementary Data" in this Annual Report on Form 10-K. The following discussion contains forward-looking statements. Actual results may differ significantly from those projected in the forward-looking statements. Factors that might cause future results to differ materially from those projected in the forward-looking statements include, but are not limited to, those discussed in Item 1A, "Risk Factors" and elsewhere in this Annual Report on Form 10-K. Certain percentage changes may not recalculate due to rounding.

Overview

We are a full service, early-stage contract research organization (CRO). For over 70 years, we have been in the business of providing the research models required in research and development of new drugs, devices, and therapies. Over this time, we have built upon our original core competency of laboratory animal medicine and science (research model technologies) to develop a diverse portfolio of discovery and safety assessment services, both Good Laboratory Practice (GLP) and non-GLP, that enable us to support our clients from target identification through non-clinical development. We also provide a suite of products and services to support our clients' manufacturing activities. Utilizing our broad portfolio of products and services enables our clients to create a more flexible drug development model, which reduces their costs, enhances their productivity and effectiveness, and increases speed to market.

Our client base includes all major global biopharmaceutical companies, many biotechnology companies, CROs, agricultural and industrial chemical companies, life science companies, veterinary medicine companies, contract manufacturing companies, medical device companies, and diagnostic and other commercial entities, as well as leading hospitals, academic institutions, and government agencies around the world. We currently operate in over 90 facilities and over 20 countries worldwide, which numbers exclude our Insourcing Solutions (IS) sites.

Segment Reporting

Our three reportable segments are Research Models and Services (RMS), Discovery and Safety Assessment (DSA), and Manufacturing Support (Manufacturing). Our RMS reportable segment includes the Research Models and Research Model Services businesses. Research Models includes the commercial production and sale of small research models, as well as the supply of large research models. Research Model Services includes: Genetically Engineered Models and Services (GEMS), which performs contract breeding and other services associated with genetically engineered research models; Research Animal Diagnostic Services (RADS), which provides health monitoring and diagnostics services related to research models; and Insourcing Solutions (IS), which provides colony management of our clients' research operations (including recruitment, training, staffing, and management services). Our DSA reportable segment includes services required to take a drug through the early development process including discovery services, which are non-regulated services to assist clients with the identification, screening, and selection of a lead compound for drug development, and regulated and non-regulated (GLP and non-GLP) safety assessment services. Our Manufacturing reportable segment includes Microbial Solutions, which provides *in vitro* (non-animal) lot-release testing products, microbial detection products, and species identification services; Biologics Testing Services (Biologics), which performs specialized testing of biologics; Avian Vaccine Services (Avian), which supplies specific-pathogen-free chicken eggs and chickens; and contract development and manufacturing (CDMO) services, which, until we divested this business on February 10, 2017, allowed us to provide formulation design and development, manufacturing, and analytical and stability testing for small molecules.

Recent Acquisitions and Divestiture

Our strategy is to augment internal growth of existing businesses with complementary acquisitions. We continued to make strategic acquisitions designed to expand our portfolio of services to support the drug discovery and development continuum and position us as a market leader in the outsourced discovery services market. Our recent acquisitions and divestiture are described below.

On January 3, 2020, we acquired HemaCare Corporation (HemaCare), a business specializing in the production of human-derived cellular products for the cell therapy market. The acquisition of HemaCare will expand our comprehensive portfolio of early-stage research and manufacturing support solutions to encompass the production and customization of high-quality, human derived cellular products to better support clients' cell therapy programs. The preliminary purchase price of HemaCare was approximately $380 million in cash. The acquisition was funded through a combination of cash on hand and proceeds from our Credit Facility under the multi-currency revolving facility. This business will be reported as part of our RMS reportable segment.

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On August 28, 2019, we acquired an 80% ownership interest in a supplier that supports our DSA reportable segment. The remaining 20% interest is a redeemable non-controlling interest. The preliminary purchase price was $23.4 million, net of a $4.0 million pre-existing relationship for a supply agreement settled upon acquisition, and subject to certain post-closing adjustments that may change the purchase price. The acquisition was funded through a combination of cash on hand and proceeds from our Credit Facility under the multi-currency revolving facility. The business is reported as part of our DSA reportable segment.

On April 29, 2019, we acquired Citoxlab, a non-clinical CRO, specializing in regulated safety assessment services, non-regulated discovery services, and medical device testing. With operations in Europe and North America, the acquisition of Citoxlab further strengthens our position as a leading, global, early-stage CRO by expanding our scientific portfolio and geographic footprint, which enhances our ability to partner with clients across the drug discovery and development continuum. The preliminary purchase price for Citoxlab was $527.7 million in cash, subject to certain post-closing adjustments that may change the purchase price. The acquisition was funded through a combination of cash on hand and proceeds from our Credit Facility under the multi-currency revolving facility. Citoxlab is reported as part of our DSA reportable segment.

On April 3, 2018, we acquired MPI Research, a non-clinical CRO providing comprehensive testing services to biopharmaceutical and medical device companies worldwide. The acquisition enhances our position as a leading global early-stage CRO by strengthening our ability to partner with clients across the drug discovery and development continuum. The purchase price for MPI Research was $829.7 million in cash. The acquisition was funded by borrowings on our Credit Facility as well as the issuance of $500.0 million of 5.5% Senior Notes due 2026 (2026 Senior Notes) in an unregistered offering. MPI Research is reported as part of our DSA reportable segment.

On January 11, 2018, we acquired KWS BioTest Limited (KWS BioTest), a CRO specializing in *in vitro* and *in vivo* discovery testing services for immuno-oncology, inflammatory and infectious diseases. The acquisition enhances our discovery expertise, with complementary offerings that provide our customers with additional tools in the active therapeutic research areas of oncology and immunology. The purchase price for KWS BioTest was $20.3 million in cash. In addition to the initial purchase price, the transaction included aggregate, undiscounted contingent payments of up to £3.0 million based on future performance. During the three months ended September 29, 2018, the terms of these contingent payments were amended, resulting in a fixed payment of £2.0 million, or $2.6 million, which was paid during the three months ended March 30, 2019. The KWS BioTest business is reported as part of our DSA reportable segment.

On August 4, 2017, we acquired Brains On-Line, a CRO providing critical data that advances novel therapeutics for the treatment of central nervous system (CNS) diseases. Brains On-Line strategically expands our existing CNS capabilities and establishes us as a single-source provider for a broad portfolio of discovery CNS services. The purchase price for Brains On-Line was $21.3 million in cash. In addition to the initial purchase price, the transaction included aggregate, undiscounted contingent payments of up to €6.7 million based on future performance. During the first quarter of fiscal year 2019, the terms of these contingent payments were amended, resulting in a fixed payment of $2.6 million, which was paid during the three months ended June 29, 2019. The Brains On-Line business is reported as part of our DSA reportable segment.

On February 10, 2017, we completed the divestiture of our CDMO business to Quotient Clinical Ltd., based in London, England for $75.0 million in proceeds, net of cash, cash equivalents, and working capital adjustments. The CDMO business was acquired in April 2016 as part of the acquisition of WIL Research and was reported in our Manufacturing reportable segment.

Fiscal Quarters

Our fiscal year is typically based on 52-weeks, with each quarter composed of 13 weeks ending on the last Saturday on, or closest to, March 31, June 30, September 30, and December 31. A 53rd week was included in the fourth quarter of fiscal year 2016, which is occasionally necessary to align with a December 31 calendar year-end.

Business Trends

The demand for our products and services continued to increase meaningfully in fiscal year 2019. Our pharmaceutical and biotechnology clients continued to intensify their use of strategic outsourcing to improve their operating efficiency and to access capabilities that they do not maintain internally. Small and mid-size biotechnology clients continued to be the primary driver of revenue growth as these clients benefited from the continued strength in the biotechnology funding environment in fiscal year 2019, from capital markets, partnering with large biopharmaceutical companies, and investment by venture capital. Many of our large biopharmaceutical clients have continued to increase investments in their drug discovery and early-stage development efforts and have strengthened their relationships with both CROs, like Charles River, and biotechnology

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companies to assist them in bringing new drugs to market. Our full service, early-stage portfolio continued to lead to additional client discussions and new business opportunities in fiscal year 2019, as clients seek to outsource larger portions of their early-stage drug research programs to us.

The primary result of these trends was robust revenue growth within our DSA reportable segment in fiscal year 2019, particularly from biotechnology clients. In addition to the acquisition of Citoxlab in April 2019, increased demand and pricing contributed to robust Safety Assessment revenue growth in fiscal year 2019. Our Safety Assessment facilities remained well utilized in fiscal year 2019. Recent acquisitions (most notably Citoxlab and MPI) added modest amounts of available capacity to accommodate increasing client demand. We believe the breadth and depth of our scientific expertise, quality, and responsiveness remain key criteria when our clients make the decision to outsource to us. As biotechnology funding remains robust and our clients continue to pursue their goal of more efficient and effective drug research to bring innovative new therapies to market, they are evaluating outsourcing more of their research programs, such as discovery services. We have enhanced our Discovery Services capabilities to provide clients with a comprehensive portfolio that enables them to start working with us at the earliest stages of the discovery process. We have accomplished this through acquisitions, including Citoxlab's discovery services, KWS BioTest in January 2018 and Brains On-Line in August 2017, and through adding cutting-edge capabilities to our discovery toolkit through partnerships, such as Distributed Bio, BitBio, and Fios Genomics. In fiscal year 2019, demand in our Discovery Services business also increased meaningfully, driven by biotechnology clients as many of these clients either initiated or continued to work with us on integrated programs and other projects. Our efforts to enhance our sales strategies, provide clients with flexible partnering models, and become a trusted scientific partner for our clients' early-stage programs have been successful, and enabled us to attract new clients. Demand from large biopharmaceutical companies also increased. These clients continue to have significant internal discovery capabilities, on which they can choose to rely. In order for large biopharmaceutical clients to increasingly outsource more work to us, we must continue to demonstrate that our services can augment and accelerate our clients' drug discovery processes.

Demand for our products and services that support our clients' manufacturing activities was also robust in fiscal year 2019. Demand for our Microbial Solutions business remained strong as manufacturers continued to increase their use of our rapid microbial testing solutions. Our Biologics business continued to benefit from increased demand for services associated with the growing proportion of biologic drugs in the pipeline and on the market. To support this increased demand, we continued to expand the capacity of our Biologics business.

Demand for our Research Models and Services increased in fiscal year 2019, driven by strong demand for research models in China, higher revenue for research model services, and improved pricing. Demand for research models in China continued to be robust in fiscal year 2019, as clients in this growing market continue to value our high-quality research models. Demand for research models services also improved in fiscal year 2019, particularly for our IS and GEMS businesses. The IS business further benefited from a five-year, $95.7 million contract from the National Institute of Allergy and Infectious Diseases, or NIAID, that commenced in September 2018. The continued effect of the consolidation of internal infrastructure within our large biopharmaceutical clients and a longer-term trend towards more efficient use of research models has led to reduced demand for research models outside of China. We are confident that research models and services will remain essential tools for our clients' drug discovery and early-stage development efforts, and the RMS business will continue to be an important source of cash flow generation for us. In addition, in January 2020, we enhanced the RMS business' growth profile and portfolio of critical research tools that we are able to supply through the acquisition of HemaCare, a premier provider of human-derived cellular products used in cell therapies.

Overview of Results of Operations and Liquidity

Revenue for fiscal year 2019 was $2.6 billion compared to $2.3 billion in fiscal year 2018. The 2019 increase as compared to the corresponding period in 2018 was $355.1 million, or 15.7%, and was primarily due to both growth in our DSA and Manufacturing segments, as discussed in the above "Business Trends" section, as well as the recent acquisitions of Citoxlab and MPI Research; partially offset by the negative effect of changes in foreign currency exchange rates which decreased revenue by $36.1 million, or 1.5%, when compared to the corresponding period in 2018.

In fiscal year 2019, our operating income and operating income margin were $351.2 million and 13.4%, respectively, compared with $331.4 million and 14.6%, respectively, in fiscal year 2018. The increase in operating income was primarily due to increased revenues discussed above and contributions from our recent acquisitions of Citoxlab and MPI Research; partially offset by the following, which decreased the operating income margin: increased amortization expense and costs related to our recent acquisition activity; increased costs incurred in connection with certain global restructuring initiatives, continued investments to support future growth of the businesses, which includes increased investments in personnel (staffing levels and hourly wage increases) and facility expansions (primarily in the RMS and Biologics businesses), and company-wide IT and

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infrastructure projects. Offsetting the decreases in operating income margin were the realization of improved volume, mix, and pricing across our products and services portfolio as well as the impact of recent productivity initiatives across all businesses.

Net income attributable to common shareholders increased to $252.0 million in fiscal year 2019, from $226.4 million in the corresponding period of 2018. The increase in net income attributable to common shareholders of $25.6 million was primarily due to the increase in operating income described above, as well as a lower income tax rate due to recognizing a $20.6 million deferred tax asset in fiscal year 2019 for net operating losses expected to be utilized in the future due to changes in the Company's international financing structure.

During fiscal year 2019, our cash flows from operations was $480.9 million compared with $441.1 million for fiscal year 2018. The increase was primarily driven by the increase to net income and the favorable timing of vendor and supplier payments compared to the same period in 2018, partially offset by unfavorable changes in operating assets and liabilities, specifically related to the timing of net contract balances from contracts with customers (collectively trade receivables, net; deferred revenue; and customer contract deposits), increases in inventory levels in response to customer demand, and higher compensation payments compared to the prior year period.

On October 23, 2019, we issued $500.0 million of 4.25% Senior Notes due in 2028 (2028 Senior Notes) in an unregistered offering. Interest on the 2028 Senior Notes is payable semi-annually on May 1 and November 1, beginning on May 1, 2020. Net proceeds from the 2028 Senior Notes of approximately $494 million, along with available cash, was used to prepay $500.0 million of our term loan under our Credit Facility. Additionally, on November 4, 2019, we amended and restated our Credit Facility by increasing the amount of our multi-currency revolving facility by $500.0 million, from $1.55 billion to $2.05 billion. Under specified circumstances, we have the ability to increase the term loan and/or revolving facility by up to $1.0 billion in the aggregate.

In March 2019, we detected unauthorized access into portions of our information systems and commenced an investigation into the incident, coordinated with U.S. federal law enforcement and leading cyber security experts, and promptly implemented a comprehensive containment and remediation plan. In December 2019, we completed our remediation of this incident. The financial impact of the March 2019 event is not material. Refer to Part I, Item 1A. Risk Factors in this Annual Report on Form 10-K for further details on the results of the remediation efforts.

Critical Accounting Policies and Estimates

Our discussion and analysis of our financial condition and results of operations is based upon our consolidated financial statements prepared in accordance with generally accepted accounting principles in the United States (U.S.). The preparation of these financial statements requires us to make certain estimates and assumptions that may affect the reported amounts of assets and liabilities, the reported amounts of revenues and expenses during the reported periods and related disclosures. These estimates and assumptions are monitored and analyzed by us for changes in facts and circumstances, and material changes in these estimates could occur in the future. We base our estimates on our historical experience, trends in the industry, and various other factors that are believed to be reasonable under the circumstances. Actual results may differ from our estimates under different assumptions or conditions.

We believe that the application of our accounting policies, each of which require significant judgments and estimates on the part of management, are the most critical to aid in fully understanding and evaluating our reported financial results. Our significant accounting policies are more fully described in Note 1, "Description of Business and Summary of Significant Accounting Policies", to our consolidated financial statements contained in Item 8, "Financial Statements and Supplementary Data" in this Annual Report on Form 10-K.

We believe the following represent our critical accounting policies and estimates used in the preparation of our financial statements:

Revenue Recognition

Accounting Standard Codification Topic 606, "Revenue from Contracts with Customers" (ASC 606) became effective for us on December 31, 2017 and was adopted using the modified retrospective method for all contracts not completed as of the date of adoption. For contracts that were modified before the effective date, we reflected the aggregate effect of all modifications when identifying performance obligations and allocating transaction price in accordance with the practical expedient, which did not have a material effect on the cumulative impact of adopting ASC 606. The reported results for fiscal years 2019 and 2018 reflect the application of ASC 606 guidance while the historical results for fiscal year 2017 was prepared under the guidance of ASC 605, "Revenue Recognition" (ASC 605). There is no material difference in the reporting of revenue during fiscal years 2019 and 2018 in accordance with ASC 606 when compared to fiscal year 2017 in accordance with ASC 605.

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Revenue is recognized when, or as, obligations under the terms of a contract are satisfied, which occurs when control of the promised products or services is transferred to customers. Revenue is measured as the amount of consideration we expect to receive in exchange for transferring products or services to a customer ("transaction price").

To the extent the transaction price includes variable consideration, we estimate the amount of variable consideration that should be included in the transaction price utilizing the amount to which we expect to be entitled. Variable consideration is included in the transaction price if, in our judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Estimates of variable consideration and determination of whether to include estimated amounts in the transaction price are based largely on an assessment of our anticipated performance and all information (historical, current and forecasted) that is reasonably available. Sales, value add, and other taxes collected on behalf of third parties are excluded from revenue.

When determining the transaction price of a contract, an adjustment is made if payment from a customer occurs either significantly before or significantly after performance, resulting in a significant financing component. Generally, we do not extend payment terms beyond one year. Applying the practical expedient, we do not assess whether a significant financing component exists if the period between when we perform our obligations under the contract and when the customer pays is one year or less. Our contracts do not generally contain significant financing components.

Contracts with customers may contain multiple performance obligations. For such arrangements, the transaction price is allocated to each performance obligation based on the estimated relative standalone selling prices of the promised products or services underlying each performance obligation. We determine standalone selling prices based on the price at which the performance obligation is sold separately. If the standalone selling price is not observable through past transactions, we estimate the standalone selling price taking into account available information such as market conditions and internally approved pricing guidelines related to the performance obligations.

Contracts are often modified to account for changes in contract specifications and requirements. Contract modifications exist when the modification either creates new, or changes existing, enforceable rights and obligations. Generally, when contract modifications create new performance obligations, the modification is considered to be a separate contract and revenue is recognized prospectively. When contract modifications change existing performance obligations, the existing transaction price and measure of progress for the performance obligation to which it relates is generally recognized as an adjustment to revenue (either as an increase in or a reduction of revenue) on a cumulative catch-up basis.

Product revenue is generally recognized when the customer obtains control of our product, which occurs at a point in time, and may be upon shipment or upon delivery based on the contractual shipping terms of a contract. Service revenue is generally recognized over time as the services are delivered to the customer based on the extent of progress towards completion of the performance obligation. The selection of the method to measure progress towards completion requires judgment and is based on the nature of the products or services to be provided. Depending on which better depicts the transfer of value to the customer, we generally measure our progress using either cost-to-cost (input method) or right-to-invoice (output method). We use the cost-to-cost measure of progress when it best depicts the transfer of value to the customer which occurs as we incur costs on our contract, generally related to fixed fee service contracts. Under the cost-to-cost measure of progress, the extent of progress towards completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. The costs calculation includes variables such as labor hours, allocation of overhead costs, research model costs, and subcontractor costs. Revenue is recorded proportionally as costs are incurred. The right-to-invoice measure of progress is generally related to rate per unit contracts, as the extent of progress towards completion is measured based on discrete service or time-based increments, such as samples tested or labor hours incurred. Revenue is recorded in the amount invoiced since that amount corresponds directly to the value of our performance to date. During fiscal year 2019, $1.6 billion, or approximately 60%, of our total revenue recognized ($2.6 billion) is DSA service revenue transferred over time.

Income Taxes

We prepare and file income tax returns based on our interpretation of each jurisdiction's tax laws and regulations. In preparing our consolidated financial statements, we estimate our income tax liability in each of the jurisdictions in which we operate by estimating our actual current tax expense together with assessing temporary differences resulting from differing treatment of items for tax and financial reporting purposes. These differences result in deferred tax assets and liabilities, which are included in our consolidated balance sheets. Significant management judgment is required in assessing the realizability of our deferred tax assets. In performing this assessment, we consider whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. In making this determination, under the applicable financial accounting standards, we are allowed to consider the scheduled reversal of deferred tax liabilities, projected

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future taxable income, and the effects of tax planning strategies. In the event that actual results differ from our estimates, we adjust our estimates in future periods and we may need to establish a valuation allowance, which could materially impact our financial position and results of operations.

Our valuation allowance increased by $300.2 million from $9.8 million as of December 29, 2018 to $310.0 million as of December 28, 2019. The increase is primarily related to the recognition of $315.5 million of net operating loss deferred tax assets due to changes in our financing structure, $294.9 million of which we do not believe is more likely than not to be utilized.

We account for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. We evaluate uncertain tax positions on a quarterly basis and consider various factors, that include, but are not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, information obtained during in process audit activities and changes in facts or circumstances related to a tax position. We adjust the level of the liability to reflect any subsequent changes in the relevant facts surrounding the uncertain positions. Our liabilities for uncertain tax positions can be relieved only if the contingency becomes legally extinguished through either payment to the taxing authority or the expiration of the statute of limitations, the recognition of the benefits associated with the position meet the "more-likely-than-not" threshold or the liability becomes effectively settled through the controversy process. We consider matters to be effectively settled once the taxing authority has completed all of its required or expected examination procedures, including all appeals and administrative reviews; we have no plans to appeal or litigate any aspect of the tax position; and we believe that it is highly unlikely that the taxing authority would re-examine the related tax position. We also accrue for potential interest and penalties related to unrecognized tax benefits in income tax expense.

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as U.S. Tax Reform. U.S. Tax Reform made broad and complex changes to the U.S. tax code, including, but not limited to, (i) reducing the U.S. federal statutory tax rate from 35% to 21%; (ii) requiring companies to pay a one-time transition tax (Transition Tax) on certain unrepatriated earnings of foreign subsidiaries; (iii) generally eliminating U.S federal income taxes on dividends from foreign subsidiaries; (iv) requiring a current inclusion in U.S. federal taxable income of certain earnings of controlled foreign corporations; (v) eliminating the corporate alternative minimum tax (AMT) and changing how existing AMT credits can be realized; (vi) subjecting certain foreign earnings to U.S. taxation through base erosion anti-abuse tax (BEAT) and global intangible low-taxed income (GILTI); (vii) creating a new limitation on deductible interest expense; (viii) changing rules related to uses and limitations of net operating loss carryforwards created in tax years beginning after December 31, 2017, and (ix) modifying the officer's compensation limitation.

Our accounting for the elements of U.S. Tax Reform is complete. We have made an accounting policy election to treat taxes due on the GILTI inclusion as a current period expense. See Note 11, "Income Taxes" for further discussion.

Goodwill and Intangible Assets

We use assumptions and estimates in determining the fair value of assets acquired and liabilities assumed in a business combination. The determination of the fair value of intangible assets, which represent a significant portion of the purchase price in many of our acquisitions, requires the use of significant judgment with regard to (i) the fair value; and (ii) whether such intangibles are amortizable or non-amortizable and, if the former, the period and the method by which the intangible asset will be amortized. We utilize commonly accepted valuation techniques, such as the income approach and the cost approach, as appropriate, in establishing the fair value of intangible assets. Typically, key assumptions include projections of cash flows that arise from identifiable intangible assets of acquired businesses as well as discount rates based on an analysis of the weighted average cost of capital, adjusted for specific risks associated with the assets.

In our recent acquisitions, customer relationship intangible assets (also referred to as client relationships) have been the most significant identifiable assets acquired. To determine the fair value of the acquired client relationships, we utilized the multiple period excess earnings model (a commonly accepted valuation technique), which includes the following key assumptions: projections of cash flows from the acquired entities, which included future revenue growth rates, operating income margins, and customer attrition rates; as well as discount rates based on an analysis of the acquired entities' weighted average cost of capital. The value of client relationships acquired were $134.6 million for Citoxlab in fiscal year 2019 and $264.9 million for MPI Research in fiscal year 2018.

We review definite-lived intangible assets for impairment when indication of potential impairment exists, such as a significant reduction in cash flows associated with the assets. Actual cash flows arising from a particular intangible asset could vary from

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projected cash flows which could imply different carrying values from those established at the dates of acquisition and which could result in impairment of such asset. No impairments were recognized during 2019, 2018 or 2017.

We evaluate goodwill for impairment annually, during the fourth quarter, and when events occur or circumstances change that may reduce the fair value of the asset below its carrying amount. Events or circumstances that might require an interim evaluation include unexpected adverse business conditions, economic factors, unanticipated technological changes or competitive activities, loss of key personnel and acts by governments and courts. Estimates of future cash flows require assumptions related to revenue and operating income growth, asset-related expenditures, working capital levels and other factors. Different assumptions from those made in our analysis could materially affect projected cash flows and our evaluation of goodwill for impairment.

We have the option to first assess qualitative factors to determine whether it is necessary to perform the two-step goodwill impairment test. If we elect this option and believe, as a result of the qualitative assessment, that it is more-likely-than-not that the carrying value of goodwill is not recoverable, the quantitative two-step impairment test is required; otherwise, no further testing is required. Alternatively, we may elect to not first assess qualitative factors and immediately perform the quantitative two-step impairment test. In the first step, we compare the fair value of our reporting units to their carrying values. If the carrying values of the net assets assigned to the reporting units exceed the fair values of the reporting units, then the second step of the impairment test is performed in order to determine the implied fair value of our goodwill. If the carrying value of the reporting unit's goodwill exceeds its implied fair value, then we would record an impairment loss equal to the difference.

In fiscal years 2019, 2018 and 2017, we elected to perform the quantitative first step of the two-step goodwill impairment test for our reporting units. Fair value was determined by using a weighted combination of a market-based approach and an income approach, as this combination was deemed to be the most indicative of our fair value in an orderly transaction between market participants. Under the market-based approach, we utilized information about our Company as well as publicly available industry information to determine earnings multiples and sales multiples that are used to value our reporting units. Under the income approach, we determined fair value based on the estimated future cash flows of each reporting unit, discounted by an estimated weighted-average cost of capital, which reflects the overall level of inherent risk of the reporting unit and the rate of return an outside investor would expect to earn.

Our 2019, 2018 and 2017 impairment tests indicated that goodwill was not impaired.

Valuation and Impairment of Long-Lived Assets

Long-lived assets to be held and used, including property, plant, and equipment, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of the assets or asset group may not be recoverable. Factors we consider important that could trigger an impairment review include, but are not limited to, the following:

- significant underperformance relative to expected historical or projected future operating results;
- significant negative industry or economic trends; or
- significant changes or developments in strategy or operations that negatively affect the utilization of our long-lived assets.

Determination of recoverability is based on an estimate of undiscounted future cash flows resulting from the use of the asset, net of any sublease income, if applicable, and its eventual disposition. In the event that such cash flows are not expected to be sufficient to recover the carrying amount of the assets, the assets are written-down to their fair values. We measure any impairment based on a projected discounted cash flow method using a discount rate determined by management to be commensurate with the risk inherent in our current business model. Significant judgments are required to estimate future cash flows, including the selection of appropriate discount rates and other assumptions. We may also estimate fair value based on market prices for similar assets, as appropriate. Changes in these estimates and assumptions could materially affect the determination of fair value for these assets.

In fiscal 2017, we recognized $17.7 million of asset impairment and accelerated depreciation charges on the RMS facility in Frederick, Maryland in connection with our 2017 RMS restructuring initiatives.

Pension and Other Post-Retirement Benefit Plans

Several of our U.S. and non-U.S. subsidiaries sponsor defined benefit pension and other post-retirement benefit plans. We recognize the funded status of our defined benefit pension and other postretirement benefit plans as an asset or liability. This

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amount is defined as the difference between the fair value of plan assets and the benefit obligation. We measure plan assets and benefit obligations as of the date of our fiscal year end.

The cost and obligations of these arrangements are calculated using many assumptions to estimate the benefits that the employee earns while working, the amount of which cannot be completely determined until the benefit payments cease. Major assumptions used in the accounting for these employee benefit plans include the expected return on plan assets, withdrawal and mortality rates, discount rate, and rate of increase in employee compensation levels. Assumptions are determined based on our data and appropriate market indicators, and are evaluated each year as of the plans' measurement date. Should any of these assumptions change, they would have an effect on net periodic pension costs and the unfunded benefit obligation.

The expected long-term rate of return on plan assets reflects the average rate of earnings expected on the funds invested, or to be invested, to provide for the benefits included in the projected benefit obligations. In determining the expected long-term rate of return on plan assets, we consider the relative weighting of plan assets, the historical performance of total plan assets and individual asset classes and economic and other indicators of future performance.

The discount rate reflects the rate we would have to pay to purchase high-quality investments that would provide cash sufficient to settle our current pension obligations. A 25 basis point change in the discount rate changes the projected benefit obligation by approximately $20 million for all our plans.

The rate of compensation increase reflects the expected annual salary increases for the plan participants based on historical experience and the current employee compensation strategy.

In fiscal year 2019, new mortality improvement scales were issued in the U.S. and U.K reflecting a decline in longevity projection from the 2018 releases that we adopted, which decreased our benefit obligations by $2.8 million as of December 28, 2019. In fiscal year 2018, new mortality improvement scales were issued in the U.S. and U.K. reflecting a decline in longevity projection from the 2017 releases that we adopted, which decreased our benefit obligations by $1.7 million as of December 29, 2018.

On January 31, 2019, we commenced the process to terminate the Charles River Laboratories, Inc. Pension Plan (U.S. Pension Plan) and expect to complete the termination process during the second half of fiscal year 2020. As part of the planned termination, we re-balanced assets to better match the characteristics of the liabilities. At December 28, 2019, the U.S Pension Plan has a benefit obligation of $94.4 million and plan assets of $91.2 million. The benefit obligation has been valued at the amount expected to be required to settle the obligations. Assumptions utilized considered the portion of obligations expected to be settled through participant acceptance of lump sum payments or annuities and the cost to purchase annuities, which are subject to change upon actual plan settlement. Increasing the U.S Pension Plan's obligations to reflect the expected settlement value resulted in an actuarial loss of approximately $6 million, which was recorded within Other comprehensive income as part of the annual revaluation for fiscal year 2019. Upon settlement of the benefit obligation, pension losses currently deferred and recorded within Accumulated other comprehensive loss on our consolidated balance sheets will be reclassified to Other expense, net within our consolidated statement of income. As of December 28, 2019, we had unrecognized losses related to the U.S. Pension Plan of approximately $14 million.

Stock-Based Compensation

We grant stock options, restricted stock, restricted stock units (RSUs), and performance share units (PSUs) to employees, and stock options, restricted stock, and RSUs to non-employee directors under stock-based compensation plans. We make certain assumptions in order to value and record expense associated with awards made under our stock-based compensation arrangements. Changes in these assumptions may lead to variability with respect to the timing and amount of expense we recognize in connection with share-based payments. Stock-based compensation is recognized as an expense in the consolidated statements of income based on the grant date fair value, adjusted for forfeitures when they occur, over the requisite service period.

Determining the appropriate valuation model and related assumptions requires judgment. The fair value of stock options granted is calculated using the Black-Scholes option-pricing model and the fair value of PSUs is estimated using a lattice model with a Monte Carlo simulation, both of which require the use of subjective assumptions including volatility and expected term, among others.

Determining the appropriate amount to expense based on the anticipated achievement of PSU's performance targets requires judgment, including forecasting the achievement of future financial targets. The estimate of expense is revised periodically based on the probability of achieving the required performance targets. The cumulative impact of any changes to our estimates is reflected in the period of change.

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New Accounting Pronouncements

For a discussion of new accounting pronouncements, refer to Note 1, “Description of Business and Summary of Significant Accounting Policies” to our consolidated financial statements contained in Item 8, “Financial Statements and Supplementary Data,” in this Annual Report on Form 10-K.

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Results of Operations

Fiscal Year 2019 Compared to Fiscal Year 2018

Revenue and Operating Income

The following tables present consolidated revenue by type and by reportable segment:

	Fiscal Year			
	2019	2018	$ change	% change
	(in millions, except percentages)			
Service revenue	$ 2,029.4	$ 1,687.9	$ 341.5	20.2%
Product revenue	591.8	578.2	13.6	2.4%
Total revenue	$ 2,621.2	$ 2,266.1	$ 355.1	15.7%

	Fiscal Year				
	2019	2018	$ change	% change	Impact of FX
	(in millions, except percentages)				
RMS	$ 537.1	$ 519.7	$ 17.4	3.3%	(1.9)%
DSA	1,619.0	1,316.9	302.1	22.9%	(1.1)%
Manufacturing	465.1	429.5	35.6	8.3%	(2.7)%
Total revenue	$ 2,621.2	$ 2,266.1	$ 355.1	15.7%	(1.5)%

The following table presents operating income by reportable segment:

	Fiscal Year			
	2019	2018	$ change	% change
	(in millions, except percentages)			
RMS	$ 133.9	$ 136.5	$ (2.6)	(1.9)%
DSA	258.9	227.6	31.3	13.8 %
Manufacturing	145.4	136.2	9.2	6.8 %
Unallocated corporate	(187.0)	(168.9)	(18.1)	10.8 %
Total operating income	$ 351.2	$ 331.4	$ 19.8	6.0 %
Operating income % of revenue	13.4%	14.6%		(1.2)%

The following presents and discusses our consolidated financial results by each of our reportable segments:

RMS

	Fiscal Year				
	2019	2018	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 537.1	$ 519.7	$ 17.4	3.3 %	(1.9)%
Cost of revenue (excluding amortization of intangible assets)	333.7	319.8	13.9	4.3 %	
Selling, general and administrative	68.1	61.8	6.3	10.1 %	
Amortization of intangible assets	1.4	1.6	(0.2)	(12.9)%	
Operating income	$ 133.9	$ 136.5	$ (2.6)	(1.9)%	
Operating income % of revenue	24.9%	26.3%		(1.4)%	

RMS revenue increased $17.4 million, or 3.3%, due primarily to higher research model services revenue and higher research model product revenue in China. Research model services benefited from a large government contract in the IS business and strong client demand in the GEMS business resulting from increased research and development activity conducted across biotechnology and academic institutional clients. Partially offsetting these increases were the effect of changes in foreign currency exchange rates and lower research model product revenue outside of China, particularly from large biopharmaceutical clients.

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RMS operating income decreased $2.6 million, or 1.9%, compared to the corresponding period in 2018. RMS operating income as a percentage of revenue for fiscal year 2019 was 24.9%, a decrease of 1.4% from 26.3% for the corresponding period in 2018. Operating income and operating income as a percentage of revenue decreased primarily due to higher cost of revenue and selling, general, and administrative expenses to support the growth of the businesses, which included the following: a $2.2 million charge recorded within selling, general and administrative costs in fiscal year 2019 in connection with the modification of the option to purchase the remaining 8% equity interest in Vital River, increased investments in personnel (staffing levels and hourly wage increases), higher severance charges in connection with certain global restructuring initiatives, and facility expansions (primarily in China). In addition, operating income as a percentage of revenue decreased due to lower operating income margins on the aforementioned large government contract, and lower sales volume for research models outside of China.

DSA

	Fiscal Year				
	2019	2018	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 1,619.0	$ 1,316.9	$ 302.1	22.9 %	(1.1)%
Cost of revenue (excluding amortization of intangible assets)	1,104.1	903.9	200.2	22.2 %	
Selling, general and administrative	176.9	131.2	45.7	34.8 %	
Amortization of intangible assets	79.1	54.2	24.9	45.9 %	
Operating income	$ 258.9	$ 227.6	$ 31.3	13.8 %	
Operating income % of revenue	16.0%	17.3%		(1.3)%	

DSA revenue increased $302.1 million, or 22.9%, due primarily to the recent acquisitions of Citoxlab and MPI Research, which contributed $123.7 million and $73.0 million, respectively, to service revenue growth. Additionally, service revenue increased in both the Safety Assessment and Discovery Services businesses due to demand from biotechnology clients and increased pricing of services. These increases were partially offset by the effect of changes in foreign currency exchange rates.

DSA operating income increased $31.3 million, or 13.8%, compared to the corresponding period in 2018. DSA operating income as a percentage of revenue for fiscal year 2019 was 16.0%, a decrease of 1.3% from 17.3% for the corresponding period in 2018. The increase to operating income was primarily attributable to contributions from our recent acquisitions of Citoxlab and MPI Research. This increase was partially offset by increased costs in both cost of revenue and selling, general, and administrative expenses to support the growth of the businesses, which included the following: increased investments in personnel (staffing levels and hourly wage increases); increased investments related to facility expansions; higher severance charges in connection with certain global restructuring initiatives, and higher amortization of intangible assets and acquisition and integration costs associated with our recent acquisitions. These increased costs collectively decreased operating income as a percentage of revenue in 2019 compared to 2018.

Manufacturing

	Fiscal Year				
	2019	2018	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 465.1	$ 429.5	$ 35.6	8.3 %	(2.7)%
Cost of revenue (excluding amortization of intangible assets)	225.0	202.3	22.7	11.2 %	
Selling, general and administrative	85.6	82.0	3.6	4.4 %	
Amortization of intangible assets	9.1	9.0	0.1	0.3 %	
Operating income	$ 145.4	$ 136.2	$ 9.2	6.8 %	
Operating income % of revenue	31.3%	31.7%		(0.4)%	

Manufacturing revenue increased $35.6 million, or 8.3%, due primarily to higher demand for endotoxin products, bioburden products and services, and species identification services in the Microbial Solutions business and higher service revenue in the Biologics business; partially offset by the effect of changes in foreign currency exchange rates.

Manufacturing operating income increased $9.2 million, or 6.8%, compared to the corresponding period in 2018. Manufacturing operating income as a percentage of revenue for fiscal year 2019 was 31.3%, a decrease of 0.4% from 31.7% for the corresponding period in 2018. The increase to operating income was due primarily to the increase in revenue. This increase

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was partially offset by increased costs in both cost of revenue and selling, general, and administrative expenses to support the growth of the businesses, which included the following: increased investments in process improvements to further enhance Microbial Solutions' operating efficiency; increased investments in personnel (staffing levels and hourly wage increases), and increased investments related to facility expansions (primarily in Biologics), and certain site consolidation costs. These increased costs collectively decreased operating income as a percentage of revenue in 2019 compared to 2018.

Unallocated Corporate

	Fiscal Year			
	2019	2018	$ change	% change
	(in millions, except percentages)			
Unallocated corporate	$ 187.0	$ 168.9	$ 18.1	10.8 %
Unallocated corporate % of revenue	7.1%	7.5%		(0.4)%

Unallocated corporate costs consist of selling, general and administrative expenses that are not directly related or allocated to the reportable segments. The increase in unallocated corporate costs of $18.1 million, or 10.8%, compared to the corresponding period in 2018 is related to an increase in compensation, benefits, and other employee-related expenses; costs associated with the evaluation and integration of our recent acquisition activity; and costs related to the remediation of the unauthorized access into our information systems. Costs as a percentage of revenue for fiscal year 2019 was 7.1%, a decrease of 0.4% from 7.5% for the corresponding period in 2018.

Interest Income Interest income, which represents earnings on cash, cash equivalents, and time deposits was $1.5 million and $0.8 million for fiscal years 2019 and 2018, respectively. The increase of $0.7 million was primarily due to higher average cash balances in 2019 as compared to 2018.

Interest Expense Interest expense for fiscal year 2019 was $60.9 million, a decrease of $2.9 million, or 4.5%, compared to $63.8 million for fiscal year 2018. The decrease was due primarily to a foreign currency gain recognized in connection with a debt-related foreign exchange forward contract and lower debt issuance costs incurred compared to the corresponding period in 2018; partially offset by higher interest expense from increased debt to fund our recent acquisitions.

Other Income, Net Other income, net, was $12.3 million for fiscal year 2019, a decrease of $1.0 million, or 7.3%, compared to $13.3 million for fiscal year 2018. The decrease was due to higher foreign currency losses recognized in connection with a U.S. dollar denominated loan borrowed by a non-U.S. entity with a different functional currency compared to the corresponding period in 2018 and higher pension-related costs as compared to the corresponding period in 2018; partially offset by higher net gains on our venture capital investments and our life insurance policy investments compared to the corresponding period in 2018.

Income Taxes Income tax expense was $50.0 million for fiscal year 2019, a decrease of $4.5 million, compared to $54.5 million for fiscal year 2018. Our effective tax rate was 16.5% for fiscal year 2019, compared to 19.3% for fiscal year 2018. The decrease in our effective tax rate in the 2019 period compared to the 2018 period was primarily due to recognizing a $20.6 million deferred tax asset in fiscal year 2019 for net operating losses expected to be utilized in the future due to changes in our international financing structure.

Fiscal Year 2018 Compared to Fiscal Year 2017

Revenue and Operating Income

The following tables present consolidated revenue by type and by reportable segment:

	Fiscal Year			
	2018	2017	$ change	% change
	(in millions, except percentages)			
Service revenue	$ 1,687.9	$ 1,298.3	$ 389.6	30.0%
Product revenue	578.2	559.3	18.9	3.4%
Total revenue	$ 2,266.1	$ 1,857.6	$ 408.5	22.0%

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	Fiscal Year				
	2018	2017	$ change	% change	Impact of FX
	(in millions, except percentages)				
RMS	$ 519.7	$ 493.6	$ 26.1	5.3%	1.6%
DSA	1,316.9	980.0	336.9	34.4%	1.1%
Manufacturing	429.5	384.0	45.5	11.9%	1.4%
Total revenue	$ 2,266.1	$ 1,857.6	$ 408.5	22.0%	1.3%

The following table presents operating income by reportable segment:

	Fiscal Year			
	2018	2017	$ change	% change
	(in millions, except percentages)			
RMS	$ 136.5	$ 114.6	$ 21.9	19.1 %
DSA	227.6	182.8	44.8	24.5 %
Manufacturing	136.2	123.9	12.3	9.9 %
Unallocated corporate	(168.9)	(133.0)	(35.9)	27.0 %
Total operating income	$ 331.4	$ 288.3	$ 43.1	15.0 %
Operating income % of revenue	14.6%	15.5%		(0.9)%

The following presents and discusses our consolidated results by each of our reportable segments:

RMS

	Fiscal Year				
	2018	2017	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 519.7	$ 493.6	$ 26.1	5.3 %	1.6%
Cost of revenue (excluding amortization of intangible assets)	319.8	317.1	2.7	0.9 %	
Selling, general and administrative	61.8	60.2	1.6	2.7 %	
Amortization of intangible assets	1.6	1.7	(0.1)	(5.4)%	
Operating income	$ 136.5	$ 114.6	$ 21.9	19.1 %	
Operating income % of revenue	26.3%	23.2%		3.1 %	

RMS revenue increased $26.1 million, or 5.3%, due primarily to higher research model product revenue in China and higher revenue for research model services. Research model services benefited from a large government contract in the IS business and strong client demand in the GEMS business resulting from increased research and development activity conducted across biotechnology, global biopharmaceutical, and academic institutional clients, and the effect of changes in foreign currency exchange rates; partially offset by lower research model product revenue outside of China.

RMS operating income increased $21.9 million, or 19.1%, compared to the corresponding period in 2017. RMS operating income as a percentage of revenue for fiscal year 2018 was 26.3%, an increase of 3.1% from 23.2% for the corresponding period in 2017. Operating income and operating income as a percentage of revenue increased due primarily to lower amount of costs associated with the realignment of our research model production site in Maryland in 2018 compared to 2017. Restructuring costs (recorded primarily within cost of revenue) incurred during 2017 were $18.1 million, which primarily related to non-cash asset impairments and accelerated depreciation charges. Restructuring costs incurred during 2018 were $2.0 million, which primarily related to cash payments for severance and transition costs. Additionally, operating income and operating income as a percentage of revenue increased due to the increased revenue discussed above; partially offset by continued investments to support future growth, including increased investments in personnel (staffing levels and hourly wage increases), and facility expansions (primarily in China) as well as lower operating income margins on the aforementioned large government contract.

DSA

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	Fiscal Year				
	2018	2017	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 1,316.9	$ 980.0	$ 336.9	34.4 %	1.1%
Cost of revenue (excluding amortization of intangible assets)	903.9	661.7	242.2	36.6 %	
Selling, general and administrative	131.2	105.6	25.6	24.3 %	
Amortization of intangible assets	54.2	29.9	24.3	81.4 %	
Operating income	$ 227.6	$ 182.8	$ 44.8	24.5 %	
Operating income % of revenue	17.3%	18.7%		(1.4)%	

DSA revenue increased $336.9 million, or 34.4%, due primarily to the recent acquisitions of MPI Research, KWS BioTest, and Brains On-Line, which contributed $209.5 million, $8.6 million and $6.0 million to service revenue growth, respectively. Additionally, service revenue increased in both the Safety Assessment and Discovery Services businesses due to demand from both biotechnology and global biopharmaceutical clients and favorable pricing and mix of services. The effect of changes in foreign currency exchange rates also increased revenue.

DSA operating income increased $44.8 million, or 24.5%, compared to the corresponding period in 2017. DSA operating income as a percentage of revenue for fiscal year 2018 was 17.3%, a decrease of 1.4% from 18.7% for the corresponding period in 2017. The increase to operating income was primarily attributable to contributions from recent acquisitions of MPI Research, KWS BioTest, and Brains On-Line. These increases were partially offset by increased costs to support the growth of the Company, which include costs due to the acquisitions, including a higher service cost base, an increase in compensation, benefits, and other employee-related expenses recorded within both cost of revenue and selling, general, and administrative expense, and higher amortization of intangible assets as substantially all of our acquisitions in fiscal year 2018 are included within the DSA reportable segment. These increased costs collectively decreased operating income as a percentage of revenue in 2018 compared to 2017.

Manufacturing

	Fiscal Year				
	2018	2017	$ change	% change	Impact of FX
	(in millions, except percentages)				
Revenue	$ 429.5	$ 384.0	$ 45.5	11.9 %	1.4%
Cost of revenue (excluding amortization of intangible assets)	202.3	177.8	24.5	13.8 %	
Selling, general and administrative	82.0	72.5	9.5	13.0 %	
Amortization of intangible assets	9.0	9.8	(0.8)	(7.9)%	
Operating income	$ 136.2	$ 123.9	$ 12.3	9.9 %	
Operating income % of revenue	31.7%	32.3%		(0.6)%	

Manufacturing revenue increased $45.5 million, or 11.9%, due primarily to higher demand for endotoxin products and species identification services in the Microbial Solutions business, higher service revenue in the Biologics business, higher product revenue in the Avian business, and the effect of changes in foreign currency exchange rates; partially offset by the absence of $1.8 million of service revenue related to the CDMO business.

Manufacturing operating income increased $12.3 million, or 9.9%, compared to the corresponding period in 2017. Manufacturing operating income as a percentage of revenue for fiscal year 2018 was 31.7%, a decrease of 0.6% from 32.3% for the corresponding period in 2017. The increase to operating income was due primarily to the increase in revenue. This increase was partially offset by increased costs to support the growth of the Company, including increased investments in personnel (staffing levels and hourly wage increase), facility expansions (primarily in Microbial Solutions and Biologics), and increased investments in technology to support research and development efforts (primarily in Microbial Solutions). Increased costs are recorded in cost of revenue and selling, general, and administrative expenses and these higher costs decreased operating income as a percentage of revenue in 2018 compared to 2017.

Unallocated Corporate

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	Fiscal Year			
	2018	2017	$ change	% change
	(in millions, except percentages)			
Unallocated corporate	$ 168.9	$ 133.0	$ 35.9	27.0%
Unallocated corporate % of revenue	7.5%	7.2%		0.3%

The increase in unallocated corporate costs of $35.9 million, or 27.0%, is consistent with the allocated selling, general, and administrative expense increases discussed above and are primarily related to an increase in compensation, benefits, and other employee-related expenses and an increase in costs associated with the evaluation and integration of our recent acquisitions to support the growth of the Company. Costs as a percentage of revenue for fiscal year 2018 was 7.5%, an increase of 0.3% from 7.2% for the corresponding period in 2017.

Interest Income Interest income, which represents earnings on cash, cash equivalents, and time deposits remained consistent at $0.8 million and $0.7 million for fiscal years 2018 and 2017, respectively.

Interest Expense Interest expense for fiscal year 2018 was $63.8 million, an increase of $34.0 million, or 114.2%, compared to $29.8 million for fiscal year 2017. The increase was due primarily to higher debt to fund our recent acquisitions.

Other Income, Net Other income, net, was $13.3 million for fiscal year 2018, a decrease of $24.5 million, or 64.9%, compared to $37.8 million for fiscal year 2017. The decrease in other income, net was driven by a decrease of $7.0 million in gains recognized related to our venture capital investments, a decrease of $6.0 million in gains related to certain life insurance policies, and the absence of a $10.6 million gain recognized as a result of the CDMO business.

Income Taxes Income tax expense was $54.5 million for fiscal year 2018, a decrease of $116.9 million, compared to $171.4 million for fiscal year 2017. Our effective tax rate was 19.3% for fiscal year 2018, compared to 57.7% for fiscal year 2017. The decrease was primarily driven by the net effects of U.S. Tax Reform, including the reduction of the U.S. federal statutory tax rate from 35% in 2017 to 21% in 2018, as well as the impact of the one-time Transition Tax and change of our assertion of indefinite reinvestment of foreign earnings in 2017. In addition, 2017 includes the impact of the gain on the divestiture of the CDMO business.

Liquidity and Capital Resources

We currently require cash to fund our working capital needs, capital expansion, acquisitions, and to pay our debt, lease, venture capital investment, and pension obligations. Our principal sources of liquidity have been our cash flows from operations, supplemented by long-term borrowings. Based on our current business plan, we believe that our existing funds, when combined with cash generated from operations and our access to financing resources, are sufficient to fund our operations for the foreseeable future.

The following table presents our cash, cash equivalents and short-term investments:

	December 28, 2019	December 29, 2018
	(in millions)	
Cash and cash equivalents:		
Held in U.S. entities	$ 56.5	$ 67.3
Held in non-U.S. entities	181.5	128.1
Total cash and cash equivalents	238.0	195.4
Short-term investments:		
Held in non-U.S. entities	1.0	0.9
Total cash, cash equivalents and short-term investments	$ 239.0	$ 196.3

Borrowings

On March 26, 2018, we amended and restated our $1.65 billion credit facility, which extended the maturity date and provided for a $750.0 million term loan and a $1.55 billion multi-currency revolving facility (Credit Facility). The term loan facility matures in 19 quarterly installments with the last installment due March 26, 2023. The revolving facility matures on March 26, 2023, and requires no scheduled payment before that date. On October 23, 2019, we prepaid $500.0 million of the term loan with proceeds from a $500.0 million unregistered private offering (see 2028 Senior Notes below). Additionally, on November 4, 2019, we further amended and restated the Credit Facility to increase the multi-currency revolving facility by $500.0 million, from $1.55 billion to $2.05 billion. Under specified circumstances, we have the ability to increase the term loan and/or revolving facility by up to $1.0 billion in the aggregate.

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On April 3, 2018, we entered into an indenture (Base Indenture) with MUFG Union Bank, N.A. to allow for senior notes offerings under supplemental indentures. Concurrently on April 3, 2018, we entered into our first supplemental indenture and raised $500.0 million in aggregate principal amount of 5.5% Senior Notes due in 2026 (2026 Senior Notes) in an unregistered offering. Under the terms of the first supplemental indenture, interest on the 2026 Senior Notes is payable semi-annually on April 1 and October 1, beginning on October 1, 2018. On October 23, 2019, we entered into our second supplemental indenture and raised an additional $500.0 million in aggregate principal amount of 4.25% Senior Notes due in 2028 (2028 Senior Notes) in an unregistered offering. Under the terms of the second supplemental indenture, interest on the 2028 Senior Notes is payable semi-annually on May 1 and November 1, beginning on May 1, 2020.

Amounts outstanding under our credit facilities and both the 2026 Senior Notes and the 2028 Senior Notes were as follows:

	December 28, 2019	December 29, 2018
	(in millions)	
Term loans	$ 193.8	$ 731.3
Revolving facility	676.1	397.5
2026 Senior Notes	500.0	500.0
2028 Senior Notes	500.0	—
Total	$ 1,869.9	$ 1,628.8

The interest rates applicable to the term loan and revolving facility under the Credit Facility are, at our option, equal to either the base rate (which is the higher of (1) the prime rate, (2) the federal funds rate plus 0.50%, or (3) the one-month adjusted LIBOR rate plus 1.0%) or the adjusted LIBOR rate, plus an interest rate margin based upon our leverage ratio.

We entered into foreign exchange forward contracts during fiscal years 2019 and 2018 to limit our foreign currency exposure related to a U.S. dollar denominated loan borrowed by a non-U.S. Euro functional currency entity under the Credit Facility.

The acquisition of Citoxlab on April 29, 2019 for $527.7 million in cash was funded through a combination of cash on hand and proceeds from our Credit Facility under the multi-currency revolving facility.

The acquisition of HemaCare on January 3, 2020 for approximately $380 million in cash was funded through a combination of cash on hand and proceeds from our Credit Facility under the multi-currency revolving facility.

Repurchases of Common Stock

On May 9, 2017, our Board of Directors increased the stock repurchase authorization by $150.0 million, to an aggregate amount of $1.3 billion. During fiscal year 2019, we did not repurchase any shares under our authorized stock repurchase program. As of December 28, 2019, we had $129.1 million remaining on the authorized stock repurchase program. Our stock-based compensation plans permit the netting of common stock upon vesting of restricted stock, restricted stock units, and performance share units in order to satisfy individual statutory tax withholding requirements. During fiscal year 2019, we acquired 0.1 million shares for $18.1 million through such netting.

Cash Flows

The following table presents our net cash provided by operating activities:

	Fiscal Year		
	2019	2018	2017
	(in millions)		
Income from continuing operations, net of income taxes	$ 254.1	$ 227.2	$ 125.6
Adjustments to reconcile income from continuing operations, net of income taxes, to net cash provided by operating activities	220.7	199.1	186.6
Changes in assets and liabilities	6.1	14.8	5.9
Net cash provided by operating activities	$ 480.9	$ 441.1	$ 318.1

Net cash provided by cash flows from operating activities represents the cash receipts and disbursements related to all of our activities other than investing and financing activities. Operating cash flow is derived by adjusting our income from continuing operations for (1) non-cash operating items such as depreciation and amortization, stock-based compensation, deferred income taxes, gains on venture capital investments and divestiture, and impairment charges, as well as (2) changes in operating assets and liabilities, which reflect timing differences between the receipt and payment of cash associated with transactions and when they are recognized in our results of operations. For fiscal year 2019, compared to fiscal year 2018, the increase in net cash provided by operating activities was primarily driven by an increase in income from continuing operations, net of income taxes

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and the favorable timing of vendor and supplier payments compared to the same period in 2018; partially offset by unfavorable changes in operating assets and liabilities, specifically related to the timing of net contract balances from contracts with customers (collectively trade receivables, net; deferred revenue; and customer contract deposits), increases in inventory levels in response to customer demand, and higher compensation payments compared to the prior year period. The increase in net cash provided by operating activities from fiscal year 2017 to 2018 was primarily driven by an increase in income from continuing operations and positive changes in operating assets and liabilities resulting from an increase in our deferred revenue (primarily due to a one-time up-front payment received in connection with a strategic agreement), an increase in customer contract deposits, as well as improved collections of our receivables.

The following table presents our net cash used in investing activities:

	Fiscal Year		
	2019	2018	2017
	(in millions)		
Acquisition of businesses and assets, net of cash acquired	$ (515.7)	$ (824.9)	$ (25.0)
Capital expenditures	(140.5)	(140.1)	(82.4)
Investments, net	(21.4)	10.7	(37.2)
Proceeds from divestiture	—	—	72.5
Other, net	(3.9)	(0.7)	(0.5)
Net cash used in investing activities	$ (681.5)	$ (955.0)	$ (72.6)

The primary use of cash used in investing activities in fiscal year 2019 related to the acquisition of Citoxlab, the acquisition of a supplier, capital expenditures to support the growth of the business, and investments in certain venture capital and other equity investments. The primary use of cash in fiscal year 2018 related to our acquisitions of MPI Research and KWS BioTest, and our capital expenditures to support the growth of the business; partially offset by proceeds from net investments, which primarily relate to short-term investments held by our U.K. operations. The primary use of cash in fiscal year 2017 related to our capital expenditures to support the growth of the business, net investment activity, and our acquisition of Brains On-Line, partially offset by the proceeds from the divestiture of the CDMO business.

The following table presents our net cash provided by (used in) financing activities:

	Fiscal Year		
	2019	2018	2017
	(in millions)		
Proceeds from long-term debt and revolving credit facility	$ 3,358.5	$ 2,755.0	$ 236.8
Payments on long-term debt, revolving credit facility, and finance lease obligations	(3,124.6)	(2,201.0)	(372.4)
Proceeds from exercises of stock options	34.5	37.7	38.9
Payments on debt financing costs	(6.6)	(18.3)	—
Purchase of treasury stock	(18.1)	(13.8)	(106.9)
Other, net	(11.8)	(1.5)	(4.9)
Net cash provided by (used in) financing activities	$ 231.9	$ 558.1	$ (208.5)

For fiscal year 2019, net cash provided by financing activities reflected the net proceeds of $233.9 million on our long-term debt, revolving credit facility, and finance lease obligations. Included in the net proceeds are the following amounts:

- Proceeds of $494 million received from the issuance of the 2028 Senior Notes on October 23, 2019, proceeds of approximately $581 million from our revolving credit facility to fund our recent acquisitions; and $98 million of proceeds from our revolving credit facility to fund activities in the normal course of business; partially offset by,
- Payments of $537.5 million on our term loan, which included the $500.0 million prepayment on November 4, 2019, and approximately $151 million of repayments to our revolving credit facility in the normal course of business;
- Additionally, we had $2.4 billion of gross payments, partially offset by $2.2 billion of gross proceeds in connection with a non-U.S. Euro functional currency entity repaying Euro loans and replacing the Euro loans with U.S. dollar denominated loans. A series of forward currency contracts were executed to mitigate any foreign currency gains or losses on the U.S. dollar denominated loans. These proceeds and payments are presented as gross financing activities.

Net cash provided by financing activities also reflected proceeds from exercises of employee stock options of $34.5 million. Net cash provided by financing activities was partially offset by treasury stock purchases of $18.1 million made due to the

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netting of common stock upon vesting of stock-based awards in order to satisfy individual statutory tax withholding requirements and the purchase of an additional 5% equity interest in Vital River for $7.9 million which is included in Other, net.

For fiscal year 2018, net cash provided by financing activities reflected the incremental proceeds from the refinancing of our previous $1.65 Billion Credit Facility to the $2.3 Billion Credit Facility and the proceeds from our $500.0 million 2026 Senior Notes. Subsequent to refinancing our $2.3 Billion Credit Facility, we repaid €300 million of our revolving facility borrowed by a non-U.S. Euro functional currency entity and replaced the borrowing with a $343 million U.S. dollar denominated loan. A forward currency contract was then executed to mitigate any foreign currency gains or losses on the $343 million U.S. dollar denominated loan. Additionally, proceeds from exercises of employee stock options of $37.7 million; partially offset by payments on debt financing costs of $18.3 million, and treasury stock purchases of $13.8 million made due to the netting of common stock upon vesting of stock-based awards in order to satisfy individual statutory tax withholding requirements.

For fiscal year 2017, cash used in financing activities reflected net payments of $135.6 million on long-term debt, revolving credit facility, and finance lease obligations; and treasury stock purchases of $106.9 million made pursuant to our authorized stock repurchase program and the netting of common stock upon vesting of stock-based awards in order to satisfy individual statutory tax withholding requirements; partially offset by proceeds from exercises of employee stock options of $38.9 million.

Contractual Commitments and Obligations

Minimum future payments of our contractual obligations as of December 28, 2019 are as follows:

	Payments Due by Period				
	Total	Less than 1 Year	1 - 3 Years	3 - 5 Years	More Than 5 Years
			(in millions)		
Notes payable (1)	$ 1,875.7	$ 35.5	$ 155.1	$ 683.1	$ 1,002.0
Operating leases (2)	222.0	27.1	52.4	41.2	101.3
Finance leases	40.7	4.3	7.7	5.1	23.6
Redeemable noncontrolling interests (3)	26.3	4.0	22.3	—	—
Venture capital investment commitments (4)	48.1	34.8	13.3	—	—
Contingent payments (5)	0.9	0.9	—	—	—
Unconditional purchase obligations (6)	154.0	106.1	45.0	2.9	—
Total contractual cash obligations	$ 2,367.7	$ 212.7	$ 295.8	$ 732.3	$ 1,126.9

(1) Notes payable includes the principal payments on our debt, which include our $2.3B Credit Facility, our Senior Notes and Other debt.
(2) We lease properties and equipment for use in our operations. In addition to rent, the leases may require us to pay additional amounts for taxes, insurance, maintenance, and other operating expenses. Amounts reflected within the table detail future minimum rental commitments under non-cancellable operating leases, net of income from subleases, for each of the periods presented. Approximately $57 million of contractually committed lease payments are reflected in the table for which leases have not yet commenced, as we do not yet control the underlying assets.
(3) The estimated cash obligation for redeemable noncontrolling interests are based on the amount that would be paid if settlement occurred as of the balance sheet date based on the contractually defined redemption value as of December 28, 2019.
(4) The timing of the remaining capital commitment payments to venture capital funds is subject to the procedures of the limited liability partnerships and limited liability companies; the above table reflects the earliest possible date the payment can be required under the relevant agreements.
(5) In connection with certain business and asset acquisitions, we agreed to make additional payments aggregating to $0.9 million based upon the achievement of certain financial targets in connection with the respective acquisition. The contingent payment obligations included in the table above have not been probability adjusted or discounted.
(6) Unconditional purchase obligations include agreements to purchase goods or services that are enforceable and legally binding and that specify all significant terms, including fixed or minimum quantities to be purchased, fixed, minimum or variable price provisions, and the approximate timing of the transaction. Purchase obligations exclude agreements that are cancellable at any time without penalty.

The above table excludes obligations related to our pension and other post-retirement benefit plans. Refer to Item 8, “Financial Statements and Supplementary Data,” in this Annual Report on Form 10-K for more details.

Tax Related Obligations

We excluded liabilities pertaining to uncertain tax positions from our summary of contractual obligations presented above, as we cannot make a reliable estimate of the period of cash settlement with the respective taxing authorities. As of December 28, 2019, we had $19.7 million of liabilities associated with uncertain tax positions.

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Additionally, we excluded federal and state income tax liabilities of $52.1 million from our summary of contractual obligations presented above, relating to the one-time Transition Tax on unrepatriated earnings under U.S. Tax Reform. The Transition Tax will be paid, interest free, over an eight-year period through 2026.

Off-Balance Sheet Arrangements

As of December 28, 2019, we did not have any significant off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of SEC Regulation S-K promulgated under the Exchange Act, except as disclosed below.

Venture Capital Investments

We invest in several venture capital funds that invest in start-up companies, primarily in the life sciences industry. Our total commitment to the funds as of December 28, 2019 was $128.4 million, of which we funded $80.3 million through December 28, 2019. Refer to Note 6, "Venture Capital Investments and Other Investments," to our consolidated financial statements contained in Item 8, "Financial Statements and Supplementary Data," in this Annual Report on Form 10-K for further details.

Letters of Credit

Our off-balance sheet commitments related to our outstanding letters of credit as of December 28, 2019 were $7.5 million.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

We are exposed to market risk from changes in interest rates and currency exchange rates, which could affect our future results of operations and financial condition. We manage our exposure to these risks through our regular operating and financing activities.

Interest Rate Risk

We are exposed to changes in interest rates while conducting normal business operations as a result of ongoing financing activities. As of December 28, 2019, our debt portfolio was comprised primarily of floating interest rate borrowings. A 100-basis point increase in interest rates would increase our annual pre-tax interest expense by $8.7 million.

Foreign Currency Exchange Rate Risk

We operate on a global basis and have exposure to some foreign currency exchange rate fluctuations for our financial position, results of operations, and cash flows.

While the financial results of our global activities are reported in U.S. dollars, our foreign subsidiaries typically conduct their operations in their respective local currency. The principal functional currencies of the Company's foreign subsidiaries are the Euro, British Pound, Canadian Dollar, and Chinese Yuan Renminbi. During fiscal year 2019, the most significant drivers of foreign currency translation adjustment the Company recorded as part of other comprehensive income (loss) were the Canadian Dollar, British Pound, Hungarian Forint, Euro, and Chinese Yuan Renminbi.

Fluctuations in the foreign currency exchange rates of the countries in which we do business will affect our financial position, results of operations, and cash flows. As the U.S. dollar strengthens against other currencies, the value of our non-U.S. revenue, expenses, assets, liabilities, and cash flows will generally decline when reported in U.S. dollars. The impact to net income as a result of a U.S. dollar strengthening will be partially mitigated by the value of non-U.S. expenses, which will decline when reported in U.S. dollars. As the U.S. dollar weakens versus other currencies, the value of the non-U.S. revenue, expenses, assets, liabilities, and cash flows will generally increase when reported in U.S. dollars. For fiscal year 2019, our revenue would have increased by $90.5 million and our operating income would have increased by $2.0 million, if the U.S. dollar exchange rate had strengthened by 10%, with all other variables held constant.

We attempt to minimize this exposure by using certain financial instruments in accordance with our overall risk management and our hedge policy. We do not enter into speculative derivative agreements.

During fiscal years 2019 and 2018, we entered into foreign exchange forward contracts to limit our foreign currency exposure related to both intercompany loans and a U.S. dollar denominated loan borrowed by a non-U.S. Euro functional currency entity under our Credit Facility. Refer to Note 14, "Foreign Currency Contracts," to our consolidated financial statements contained in Item 8, "Financial Statements and Supplementary Data," in this Annual Report on Form 10-K for further details regarding these types of forward contracts.

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Item 8. Financial Statements and Supplementary Data

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of Charles River Laboratories International, Inc.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Charles River Laboratories International, Inc. and its subsidiaries (the "Company") as of December 28, 2019 and December 29, 2018, and the related consolidated statements of income, of comprehensive income, of changes in equity and of cash flows for each of the three fiscal years in the period ended December 28, 2019, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 28, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 28, 2019 and December 29, 2018, and the results of its operations and its cash flows for each of the three fiscal years in the period ended December 28, 2019 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 28, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Note 1 to the consolidated financial statements, the Company changed the manner in which it accounts for leases in 2019.

Basis for Opinions

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

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

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

As described in Management's Report on Internal Control over Financial Reporting, management has excluded Citoxlab and the acquisition of a DSA supplier from its assessment of internal control over financial reporting as of December 28, 2019 because they were acquired by the Company in purchase business combinations during 2019. We have also excluded Citoxlab and the acquisition of the DSA supplier from our audit of internal control over financial reporting. Citoxlab and the DSA supplier whose total assets and total revenues excluded from management's assessment and our audit of internal control over financial reporting represent 5.0% and 4.7%, respectively, of the related consolidated financial statement amounts as of and for the fiscal year ended December 28, 2019.

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Definition and Limitations of Internal Control over Financial Reporting

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

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

Critical Audit Matters

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

Acquisition of Citoxlab - Valuation of Acquired Customer Relationship Intangible Assets

As described in Notes 1 and 2 to the consolidated financial statements, the Company completed the acquisition of Citoxlab on April 29, 2019. The preliminary purchase price allocation included customer relationship intangible assets (also referred to as client relationships) of $134.6 million. The determination of the fair value of intangible assets, which represent a significant portion of the purchase price, requires the use of significant judgment with regard to (i) the fair value; and (ii) the period and the method by which the intangible assets will be amortized. To determine the fair value of the acquired client relationships, management utilized the multiple period excess earnings model (a commonly accepted valuation technique), which includes the following key assumptions: projections of cash flows from the acquired entities, which include future revenue growth rates, operating income margins, and customer attrition rates, as well as discount rates based on an analysis of the weighted average cost of capital.

The principal considerations for our determination that performing procedures relating to the acquisition of Citoxlab - valuation of acquired customer relationship intangible assets is a critical audit matter are (i) there was a high degree of auditor judgment and subjectivity in applying procedures relating to the fair value measurement of customer relationship intangible assets acquired due to the significant amount of judgment and estimation by management when developing the estimate, (ii) significant audit effort was required in evaluating the key assumptions relating to the estimate, including future revenue growth rates, operating income margins, customer attrition rates, and discount rates, and in evaluating audit evidence relating to the economic useful life over which cash flow projections were estimated in the valuation of the customer relationship intangible assets, and (iii) the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the valuation of acquired customer relationship intangible assets, including controls over the review of the valuation methodology, the key assumptions underlying the valuation, and the useful lives of the acquired customer relationship intangible assets. These procedures also included, among others, (i) reading the purchase agreement, (ii) testing management's process for estimating the fair value of customer relationship intangible assets and evaluating the reasonableness of the estimated future revenue growth rates, operating margins and customer attrition rate assumptions by evaluating their consistency with data from external sources, past performance of the acquired business, and evidence obtained in other areas of the audit, and (iii) evaluating the reasonableness of the economic useful life over which cash flow projections are estimated. Professionals with specialized skill and knowledge were used to assist in the evaluation of the Company's valuation model and certain significant assumptions, including customer attrition and the discount rates.

Discovery and Safety Assessment Revenue Recognized Over Time

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As described in Notes 1 and 3 to the consolidated financial statements, the Company recognized revenue of $1,619.0 million in its Discovery and Safety Assessment (DSA) segment in 2019, of which $1,618.3 million was recognized over time as services are delivered to the customer based on the extent of progress towards completion of the performance obligation using either the cost-to-cost (input method) or right to invoice measures of progress (output method). The selection of the method to measure progress towards completion requires judgment and is based on the nature of the products or services to be provided. Management uses the cost-to-cost measure of progress when it best depicts the transfer of value to the customer, which occurs as the Company incurs costs on its contract, generally related to fixed fee service contracts. Under the cost-to-cost measure of progress, the extent of progress towards completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. The costs calculation includes variables such as labor hours, allocation of overhead costs, research model costs, and subcontractor costs. Revenue is recorded proportionally as costs are incurred. The right-to-invoice measure of progress is generally related to rate per unit contracts, as the extent of progress towards completion is measured based on discrete service or time-based increments, such as samples tested or labor hours incurred. Revenue is recorded in the amount invoiced since that amount corresponds directly to the value of the Company's performance to date.

The principal considerations for our determination that performing procedures relating to DSA revenue recognized over time is a critical audit matter are there was a high degree of auditor subjectivity and effort in performing procedures to evaluate the calculation of DSA revenue recognized over time, including the estimates of the variables within the calculation of the forecasted cost of service contracts, such as labor hours, allocation of overhead costs, research model costs, and subcontractor costs.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to DSA revenue recognized over time, including controls over the review of agreements, development of the forecasted costs, the review of budget versus actual costs incurred and the review of revenue recognition. These procedures also included, among others, (i) reading agreements and reports describing the results of services provided for a sample of service contracts selected for testing, (ii) evaluating and testing management's process for determining the amount of revenue recognized for a sample of service contracts, which included evaluating the reasonableness of forecasted costs through a comparison of actual current year project costs to historical management cost estimates for completed service contracts, and (iii) testing actual costs incurred for a sample of in-process service contracts by examining evidence of costs incurred, including invoices, time cards, human resources documents, and the completeness and accuracy of overhead allocations.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts

February 11, 2020

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

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED STATEMENTS OF INCOME
(in thousands, except per share amounts)

	Fiscal Year		
	2019	**2018**	**2017**
Service revenue	$ 2,029,371	$ 1,687,941	$ 1,298,298
Product revenue	591,855	578,155	559,303
Total revenue	2,621,226	2,266,096	1,857,601
Costs and expenses:			
Cost of services provided (excluding amortization of intangible assets)	1,371,699	1,150,371	867,014
Cost of products sold (excluding amortization of intangible assets)	291,216	275,658	289,669
Selling, general and administrative	517,622	443,854	371,266
Amortization of intangible assets	89,538	64,830	41,370
Operating income	351,151	331,383	288,282
Other income (expense):			
Interest income	1,522	812	690
Interest expense	(60,882)	(63,772)	(29,777)
Other income, net	12,293	13,258	37,760
Income from continuing operations, before income taxes	304,084	281,681	296,955
Provision for income taxes	50,023	54,463	171,369
Income from continuing operations, net of income taxes	254,061	227,218	125,586
Income (loss) from discontinued operations, net of income taxes	—	1,506	(137)
Net income	254,061	228,724	125,449
Less: Net income attributable to noncontrolling interests	2,042	2,351	2,094
Net income attributable to common shareholders	$ 252,019	$ 226,373	$ 123,355
Earnings per common share			
Basic:			
Continuing operations attributable to common shareholders	$ 5.17	$ 4.69	$ 2.60
Discontinued operations	$ —	$ 0.03	$ —
Net income attributable to common shareholders	$ 5.17	$ 4.72	$ 2.60
Diluted:			
Continuing operations attributable to common shareholders	$ 5.07	$ 4.59	$ 2.54
Discontinued operations	$ —	$ 0.03	$ —
Net income attributable to common shareholders	$ 5.07	$ 4.62	$ 2.54
Weighted-average number of common shares outstanding:			
Basic	48,730	47,947	47,481
Diluted	49,693	49,018	48,564

See Notes to Consolidated Financial Statements.

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(in thousands)

	Fiscal Year		
	2019	**2018**	**2017**
Net income	$ 254,061	$ 228,724	$ 125,449
Other comprehensive income (loss):			
Foreign currency translation adjustment and other	14,224	(28,305)	78,084
Pension and other post-retirement benefit plans (Note 12):			
Prior service cost and (losses) gains arising during the period	(25,165)	(1,659)	36,593
Amortization of net loss and prior service benefit included in net periodic cost for pension and other post-retirement benefit plans	1,772	2,477	3,344
Comprehensive income, before income taxes	244,892	201,237	243,470
Less: Income tax (benefit) expense related to items of other comprehensive income (Note 10)	(3,633)	(1,892)	7,954
Comprehensive income, net of income taxes	248,525	203,129	235,516
Less: Comprehensive income related to noncontrolling interests, net of income taxes	1,822	1,398	3,128
Comprehensive income attributable to common shareholders, net of income taxes	$ 246,703	$ 201,731	$ 232,388

See Notes to Consolidated Financial Statements.

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED BALANCE SHEETS
(in thousands, except per share amounts)

	December 28, 2019	December 29, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 238,014	$ 195,442
Trade receivables, net	514,033	472,248
Inventories	160,660	127,892
Prepaid assets	52,588	53,447
Other current assets	56,030	48,807
Total current assets	1,021,325	897,836
Property, plant and equipment, net	1,044,128	932,877
Operating lease right-of-use assets, net	140,085	—
Goodwill	1,540,565	1,247,133
Client relationships, net	613,573	537,945
Other intangible assets, net	75,840	72,943
Deferred tax assets	44,659	23,386
Other assets	212,615	143,759
Total assets	$ 4,692,790	$ 3,855,879
Liabilities, Redeemable Noncontrolling Interests and Equity		
Current liabilities:		
Current portion of long-term debt and finance leases	$ 38,545	$ 31,416
Accounts payable	111,498	66,250
Accrued compensation	158,617	137,212
Deferred revenue	171,805	145,139
Accrued liabilities	139,118	106,925
Other current liabilities	90,598	71,280
Total current liabilities	710,181	558,222
Long-term debt, net and finance leases	1,849,666	1,636,598
Operating lease right-of-use liabilities	116,252	—
Deferred tax liabilities	167,283	143,635
Other long-term liabilities	182,933	179,121
Total liabilities	3,026,315	2,517,576
Commitments and contingencies (Notes 2, 9, 11, 12, 16 and 17)		
Redeemable noncontrolling interests	28,647	18,525
Equity:		
Preferred stock, $0.01 par value; 20,000 shares authorized; no shares issued and outstanding	—	—
Common stock, $0.01 par value; 120,000 shares authorized; 48,936 shares issued and 48,936 shares outstanding as of December 28, 2019 and 48,210 shares issued and 48,209 shares outstanding as of December 29, 2018	489	482
Additional paid-in capital	1,531,785	1,447,512
Retained earnings	280,329	42,096
Treasury stock, at cost, 0 and 1 share as of December 28, 2019 and December 29, 2018, respectively	—	(55)
Accumulated other comprehensive loss	(178,019)	(172,703)
Total equity attributable to common shareholders	1,634,584	1,317,332
Noncontrolling interest	3,244	2,446
Total equity	1,637,828	1,319,778
Total liabilities, redeemable noncontrolling interests and equity	$ 4,692,790	$ 3,855,879

See Notes to Consolidated Financial Statements.

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Fiscal Year		
	2019	**2018**	**2017**
Cash flows relating to operating activities			
Net income	$ 254,061	$ 228,724	$ 125,449
Less: Income (loss) from discontinued operations, net of income taxes	—	1,506	(137)
Income from continuing operations, net of income taxes	254,061	227,218	125,586
Adjustments to reconcile net income from continuing operations to net cash provided by operating activities:			
Depreciation and amortization	198,095	161,779	131,159
Stock-based compensation	57,271	47,346	44,003
Deferred income taxes	(21,895)	(9,702)	28,254
Gain on venture capital investments	(20,706)	(15,928)	(22,867)
Gain on divestiture	—	—	(10,577)
Impairment charges	—	—	17,239
Other, net	7,931	15,613	(666)
Changes in assets and liabilities:			
Trade receivables, net	(8,323)	(21,196)	(48,279)
Inventories	(21,399)	(13,338)	(17,838)
Accounts payable	29,775	(12,732)	34
Accrued compensation	3,394	31,616	3,666
Long-term payable on Transition Tax (Notes 5 and 11)	—	(8,974)	61,038
Deferred revenue	(3,620)	36,072	(8,466)
Customer contract deposits	(10,898)	28,115	—
Other assets and liabilities, net	17,250	(24,749)	15,788
Net cash provided by operating activities	480,936	441,140	318,074
Cash flows relating to investing activities			
Acquisition of businesses and assets, net of cash acquired	(515,701)	(824,868)	(25,012)
Capital expenditures	(140,514)	(140,054)	(82,431)
Purchases of investments and contributions to venture capital investments	(22,341)	(25,125)	(46,217)
Proceeds from sale of investments	942	35,849	9,128
Proceeds from divestiture	—	—	72,462
Other, net	(3,888)	(805)	(516)
Net cash used in investing activities	(681,502)	(955,003)	(72,586)
Cash flows relating to financing activities			
Proceeds from long-term debt and revolving credit facility	3,358,461	2,755,028	236,856
Proceeds from exercises of stock options	34,546	37,657	38,870
Payments on long-term debt, revolving credit facility, and finance lease obligations	(3,124,588)	(2,201,003)	(372,435)
Payments on debt financing costs	(6,593)	(18,337)	—
Purchase of treasury stock	(18,087)	(13,846)	(106,909)
Other, net	(11,802)	(1,440)	(4,858)
Net cash provided by (used in) financing activities	231,937	558,059	(208,476)
Discontinued operations			
Net cash used in operating activities from discontinued operations	—	(3,735)	(1,809)
Effect of exchange rate changes on cash, cash equivalents, and restricted cash	11,357	(9,474)	11,234
Net change in cash, cash equivalents, and restricted cash	42,728	30,987	46,437
Cash, cash equivalents, and restricted cash, beginning of period	197,318	166,331	119,894
Cash, cash equivalents, and restricted cash, end of period	$ 240,046	$ 197,318	$ 166,331

See Notes to Consolidated Financial Statements.

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS (continued)
(in thousands)

	Fiscal Year		
	2019	**2018**	**2017**
Supplemental cash flow information:			
Cash and cash equivalents	$ 238,014	$ 195,442	$ 163,794
Restricted cash included in Other current assets	431	465	592
Restricted cash included in Other assets	1,601	1,411	1,945
Cash, cash equivalents, and restricted cash, end of period	$ 240,046	$ 197,318	$ 166,331
Cash paid for income taxes	$ 54,060	$ 67,600	$ 60,377
Cash paid for interest	$ 67,813	$ 47,540	$ 27,417
Non-cash investing and financing activities:			
Additions to property, plant and equipment, net	$ 21,447	$ 18,212	$ 38,199
Assets acquired under finance leases	$ 4,819	$ 1,473	$ 722

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CHARLES RIVER LABORATORIES INTERNATIONAL, INC.
CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY
(in thousands)

	Common stock		Additional Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Treasury Stock		Total Equity Attributable to Common Shareholders	Noncontrolling Interest	Total Equity
	Shares	Amount				Shares	Amount			
December 31, 2016	**86,301**	**$ 863**	**$2,477,371**	**$165,303**	**$ (253,764)**	**38,938**	**$(1,553,005)**	**$ 836,768**	**$ 2,357**	**$ 839,125**
Net income	—	—	—	123,355	—	—	—	123,355	1,179	124,534
Other comprehensive income	—	—	—	—	109,033	—	—	109,033	—	109,033
Dividends declared to noncontrolling interest	—	—	—	—	—	—	—	—	(1,209)	(1,209)
Issuance of stock under employee compensation plans	1,194	12	38,818	—	—	—	—	38,830	—	38,830
Acquisition of treasury shares	—	—	—	—	—	1,155	(106,909)	(106,909)	—	(106,909)
Stock-based compensation	—	—	44,003	—	—	—	—	44,003	—	44,003
December 30, 2017	**87,495**	**875**	**2,560,192**	**288,658**	**(144,731)**	**40,093**	**(1,659,914)**	**1,045,080**	**2,327**	**1,047,407**
Net income	—	—	—	226,373	—	—	—	226,373	1,550	227,923
Other comprehensive loss	—	—	—	—	(24,642)	—	—	(24,642)	—	(24,642)
Reclassification due to adoption of ASU 2018-02	—	—	—	3,330	(3,330)	—	—	—	—	—
Adjustment due to adoption of ASU 2016-01	—	—	—	1,424	—	—	—	1,424	—	1,424
Dividends declared to noncontrolling interest	—	—	—	—	—	—	—	—	(1,431)	(1,431)
Adjustment of redeemable noncontrolling interest to redemption value	—	—	(2,069)	—	—	—	—	(2,069)	—	(2,069)
Issuance of stock under employee compensation plans	936	9	37,657	—	—	—	—	37,666	—	37,666
Acquisition of treasury shares	—	—	—	—	—	129	(13,846)	(13,846)	—	(13,846)
Retirement of treasury shares	(40,221)	(402)	(1,195,614)	(477,689)	—	(40,221)	1,673,705	—	—	—
Stock-based compensation	—	—	47,346	—	—	—	—	47,346	—	47,346
December 29, 2018	**48,210**	**482**	**1,447,512**	**42,096**	**(172,703)**	**1**	**(55)**	**1,317,332**	**2,446**	**1,319,778**
Net income	—	—	—	252,019	—	—	—	252,019	2,084	254,103
Other	—	—	—	—	(5,316)	—	—	(5,316)	—	(5,316)

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comprehensive loss										
Dividends declared to noncontrolling interest	—	—	—	—	—	—	—	—	(1,286)	(1,286)
Adjustment of redeemable noncontrolling interest to redemption value	—	—	(1,451)	—	—	—	—	(1,451)	—	(1,451)
Purchase of additional equity interest in and modification of Vital River redeemable noncontrolling interest	—	—	(1,870)	—	—	—	—	(1,870)	—	(1,870)
Issuance of stock under employee compensation plans	866	8	34,678	—	—	—	—	34,686	—	34,686
Acquisition of treasury shares	—	—	—	—	—	139	(18,087)	(18,087)	—	(18,087)
Retirement of treasury shares	(140)	(1)	(4,355)	(13,786)	—	(140)	18,142	—	—	—
Stock-based compensation	—	—	57,271	—	—	—	—	57,271	—	57,271
December 28, 2019	**48,936**	**$ 489**	**$1,531,785**	**$280,329**	**$ (178,019)**	**—**	**$ —**	**$ 1,634,584**	**$ 3,244**	**$1,637,828**

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1. DESCRIPTION OF BUSINESS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Description of Business

Charles River Laboratories International, Inc. (the Company), together with its subsidiaries, is a full service, early-stage contract research organization (CRO). The Company has built upon its core competency of laboratory animal medicine and science (research model technologies) to develop a diverse portfolio of discovery and safety assessment services, both Good Laboratory Practice (GLP) and non-GLP, that enable the Company to support its clients from target identification through non-clinical development. The Company also provides a suite of products and services to support its clients' manufacturing activities.

Principles of Consolidation

The Company's consolidated financial statements reflect its financial statements and those of its subsidiaries in which the Company holds a controlling financial interest. For consolidated entities in which the Company owns or is exposed to less than 100% of the economics, the Company records net income (loss) attributable to noncontrolling interests in its consolidated statements of income equal to the percentage of the economic or ownership interest retained in such entities by the respective noncontrolling parties. Intercompany balances and transactions are eliminated in consolidation.

The Company's fiscal year is typically based on 52-weeks, with each quarter composed of 13 weeks ending on the last Saturday on, or closest to, March 31, June 30, September 30, and December 31.

Segment Reporting

The Company reports its results in three reportable segments: Research Models and Services (RMS), Discovery and Safety Assessment (DSA), and Manufacturing Support (Manufacturing). The Company's RMS reportable segment includes the Research Models and Research Model Services businesses. Research Models includes the commercial production and sale of small research models, as well as the supply of large research models. Research Model Services includes: Genetically Engineered Models and Services (GEMS), which performs contract breeding and other services associated with genetically engineered models; Research Animal Diagnostic Services (RADS), which provides health monitoring and diagnostics services related to research models; and Insourcing Solutions (IS), which provides colony management of its clients' research operations (including recruitment, training, staffing, and management services). The Company's DSA reportable segment includes services required to take a drug through the early development process including discovery services, which are non-regulated services to assist clients with the identification, screening, and selection of a lead compound for drug development, and regulated and non-regulated (GLP and non-GLP) safety assessment services. The Company's Manufacturing reportable segment includes Microbial Solutions, which provides *in vitro* (non-animal) lot-release testing products, microbial detection products, and species identification services; Biologics Testing Services (Biologics), which performs specialized testing of biologics; Avian Vaccine Services (Avian), which supplies specific-pathogen-free chicken eggs and chickens; and contract development and manufacturing (CDMO) services, which, until the Company divested this business on February 10, 2017, allowed it to provide formulation design and development, manufacturing, and analytical and stability testing for small molecules.

Use of Estimates

The preparation of consolidated financial statements in accordance with generally accepted accounting principles in the United States (U.S. GAAP) requires that the Company make estimates and judgments that may affect the reported amounts of assets, liabilities, revenues, expenses and related disclosure of contingent assets and liabilities. On an on-going basis, the Company evaluates its estimates, judgments, and methodologies. The Company bases its estimates on historical experience and on various other assumptions that are believed to be reasonable, the results of which form the basis for making judgments about the carrying values of assets and liabilities. Actual results may differ from these estimates under different assumptions or conditions. Changes in estimates are reflected in reported results in the period in which they become known.

Cash, Cash Equivalents, and Investments

Cash equivalents include money market funds, time deposits and other investments with remaining maturities at the purchase date of three months or less. Time deposits with original maturities of greater than three months are reported as short term investments.

Trade Receivables, Net

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The Company records trade receivables net of an allowance for doubtful accounts. An allowance for doubtful accounts is established based on historical collection information, a review of major client accounts receivable balances and current economic conditions in the geographies in which it operates. Amounts determined to be uncollectible are charged or written off against the allowance.

Concentrations of Credit Risk

Financial instruments that potentially subject the Company to concentrations of credit risk consist primarily of cash and cash equivalents, investments and trade receivables. The Company places cash and cash equivalents and investments in various financial institutions with high credit rating and limits the amount of credit exposure to any one financial institution. Trade receivables are primarily from clients in the pharmaceutical and biotechnology industries, as well as academic and government institutions. Concentrations of credit risk with respect to trade receivables, which are typically unsecured, are limited due to the wide variety of customers using the Company's products and services as well as their dispersion across many geographic areas. No single client accounted for more than 5% of revenue in fiscal years 2019, 2018, or 2017 or trade receivables as of December 28, 2019 or December 29, 2018.

Fair Value Measurements

The accounting standard for fair value measurements defines fair value, establishes a framework for measuring fair value in accordance with U.S. GAAP, and requires certain disclosures about fair value measurements. Under this standard, fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The Company has certain financial assets and liabilities recorded at fair value, which have been classified as Level 1, 2 or 3 within the fair value hierarchy:

- Level 1 - Fair values are determined utilizing prices (unadjusted) in active markets for identical assets or liabilities that the Company has the ability to access,
- Level 2 - Fair values are determined by utilizing quoted prices for identical or similar assets and liabilities in active markets or other market observable inputs such as interest rates, yield curves, and foreign currency spot rates,
- Level 3 - Prices or valuations that require inputs that are both significant to the fair value measurement and unobservable.

The fair value hierarchy level is determined by asset and class based on the lowest level of significant input. The observability of inputs may change for certain assets or liabilities. This condition could cause an asset or liability to be reclassified between levels. The Company recognizes transfers between levels within the fair value hierarchy, if any, at the end of each quarter.

Valuation methodologies used for assets and liabilities measured or disclosed at fair value are as follows:

- Cash equivalents - Valued at market prices determined through third-party pricing services;
- Foreign currency forward contracts - Valued using market observable inputs, such as forward foreign exchange points and foreign exchanges rates;
- Life insurance policies - Valued at cash surrender value based on the fair value of underlying investments;
- Debt instruments - The book value of the Company's term and revolving loans, which are variable rate loans carried at amortized cost, approximates the fair value based on current market pricing of similar debt. The book value of the Company's 5.5% Senior Notes due in 2026 and the 4.25% Senior Notes due in 2028 (Senior Notes), which are fixed rate debt, are carried at amortized cost. Fair value of the Senior Notes is based on quoted market prices and on borrowing rates available to the Company; and
- Contingent consideration - Valued based on a probability weighting of the future cash flows associated with the potential outcomes.

Inventories

The Company's inventories consist of raw materials, work in process and finished product related primarily to small models, large models, microbial solutions products, and avian related eggs and flocks. Inventories are stated at the lower of cost or net realizable value. Inventory value is generally based on the standard cost method for all businesses except for the Avian business, which is based on an average cost. Standard costs are trued-up to reflect actual cost. For small models inventory, costs include direct materials such as feed and bedding, costs of personnel directly involved in the care of the models, and an allocation of facility overhead. For the large models inventory, costs are primarily the external cost paid to acquire the model.

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For the microbial solutions inventory, costs include direct materials, cost of personnel directly involved in the manufacturing and assembly of products sold, and an allocation of facility overhead. For the avian related inventory, costs include direct materials, such as animal feed, cost of personnel directly involved with the care of the eggs and flocks, and an allocation of facility overhead. Inventory costs are charged to cost of revenue in the period the products are sold to an external party. The Company analyzes its inventory levels on a quarterly basis and writes down inventory that is determined to be damaged, obsolete or otherwise unmarketable, with a corresponding charge to cost of products sold.

Property, Plant and Equipment, Net

Property, plant and equipment, net, including improvements that significantly add to productive capacity or extend useful life, are carried at cost and are subject to review for impairment whenever events or changes in circumstances indicate that the carrying amount of the asset may not be recoverable. The cost of normal, recurring, or periodic repairs and maintenance activities related to property, plant and equipment is expensed as incurred. In addition, the Company capitalizes certain internal use computer software development costs. Costs incurred during the preliminary project stage are expensed as incurred, while costs incurred during the application development stage are capitalized and amortized over the estimated useful life of the software. The Company also capitalizes costs related to specific upgrades and enhancements when it is probable the expenditures will result in additional functionality. Maintenance and training costs related to software obtained for internal use are expensed as incurred.

Interest costs incurred during the construction of major capital projects are capitalized until the underlying asset is ready for its intended use, at which point the interest costs are amortized as depreciation expense over the life of the underlying asset.

The Company generally depreciates the cost of its property, plant and equipment using the straight-line method over the estimated useful lives of the respective assets as follow:

	Estimated Useful Lives
	(in years)
Land	Indefinite
Buildings	20 - 40
Machinery and equipment	3 - 20
Furniture and fixtures	5 - 10
Computer hardware and software	3 - 8
Vehicles	3 - 5

Leasehold improvements are amortized over the shorter of the estimated useful life of the asset or the lease term. Finance lease assets are amortized over the lease term, however, if ownership is transferred by the end of the finance lease, or there is a bargain purchase option, such finance lease assets are amortized over the useful life that would be assigned if such assets were owned.

When the Company disposes of property, plant and equipment, it removes the associated cost and accumulated depreciation from the related accounts on its consolidated balance sheet and includes any resulting gain or loss in its consolidated statement of income.

Business Combinations

The Company accounts for business combinations under the acquisition method of accounting. The Company allocates the amounts that it pays for each acquisition to the assets it acquires and liabilities it assumes based on their fair values at the dates of acquisition, including identifiable intangible assets, which typically represents a significant portion of the purchase price. The determination of the fair value of intangible assets requires the use of significant judgment using management's best estimates of inputs and assumptions that a market participant would use. Significant judgments include (i) the fair value; and (ii) whether such intangible assets are amortizable or non-amortizable and, if the former, the period and the method by which the intangible asset will be amortized. The Company utilizes commonly accepted valuation techniques, such as the income approach and the cost approach, as appropriate, in establishing the fair value of intangible assets. Typically, key assumptions include projections of cash flows that arise from identifiable intangible assets of acquired businesses as well as discount rates based on an analysis of the weighted average cost of capital, adjusted for specific risks associated with the assets.

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In recent acquisitions, customer relationship intangible assets (also referred to as client relationships) are the most significant identifiable asset acquired. To determine the fair value of the acquired client relationships, the Company typically utilizes the multiple period excess earnings model (a commonly accepted valuation technique), which relies on the following key assumptions: projections of cash flows from the acquired entities, which includes future revenue growth rates, operating income margins, and customer attrition rates; as well as discount rates based on an analysis of the acquired entities' weighted average cost of capital.

Contingent Consideration

The consideration for the Company's acquisitions often includes future payments that are contingent upon the occurrence of a particular event. The Company records an obligation for such contingent payments at fair value on the acquisition date. The Company estimates the fair value of contingent consideration obligations through valuation models that incorporate probability adjusted assumptions related to the achievement of the milestones and the likelihood of making related payments. The Company revalues these contingent consideration obligations each reporting period. Changes in the fair value of the contingent consideration obligations are recognized in the Company's consolidated statements of income as a component of selling, general and administrative expenses. Changes in the fair value of the contingent consideration obligations can result from changes to one or multiple inputs, including adjustments to the discount rates and changes in the assumed probabilities of successful achievement of certain financial targets.

Discount rates in the Company's valuation models represent a measure of the credit risk associated with settling the liability. The period over which the Company discounts its contingent obligations is typically based on when the contingent payments would be triggered. These fair value measurements are based on significant inputs not observable in the market. See Note 7, "Fair Value."

Goodwill and Intangible Assets

Goodwill represents the difference between the purchase price and the fair value of the identifiable tangible and intangible net assets when accounted for using the acquisition method of accounting. Goodwill is not amortized, but reviewed for impairment on an annual basis, during the fourth quarter, or more frequently if an event occurs or circumstances change that would more-likely-than-not reduce the fair value of the Company's reporting units below their carrying amounts.

The Company has the option to first assess qualitative factors to determine whether it is necessary to perform the two-step impairment test. If the Company elects this option and believes, as a result of the qualitative assessment, that it is more-likely-than-not that the carrying value of goodwill is not recoverable, the quantitative two-step impairment test is required; otherwise, no further testing is required. Alternatively, the Company may elect to not first assess qualitative factors and immediately perform the quantitative two-step impairment test. In the first step, the Company compares the fair value of its reporting units to their carrying values. If the carrying values of the net assets assigned to the reporting units exceed the fair values of the reporting units, then the second step of the impairment test is performed in order to determine the implied fair value of the Company's goodwill. If the carrying value of the reporting unit's goodwill exceeds its implied fair value, then the Company would record an impairment loss equal to the difference.

Definite-lived intangible assets, including client relationships, are amortized over the pattern in which the economic benefits of the intangible assets are utilized and reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of the assets or asset group may not be recoverable. Determination of recoverability is based on an estimate of undiscounted future cash flows resulting from the use of the asset, which requires the use of customer attribution rates and other assumptions. In the event that such cash flows are not expected to be sufficient to recover the carrying amount of the definite-lived intangible assets, the definite-lived intangible assets are written-down to their fair values.

Valuation and Impairment of Long-Lived Assets

Long-lived assets to be held and used are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of the assets or asset group may not be recoverable.

Determination of recoverability is based on an estimate of undiscounted future cash flows resulting from the use of the asset and its eventual disposition. In the event that such cash flows are not expected to be sufficient to recover the carrying amount of the assets, the assets are written-down to their fair values.

Long-lived assets to be disposed of are carried at fair value less costs to sell.

Venture Capital Investments

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The Company invests in several venture capital funds that invest in start-up companies, primarily in the life sciences industry. The Company's ownership interest in these funds ranges from less than 1% to approximately 12%. The Company accounts for the investments in limited partnerships (LPs), which are variable interest entities, under the equity method of accounting. For publicly-held investments in the LPs, the Company adjusts for changes in fair market value based on reported share holdings at the end of each fiscal quarter. The Company is not the primary beneficiary because it has no power to direct the activities that most significantly affect the LPs' economic performance. The Company accounts for the investments in limited liability companies, which are not variable interest entities, under the equity method of accounting.

Under the equity method of accounting, the Company's portion of the investment gains and losses, as reported in the fund's financial statements on a quarterly lag each reporting period, is recorded in other income, net in the accompanying consolidated statements of income. In addition, the Company adjusts the carrying value of these investments to reflect its estimate of changes to fair value since the fund's financial statements are based on information from the fund's management team, market prices of known public holdings of the fund and other information.

Other Investments

The Company invests in equity of certain privately-held companies, primarily with minority positions. These investments are reported at fair value or under the equity method of accounting, as appropriate. Equity investments that do not have readily determinable fair values are generally recorded at cost, plus or minus certain adjustments.

Life Insurance Contracts

Investments in life insurance contracts are recorded at cash surrender value. The initial investment at the transaction price is recognized and remeasured based on fair value of underlying investments or contractual value each reporting period. Investments in and redemptions of these life insurance contracts are reported as cash flows from investing activities in the consolidated statement of cash flows. The Company held 44 and 45 contracts at December 28, 2019 and December 29, 2018, with a face value of $72.7 million and $65.2 million, respectively.

Leases

At inception of a contract, the Company determines if a contract meets the definition of a lease. A lease is a contract, or part of a contract, that conveys the right to control the use of identified property, plant, or equipment (an identified asset) for a period of time in exchange for consideration. The Company determines if the contract conveys the right to control the use of an identified asset for a period of time. The Company assesses throughout the period of use whether the Company has both of the following: (1) the right to obtain substantially all of the economic benefits from use of the identified asset, and (2) the right to direct the use of the identified asset. This determination is reassessed if the terms of the contract are changed. Leases are classified as operating or finance leases based on the terms of the lease agreement and certain characteristics of the identified asset. Right-of-use assets and lease liabilities are recognized at lease commencement date based on the present value of the minimum future lease payments.

The Company leases laboratory, production, and office space (real estate), as well as land, vehicles and certain equipment under non-cancellable operating and finance leases. The carrying value of the Company's right-of-use lease assets is substantially concentrated in its real estate leases, while the volume of lease agreements is primarily concentrated in vehicles and equipment leases. The Company's policy is to not record leases with an original term of twelve months or less on the consolidated balance sheets. The Company recognizes lease expense for these short-term leases on a straight-line basis over the lease term.

Certain lease agreements include rental payments that are adjusted periodically for inflation or other variables. In addition to rent, the leases may require the Company to pay additional amounts for taxes, insurance, maintenance and other expenses, which are generally referred to as non-lease components. Such adjustments to rental payments and variable non-lease components are treated as variable lease payments and recognized in the period in which the obligation for these payments was incurred. Variable lease components and variable non-lease components are not measured as part of the right-of-use asset and liability. Only when lease components and their associated non-lease components are fixed are they accounted for as a single lease component and are recognized as part of a right-of-use asset and liability. Total contract consideration is allocated to the combined fixed lease and non-lease component. This policy election applies consistently to all asset classes under lease agreements.

Most leases contain clauses for renewal at the Company's option with renewal terms that generally extend the lease term from 1 to 5 years. Certain lease agreements contain options to purchase the leased property and options to terminate the lease. Payments to be made in option periods are recognized as part of the right-of-use lease assets and lease liabilities when it is reasonably certain that the option to extend the lease will be exercised or the option to terminate the lease will not be exercised,

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or is not at the Company's option. The Company determines whether the reasonably certain threshold is met by considering contract-, asset-, market-, and entity-based factors.

A portfolio approach is applied to certain lease contracts with similar characteristics. The Company's lease agreements do not contain any significant residual value guarantees or material restrictive covenants imposed by the leases.

The Company subleases a limited number of lease arrangements. Sublease activity is not material to the consolidated financial statements.

Stock-Based Compensation

The Company may grant stock options, restricted stock, restricted stock units (RSUs), and performance share units (PSUs) to employees and stock options, restricted stock, and RSUs to non-employee directors under stock-based compensation plans. Stock-based compensation is recognized as an expense in the consolidated statements of income based on the grant date fair value, adjusted for forfeitures when they occur, over the requisite service period.

For stock options, restricted stock and RSUs that vest based on service conditions, the Company uses the straight-line method to allocate compensation expense to reporting periods. Where awards are made with non-substantive vesting periods and a portion of the award continues to vest after the employee's eligible retirement, the Company recognizes expense based on the period from the grant date to the date on which the employee is retirement eligible. The Company records the expense for PSU grants subject to performance and/or market conditions using the accelerated attribution method over the remaining service period when management determines that achievement of the performance-based milestone is probable.

The fair value of stock options granted is calculated using the Black-Scholes option-pricing model and the fair value of PSUs is estimated using a lattice model with a Monte Carlo simulation, both of which require the use of subjective assumptions including volatility and expected term, among others. The expected volatility assumption is typically determined using the historical volatility of the Company's common stock over the expected life of the stock-based award. The expected term is determined using historical option exercise activity. The fair value of restricted stock and RSUs is based on the market value of the Company's common stock on the date of grant.

Revenue Recognition

Accounting Standard Codification Topic 606, "Revenue from Contracts with Customers" (ASC 606) became effective for the Company on December 31, 2017 and was adopted using the modified retrospective method for all contracts not completed as of the date of adoption. For contracts that were modified before the effective date, the Company reflected the aggregate effect of all modifications when identifying performance obligations and allocating transaction price in accordance with the practical expedient, which did not have a material effect on the cumulative impact of adopting ASC 606. The reported results for fiscal years 2019 and 2018 reflect the application of ASC 606 guidance while the historical results for fiscal year 2017 was prepared under the guidance of ASC 605, "Revenue Recognition" (ASC 605). There is no material difference in the reporting of revenue during fiscal years 2019 and 2018 in accordance with ASC 606 when compared to fiscal year 2017 in accordance with ASC 605.

Revenue is recognized when, or as, obligations under the terms of a contract are satisfied, which occurs when control of the promised products or services is transferred to customers. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring products or services to a customer ("transaction price").

To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing the amount to which the Company expects to be entitled. Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Estimates of variable consideration and determination of whether to include estimated amounts in the transaction price are based largely on an assessment of the Company's anticipated performance and all information (historical, current and forecasted) that is reasonably available. Sales, value add, and other taxes collected on behalf of third parties are excluded from revenue.

When determining the transaction price of a contract, an adjustment is made if payment from a customer occurs either significantly before or significantly after performance, resulting in a significant financing component. Generally, the Company does not extend payment terms beyond one year. Applying the practical expedient, the Company does not assess whether a significant financing component exists if the period between when the Company performs its obligations under the contract and when the customer pays is one year or less. The Company's contracts do not generally contain significant financing components.

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Contracts with customers may contain multiple performance obligations. For such arrangements, the transaction price is allocated to each performance obligation based on the estimated relative standalone selling prices of the promised products or services underlying each performance obligation. The Company determines standalone selling prices based on the price at which the performance obligation is sold separately. If the standalone selling price is not observable through past transactions, the Company estimates the standalone selling price taking into account available information such as market conditions and internally approved pricing guidelines related to the performance obligations.

Contracts are often modified to account for changes in contract specifications and requirements. Contract modifications exist when the modification either creates new, or changes existing, enforceable rights and obligations. Generally, when contract modifications create new performance obligations, the modification is considered to be a separate contract and revenue is recognized prospectively. When contract modifications change existing performance obligations, the existing transaction price and measure of progress for the performance obligation to which it relates is generally recognized as an adjustment to revenue (either as an increase in or a reduction of revenue) on a cumulative catch-up basis.

Product revenue is generally recognized when the customer obtains control of the Company's product, which occurs at a point in time, and may be upon shipment or upon delivery based on the contractual shipping terms of a contract. Service revenue is generally recognized over time as the services are delivered to the customer based on the extent of progress towards completion of the performance obligation. The selection of the method to measure progress towards completion requires judgment and is based on the nature of the products or services to be provided. Depending on which better depicts the transfer of value to the customer, the Company generally measures its progress using either cost-to-cost (input method) or right-to-invoice (output method). The Company uses the cost-to-cost measure of progress when it best depicts the transfer of value to the customer which occurs as the Company incurs costs on its contract, generally related to fixed fee service contracts. Under the cost-to-cost measure of progress, the extent of progress towards completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. The costs calculation includes variables such as labor hours, allocation of overhead costs, research model costs, and subcontractor costs. Revenue is recorded proportionally as costs are incurred. The right-to-invoice measure of progress is generally related to rate per unit contracts, as the extent of progress towards completion is measured based on discrete service or time-based increments, such as samples tested or labor hours incurred. Revenue is recorded in the amount invoiced since that amount corresponds directly to the value of the Company's performance to date.

Income Taxes

The provision for income taxes includes federal, state, local and foreign taxes. Income taxes are accounted for under the liability method. Deferred tax assets and liabilities are recognized for the expected future tax consequences of temporary differences between the financial statements carrying amounts and their respective tax basis. The Company measures deferred tax assets and liabilities using the enacted tax rates in effect when the temporary differences are expected to be settled. The Company evaluates the realizability of its deferred tax assets and establishes a valuation allowance when it is more likely than not that all or a portion of deferred tax assets will not be realized.

The Company accounts for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The Company evaluates uncertain tax positions on a quarterly basis and considers various factors, including, but not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, information obtained during in-process audit activities and changes in facts or circumstances related to a tax position. The Company also accrues for potential interest and penalties related to unrecognized tax benefits in income tax expense.

Foreign Currency Contracts

Foreign currency contracts are recorded at fair value in the Company's consolidated balance sheets and are not designated as hedging instruments. Any gains or losses on forward contracts associated with intercompany loans are recognized immediately in Other income, net and are largely offset by the remeasurement of the underlying intercompany loan. Any gains or losses on forward contracts associated with the Company's U.S. dollar denominated loan borrowed by a non-U.S. entity under the Company's Credit Facility are recognized immediately in Interest expense. Gains or losses incurred on the remeasurement of the Company's U.S. dollar denominated loan borrowed by a non-U.S. entity with a different functional currency is recorded in Other income, net.

Translation of Foreign Currencies

For the Company's subsidiaries that transact in a functional currency other than the U.S. dollar, assets and liabilities are translated at current rates of exchange as of the balance sheet date. Income and expense items are translated at the average

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foreign exchange rates for the period. Adjustments resulting from the translation of the financial statements of the Company's foreign operations into U.S. dollars are excluded from the determination of net income and are recorded in accumulated other comprehensive loss, a separate component of equity.

Pension and Other Post-Retirement Benefit Plans

The Company recognizes the funded status of its defined benefit pension and other post-retirement benefit plans as an asset or liability. This amount is defined as the difference between the fair value of plan assets and the benefit obligation. The Company measures plan assets and benefit obligations as of its fiscal year end.

The key assumptions used to calculate benefit obligations and related pension costs include expected long-term rate of return on plan assets, withdrawal and mortality rates, expected rate of increase in employee compensation levels and a discount rate. Assumptions are determined based on the Company's data and appropriate market indicators, and evaluated each year as of the plan's measurement date.

The expected long-term rate of return on plan assets reflects the average rate of earnings expected on the funds invested, or to be invested, to provide for the benefits included in the projected benefit obligations. In determining the expected long-term rate of return on plan assets, the Company considers the relative weighting of plan assets, the historical performance of total plan assets and individual asset classes and economic and other indicators of future performance.

The rate of compensation increase reflects the expected annual salary increases for the plan participants based on historical experience and the current employee compensation strategy.

The Company is required to recognize as a component of other comprehensive income, net of tax, the actuarial gains or losses and prior service costs or credits that arise but were not previously required to be recognized as components of net periodic benefit cost. Other comprehensive income is adjusted as these amounts are later recognized in income as components of net periodic benefit cost.

The Company records the service cost component of the net periodic benefit cost within Cost of services provided and Selling, general, and administrative expenses (within Operating income) and all other components of net periodic benefit cost within Other income, net in the consolidated statements of income.

The Company recognizes pension settlement gains or losses in the period when all of the following settlement criteria are met: there is an irrevocable action, the Company is relieved of primary responsibility for a benefit obligation, and significant risks related to the obligation and the assets used to effect the settlement are eliminated. Refer to Note 12. "Employee Benefit Plans" for further discussion of the U.S. Pension Plan termination and expected settlement in fiscal 2020.

Earnings Per Share

Basic earnings per share is calculated by dividing net income attributable to common shareholders by the weighted average number of common shares outstanding during the period. Except where the result would be anti-dilutive to income from continuing operations, diluted earnings per share is computed using the treasury stock method, assuming the exercise of stock options and the vesting of restricted stock awards, RSUs, or PSUs, as well as their related income tax effects.

Treasury Shares

The Company periodically retires treasury shares acquired through share repurchases and returns those shares to the status of authorized but unissued. The Company accounts for treasury stock transactions under the cost method. For each reacquisition of common stock, the number of shares and the acquisition price for those shares is added to the existing treasury stock count and total value. Thus, the average cost per share is re-averaged each time shares are acquired. When treasury shares are retired, the Company allocates the excess of the repurchase price over the par value of shares acquired to both retained earnings and additional paid-in-capital. The portion allocated to additional paid-in-capital is determined by applying a percentage, determined by dividing the number of shares to be retired by the number of shares issued, to the balance of additional paid-in-capital as of the retirement date.

Newly Adopted Accounting Pronouncements

In June 2018, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) 2018-07, "Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting." ASU 2018-07 aligns the accounting for share-based payment awards issued to employees and nonemployees as well as improves financial reporting for share-based payments to nonemployees. The Company's adoption of this standard in fiscal year 2019 did not have a significant impact on the consolidated financial statements and related disclosures.

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In August 2017, the FASB issued ASU 2017-12, "Derivatives and Hedging (Topic 815) Targeted Improvements to Accounting for Hedging Activities." ASU 2017-12 refines and expands hedge accounting for both financial and commodity risks. It also creates more transparency around how economic results are presented, both on the face of the financial statements and in the disclosures. In addition, this ASU makes certain targeted improvements to simplify the application of hedge accounting guidance. The Company's adoption of this standard in fiscal year 2019 did not have a significant impact on the consolidated financial statements and related disclosures.

In February 2016, the FASB issued ASU 2016-02, "Leases." The standard, including subsequently issued amendments, collectively referred to as Accounting Standards Codification (ASC) 842, "Leases", established the principles that lessees and lessors will apply to report useful information to users of financial statements about the amount, timing and uncertainty of cash flows arising from a lease. The Company adopted this standard using the modified retrospective transition approach as applied to leases existing as of or entered into after the adoption date (December 30, 2018) in fiscal year 2019. See Note 16, "Leases" for a discussion of the Company's adoption of this standard and its impact on the consolidated financial statements and related disclosures.

Newly Issued Accounting Pronouncements

In January 2020, the FASB issued ASU 2020-01, "Investments-Equity Securities (Topic 321), Investments-Equity Method and Joint Ventures (Topic 323), and Derivatives and Hedging (Topic 815)." ASU 2020-01 states any equity security transitioning from the alternative method of accounting under Topic 321 to the equity method, or vice versa, due to an observable transaction will be remeasured immediately before the transition. In addition, the ASU clarifies the accounting for certain non-derivative forward contracts or purchased call options to acquire equity securities stating such instruments will be measured using the fair value principles of Topic 321 before settlement or exercise. The ASU is effective for fiscal years beginning after December 15, 2020, and will be applied on a prospective basis. Early adoption is permitted. The Company is still evaluating the impact this standard will have on its consolidated financial statements and related disclosures, but does not believe there will be a material impact upon adoption.

In December 2019, the FASB issued ASU 2019-12, "Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes." ASU 2019-12 simplifies the accounting for income taxes by removing exceptions within the general principles of Topic 740 regarding the calculation of deferred tax liabilities, the incremental approach for intraperiod tax allocation, and calculating income taxes in an interim period. In addition, the ASU adds clarifications to the accounting for franchise tax (or similar tax). which is partially based on income, evaluating tax basis of goodwill recognized from a business combination, and reflecting the effect of any enacted changes in tax laws or rates in the annual effective tax rate computation in the interim period that includes the enactment date. The ASU is effective for fiscal years beginning after December 15, 2020, and will be applied either retrospectively or prospectively based upon the applicable amendments. Early adoption is permitted. The adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-15, "Intangibles - Goodwill and Other - Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computer Arrangement that is a Service Contract." ASU 2018-15 aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The ASU is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years and will be applied either retrospectively or prospectively. Early adoption is permitted. The adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-14, "Compensation Retirement Benefits - Defined Benefit Plans - General (Subtopic 715-20)." ASU 2018-14 removes the requirements to disclose the amounts in Accumulated other comprehensive income (loss) expected to be recognized as components of net periodic benefit cost over the next fiscal year and the related party disclosures about the amount of future annual benefits covered by insurance contracts. In addition, the ASU adds the requirement to disclose an explanation for any significant gains and losses related to changes in the benefit obligation for the period. The ASU is effective for fiscal years ending after December 15, 2020 and will be applied on a retrospective basis to all periods presented. Early adoption is permitted. The adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-13, "Fair Value Measurement (Topic 820) - Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement." ASU 2018-13 removes the disclosure requirement for the amount and reasons for transfers between Level 1 and Level 2 fair value measurements as well as the process for Level 3 fair value measurements. In addition, the ASU adds the disclosure requirements for changes in unrealized gains and losses included in

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Other comprehensive income (loss) for recurring Level 3 fair value measurements held at the end of the reporting period as well as the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements. The ASU is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years and will be applied on a retrospective basis to all periods presented. Early adoption is permitted. The adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In January 2017, the FASB issued ASU 2017-04, "Simplifying the Test for Goodwill Impairment." The standard simplifies the accounting for goodwill impairment by removing Step 2 of the goodwill impairment test, which requires a hypothetical purchase price allocation. This standard is effective for annual or interim goodwill impairment tests in fiscal years beginning after December 15, 2019, and will be applied on a prospective basis. Early adoption is permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017. The adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In June 2016, the FASB issued ASU 2016-13, "Financial Instruments - Credit Losses." The standard, including subsequently issued amendments, requires a financial asset measured at amortized cost basis, such as accounts receivable and certain other financial assets, to be presented at the net amount expected to be collected based on relevant information about past events, including historical experience, current conditions, and reasonable and supportable forecasts that affect the collectability of the reported amount. This ASU is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years, and requires the modified retrospective approach. Early adoption is permitted. Based on the composition of the Company's trade receivables and other financial assets, current market conditions, and historical credit loss activity, the adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

2. BUSINESS COMBINATIONS AND DIVESTITURE

HemaCare Corporation

On January 3, 2020, the Company acquired HemaCare Corporation (HemaCare), a business specializing in the production of human-derived cellular products for the cell therapy market. The acquisition of HemaCare will expand the Company's comprehensive portfolio of early-stage research and manufacturing support solutions to encompass the production and customization of high-quality, human derived cellular products to better support clients' cell therapy programs. The preliminary purchase price of HemaCare was approximately $380 million in cash. The acquisition was funded through a combination of cash on hand and proceeds from the Company's Credit Facility under the multi-currency revolving facility. See Note 9, "Long-Term Debt and Finance Leases." This business will be reported as part of the Company's RMS reportable segment. Due to the limited time between the acquisition date and the filing of this Annual Report on Form 10-K, it is not practicable for the Company to disclose the preliminary allocation of the purchase price to assets acquired and liabilities assumed. The Company incurred transaction and integration costs in connection with the acquisition of $3.3 million during fiscal year 2019, which were included in Selling, general and administrative expenses within the consolidated statements of income.

Citoxlab

On April 29, 2019, the Company acquired Citoxlab, a non-clinical CRO, specializing in regulated safety assessment services, non-regulated discovery services, and medical device testing. With operations in Europe and North America, the acquisition of Citoxlab further strengthens the Company's position as a leading, global, early-stage CRO by expanding its scientific portfolio and geographic footprint, which enhances the Company's ability to partner with clients across the drug discovery and development continuum. The preliminary purchase price for Citoxlab was $527.7 million in cash, subject to certain post-closing adjustments that may change the purchase price. The acquisition was funded through a combination of cash on hand and proceeds from the Company's Credit Facility under the multi-currency revolving facility. This business is reported as part of the Company's DSA reportable segment.

The preliminary purchase allocation of $491.0 million, net of $36.7 million of cash acquired was as follows:

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	April 29, 2019
	(in thousands)
Trade receivables (contractual amount of $35,405)	$ 35,405
Inventories	5,282
Other current assets (excluding cash)	13,917
Property, plant and equipment	88,605
Goodwill	280,711
Definite-lived intangible assets	162,400
Other long-term assets	20,163
Deferred revenue	(15,278)
Current liabilities	(46,081)
Deferred tax liabilities	(27,458)
Other long-term liabilities	(22,624)
Redeemable noncontrolling interest	(4,035)
Total purchase price allocation	$ 491,007

The preliminary purchase price allocation is subject to change as additional information becomes available concerning the fair value and tax basis of the assets acquired and liabilities assumed, including certain contracts and obligations. Any additional adjustments to the purchase price allocation will be made as soon as practicable but no later than one year from the date of acquisition. From the date of the acquisition through December 28, 2019, the Company recorded measurement-period adjustments related to the acquisition that resulted in an immaterial change to the purchase price allocation on a consolidated basis.

The breakout of definite-lived intangible assets acquired was as follows:

	Definite-Lived Intangible Assets	Weighted Average Amortization Life
	(in thousands)	(in years)
Client relationships	$ 134,600	13
Developed technology	19,900	3
Backlog	7,900	1
Total definite-lived intangible assets	$ 162,400	12

The goodwill resulting from the transaction, $7.2 million of which is deductible for tax purposes due to a prior asset acquisition, is primarily attributable to the potential growth of the Company's DSA business from customers introduced through Citoxlab and the assembled workforce of the acquired business.

The Company incurred transaction and integration costs in connection with the acquisition of $20.7 million during fiscal year 2019, which were primarily included in Selling, general and administrative expenses within the consolidated statements of income.

Beginning on April 29, 2019, Citoxlab has been included in the operating results of the Company. Citoxlab revenue and operating income from April 29, 2019 through December 28, 2019 was $123.7 million and $6.2 million, respectively.

The following selected unaudited pro forma consolidated results of operations are presented as if the Citoxlab acquisition had occurred as of the beginning of the period immediately preceding the period of acquisition, which is December 31, 2017, after giving effect to certain adjustments. For fiscal year 2019, these adjustments included additional amortization of intangible assets and depreciation of fixed assets of $5.7 million, additional interest expense on borrowings of $1.2 million, elimination of intercompany activity and other one-time costs, and the tax impacts of these adjustments. For fiscal year 2018, these adjustments included additional amortization of intangible assets and depreciation of fixed assets of $9.4 million, additional interest expense on borrowings of $4.1 million, elimination of intercompany activity and other one-time costs, and the tax impacts of these adjustments.

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	Fiscal Year	
	2019	2018
	(in thousands) (unaudited)	
Revenue	$ 2,683,610	$ 2,442,283
Net income attributable to common shareholders	268,995	233,288

These unaudited pro forma results of operations have been prepared for comparative purposes only, and they do not purport to be indicative of the results of operations that actually would have resulted had the acquisition occurred on the dates indicated or that may result in the future. No effect has been given for synergies, if any, that may be realized through the acquisition.

MPI Research

On April 3, 2018, the Company acquired MPI Research, a non-clinical CRO providing comprehensive testing services to biopharmaceutical and medical device companies worldwide. The acquisition enhances the Company's position as a leading global early-stage CRO by strengthening its ability to partner with clients across the drug discovery and development continuum. The purchase price for MPI Research was $829.7 million in cash. The acquisition was funded by borrowings on the Credit Facility as well as the issuance of the Company's 2026 Senior Notes. See Note 9, "Long-Term Debt and Finance Lease Obligations." This business is reported as part of the Company's DSA reportable segment.

The purchase allocation of $800.8 million, net of $27.7 million of cash acquired and a final net working capital adjustment of $1.2 million, was as follows:

	April 3, 2018
	(in thousands)
Trade receivables (contractual amount of $35,073)	$ 35,073
Inventories	4,463
Other current assets (excluding cash)	5,893
Property, plant and equipment	128,403
Goodwill	441,656
Definite-lived intangible assets	309,200
Other long-term assets	1,081
Deferred revenue	(23,926)
Current liabilities	(32,885)
Deferred tax liabilities	(65,945)
Other long-term liabilities	(2,213)
Total purchase price allocation	$ 800,800

From the date of the acquisition through March 30, 2019, the Company recorded measurement-period adjustments related to the acquisition that resulted in an immaterial change to the purchase price allocation on a consolidated basis. No further adjustments will be made to the purchase price allocation.

The breakout of definite-lived intangible assets acquired was as follows:

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	Definite-Lived Intangible Assets	Weighted Average Amortization Life
	(in thousands)	(in years)
Client relationships	$ 264,900	13
Developed technology	23,400	3
Backlog	20,900	1
Total definite-lived intangible assets	$ 309,200	12

The goodwill resulting from the transaction, $4.1 million of which is deductible for tax purposes due to a prior asset acquisition, is primarily attributable to the potential growth of the Company's DSA business from customers introduced through MPI Research and the assembled workforce of the acquired business.

No significant integration costs were incurred in connection with the acquisition for fiscal year 2019. The Company incurred transaction and integration costs in connection with the acquisition of $16.5 million during fiscal year 2018, which were primarily included in Selling, general and administrative expenses within the consolidated statements of income.

MPI Research revenue and operating income from April 3, 2018 through December 29, 2018 was $209.5 million and $33.4 million, respectively. Beginning on April 3, 2018, MPI Research has been included in the operating results of the Company.

The following selected unaudited pro forma consolidated results of operations are presented as if the MPI Research acquisition had occurred as of the beginning of the period immediately preceding the period of acquisition, which is January 1, 2017, after giving effect to certain adjustments. For fiscal year 2018, these adjustments included additional amortization of intangible assets and depreciation of fixed assets of $14.1 million, additional interest expense on borrowings of $2.8 million, elimination of intercompany activity and other one-time costs, and the tax impacts of these adjustments. For fiscal year 2017, these adjustments included additional amortization of intangible assets and depreciation of fixed assets of $22.4 million, additional interest expense on borrowings of $27.1 million, elimination of intercompany activity and other one-time costs, and the tax impacts of these adjustments.

	Fiscal Year	
	2018	2017
	(in thousands) (unaudited)	
Revenue	$ 2,328,213	$ 2,095,385
Net income attributable to common shareholders	225,550	126,641

These unaudited pro forma results of operations have been prepared for comparative purposes only, and they do not purport to be indicative of the results of operations that actually would have resulted had the acquisition occurred on the dates indicated or that may result in the future. No effect has been given for synergies, if any, that may be realized through the acquisition.

KWS BioTest Limited

On January 11, 2018, the Company acquired KWS BioTest Limited (KWS BioTest), a CRO specializing in *in vitro* and *in vivo* discovery testing services for immuno-oncology, inflammatory and infectious diseases. The acquisition enhances the Company's discovery expertise, with complementary offerings that provide the Company's customers with additional tools in the active therapeutic research areas of oncology and immunology. The purchase price for KWS BioTest was $20.3 million in cash, and was funded by the Company's various borrowings. In addition to the initial purchase price, the transaction included aggregate, undiscounted contingent payments of up to £3.0 million based on future performance. The terms of these contingent payments were amended during fiscal year 2018, resulting in a fixed payment of £2.0 million or $2.6 million, which was paid during the first quarter of fiscal year 2019. The KWS BioTest business is reported as part of the Company's DSA reportable segment.

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The purchase price allocation of $21.5 million, net of $1.0 million of cash acquired and a final net working capital adjustment of $0.4 million, was as follows:

	January 11, 2018
	(in thousands)
Trade receivables (contractual amount of $1,309)	$ 1,309
Other current assets (excluding cash)	99
Property, plant and equipment	1,136
Definite-lived intangible assets - client relationships	3,647
Goodwill	17,660
Current liabilities	(1,575)
Deferred revenue	(151)
Long-term liabilities	(596)
Total purchase price allocation	$ 21,529

From the date of the acquisition through December 29, 2018, the Company recorded measurement-period adjustments related to the acquisition that resulted in an immaterial change to the purchase price allocation on a consolidated basis. No further adjustments will be made to the purchase price allocation.

The only definite-lived intangible asset relates to client relationships, which will be amortized over a weighted average life of 12 years.

The goodwill resulting from the transaction is primarily attributable to the potential growth of the Company's DSA business from customers introduced through KWS BioTest and the assembled workforce of the acquired business. The goodwill attributable to KWS BioTest is not deductible for tax purposes.

No significant integration costs were incurred in connection with the acquisition during fiscal year 2019. The Company incurred transaction and integration costs in connection with the acquisition of $0.7 million during fiscal year 2018, which were included in Selling, general and administrative expenses within the consolidated statements of income.

Pro forma financial information as well as actual revenue and operating income (loss) have not been included because KWS BioTest's financial results are not significant when compared to the Company's consolidated financial results.

Brains On-Line

On August 4, 2017, the Company acquired Brains On-Line, a CRO providing critical data that advances novel therapeutics for the treatment of central nervous system (CNS) diseases. Brains On-Line strategically expands the Company's existing CNS capabilities and establishes the Company as a single-source provider for a broad portfolio of discovery CNS services. The purchase price for Brains On-Line was $21.3 million in cash and was funded by the Company's various borrowings. In addition to the initial purchase price, the transaction included aggregate, undiscounted contingent payments of up to €6.7 million based on future performance. During the first quarter of fiscal year 2019, the terms of these contingent payments were amended, resulting in a fixed payment of $2.6 million, which was paid during the three months ended June 29, 2019. The Brains On-Line business is reported as part of the Company's DSA reportable segment.

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The purchase price allocation of $20.1 million, net of $0.6 million of cash acquired, was as follows:

	August 4, 2017
	(in thousands)
Trade receivables (contractual amount of $1,146)	$ 1,146
Other current assets (excluding cash)	640
Property, plant and equipment	664
Other long-term assets	29
Definite-lived intangible assets	9,300
Goodwill	12,582
Current liabilities	(1,683)
Deferred revenue	(405)
Long-term liabilities	(2,151)
Total purchase price allocation	$ 20,122

From the date of the acquisition through June 30, 2018, the Company recorded measurement-period adjustments related to the acquisition that resulted in an immaterial change to the purchase price allocation on a consolidated basis. No further adjustments will be made to the purchase price allocation.

The breakout of definite-lived intangible assets acquired was as follows:

	Definite-Lived Intangible Assets	Weighted Average Amortization Life
	(in thousands)	(in years)
Client relationships	$ 7,000	13
Other intangible assets	2,300	10
Total definite-lived intangible assets	$ 9,300	12

The goodwill resulting from the transaction is primarily attributable to the potential growth of the Company's DSA businesses from customers and technology introduced through Brains On-Line and the assembled workforce of the acquired business. The goodwill attributable to Brains On-Line is not deductible for tax purposes.

No significant integration costs were incurred in connection with the acquisition during fiscal years 2019 or 2018. The Company incurred transaction and integration costs in connection with the acquisition of $2.6 million during fiscal year 2017, which were included in selling, general and administrative expenses within the consolidated statements of income.

Pro forma financial information as well as actual revenue and operating income (loss) have not been included because Brains On-Line's financial results are not significant when compared to the Company's consolidated financial results.

Other Acquisition

On August 28, 2019, the Company acquired an 80% ownership interest in a supplier that supports the Company's DSA reportable segment. The remaining 20% interest is a redeemable non-controlling interest. See Note 10, "Equity and Noncontrolling Interests." The preliminary purchase price was $23.4 million, net of a $4.0 million pre-existing relationship for a supply agreement settled upon acquisition, and subject to certain post-closing adjustments that may change the purchase price. The acquisition was funded through a combination of cash on hand and proceeds from the Company's Credit Facility under the multi-currency revolving facility. The business is reported as part of the Company's DSA reportable segment.

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The preliminary purchase allocation of $23.1 million, net of $0.3 million of cash acquired was as follows:

	August 28, 2019
	(in thousands)
Trade receivables (contractual amount of $189)	$ 189
Inventories	7,644
Property, plant and equipment	1,462
Goodwill	12,669
Other long-term assets	11,849
Current liabilities	(441)
Deferred tax liabilities	(1,331)
Other long-term liabilities	(238)
Redeemable noncontrolling interest	(8,740)
Total purchase price allocation	$ 23,063

The purchase price allocation is subject to change as additional information becomes available concerning the fair value and tax basis of the assets acquired and liabilities assumed, including certain contracts and obligations. Any additional adjustments to the purchase price allocation will be made as soon as practicable but no later than one year from the date of acquisition. From the date of the acquisition through December 28, 2019, the Company recorded measurement-period adjustments related to the acquisition that resulted in an immaterial change to the purchase price allocation on a consolidated basis.

The Company incurred transaction and integration costs in connection with the acquisition of $3.6 million for fiscal year 2019 which are primarily included in Selling, general and administrative expenses within the consolidated statements of income.

Pro forma financial information as well as the disclosure of actual results have not been included because these financial results are not significant when compared to the Company's consolidated financial results.

Contract Manufacturing

On February 10, 2017, the Company sold its CDMO business to Quotient Clinical Ltd., based in London, England, for $75 million in proceeds, net of $0.6 million in cash and cash equivalents transferred in conjunction with the sale and $0.3 million of working capital adjustments.

The CDMO business was acquired in April 2016 as part of the acquisition of WIL Research and was reported in the Company's Manufacturing reportable segment. The Company determined that the CDMO business was not optimized within the Company's portfolio at its current scale, and that the capital could be better deployed in other long-term growth opportunities.

During the three months ended April 1, 2017, the Company recorded a gain on the divestiture of the CDMO business of $10.6 million, which was included in other income, net within the Company's consolidated statements of income. The carrying amounts of the major classes of assets and liabilities associated with the divestiture of the CDMO business were as follows:

	February 10, 2017
	(in thousands)
Assets	
Current assets	$ 5,505
Property, plant and equipment, net	11,174
Goodwill	35,857
Long-term assets	17,154
Total assets	$ 69,690
Liabilities	
Deferred revenue	$ 4,878
Other current liabilities	1,158
Total liabilities	$ 6,036

3. REVENUE FROM CONTRACTS WITH CUSTOMERS

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Disaggregation of Revenue

The following tables disaggregate the Company's revenue by major business line and timing of transfer of products or services:

Major Products/Service Lines:	**2019**	**2018**
	(in thousands)	
RMS	$ 537,089	$ 519,682
DSA	1,618,995	1,316,854
Manufacturing	465,142	429,560
Total revenue	$ 2,621,226	$ 2,266,096

Timing of Revenue Recognition:	**2019**	**2018**
	(in thousands)	
RMS		
Services and products transferred over time	$ 227,872	$ 202,872
Services and products transferred at a point in time	309,217	316,810
DSA		
Services and products transferred over time	1,618,281	1,316,005
Services and products transferred at a point in time	714	849
Manufacturing		
Services and products transferred over time	142,896	128,287
Services and products transferred at a point in time	322,246	301,273
Total revenue	$ 2,621,226	$ 2,266,096

RMS

The RMS business generates revenue through the commercial production and sale of research models and the provision of services related to the maintenance and monitoring of research models and management of clients' research operations. Revenue from the sale of research models is recognized at a point in time when the customer obtains control of the product, which may be upon shipment or upon delivery based on the shipping terms of a contract. Revenue generated from research models services is recognized over time and is typically based on a right-to-invoice measure of progress (output method) as invoiced amounts correspond directly to the value of the Company's performance to date.

DSA

The Discovery and Safety Assessment business provides a full suite of integrated drug discovery services directed at the identification, screening and selection of a lead compound for drug development and offers a full range of safety assessment services including bioanalysis, drug metabolism, pharmacokinetics, toxicology and pathology. Discovery and Safety Assessment services revenue is generally recognized over time using the cost-to-cost or right to invoice measures of progress, primarily representing fixed fee service contracts and per unit service contracts, respectively.

Manufacturing

The Manufacturing business includes Microbial Solutions, which provides *in vitro* (non-animal) lot-release testing products, microbial detection products, and species identification services; Biologics Testing Services (Biologics), which performs specialized testing of biologics; and Avian Vaccine Services (Avian), which supplies specific-pathogen-free chicken eggs and chickens. Species identification service revenue is generally recognized at a point in time as identifications are completed by the Company. Biologics service revenue is generally recognized over time using the cost-to-cost measure of progress. Microbial Solutions and Avian product sales are generally recognized at a point in time when the customer obtains control of the product, which may be upon shipment or upon delivery based on the contractual shipping terms of a contract.

Transaction Price Allocated to Future Performance Obligations

The Company discloses the aggregate amount of transaction price that is allocated to performance obligations that have not yet been satisfied as of December 28, 2019. Excluded from the disclosure is the value of unsatisfied performance obligations for (i)

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contracts with an original expected length of one year or less and (ii) contracts for which revenue is recognized at the amount to which the Company has the right to invoice for services performed.

The following table includes estimated revenue expected to be recognized in the future related to performance obligations that are unsatisfied (or partially satisfied) as of December 28, 2019:

	Revenue Expected to be Recognized in Future Periods				
	Less than 1 Year	1 to 3 Years	4 to 5 Years	Beyond 5 Years	Total
	(in thousands)				
DSA	$ 156,125	$ 89,458	$ 5,965	$ 527	$ 252,075
Manufacturing	11,604	11,816	19	13	23,452
Total	$ 167,729	$ 101,274	$ 5,984	$ 540	$ 275,527

Contract Balances from Contracts with Customers

The timing of revenue recognition, billings and cash collections results in billed receivables (client receivables), contract assets (unbilled revenue), and contract liabilities (current and long-term deferred revenue and customer contract deposits) on the consolidated balance sheets. The Company's payment terms are generally 30 days in the United States and consistent with prevailing practice in international markets. A contract asset is recorded when a right to consideration in exchange for goods or services transferred to a customer is conditioned other than the passage of time. Client receivables are recorded separately from contract assets since only the passage of time is required before consideration is due. A contract liability is recorded when consideration is received, or such consideration is unconditionally due, from a customer prior to transferring goods or services to the customer under the terms of a contract. Contract liabilities are recognized as revenue after control of the products or services is transferred to the customer and all revenue recognition criteria have been met. The following table provides information about client receivables, contract assets, and contract liabilities from contracts with customers:

	December 28, 2019	December 29, 2018
	(in thousands)	
Balances from contracts with customers:		
Client receivables	$ 395,740	$ 370,131
Contract assets (unbilled revenue)	121,957	105,216
Contract liabilities (current and long-term deferred revenue)	192,788	179,559
Contract liabilities (customer contract deposits)	33,080	38,245

When the Company does not have the unconditional right to advanced billings, both advanced client payments and unpaid advanced client billings are excluded from deferred revenue, with the advanced billings also being excluded from client receivables. The Company excluded approximately $27 million and $22 million of unpaid advanced client billings from both client receivables and deferred revenue in the accompanying consolidated balance sheets as of December 28, 2019 and December 29, 2018, respectively. Advanced client payments of approximately $33 million and $38 million have been presented as customer contract deposits within other current liabilities in the accompanying consolidated balance sheets as of December 28, 2019 and December 29, 2018.

Other changes in the contract asset and the contract liability balances during fiscal year 2019 were as follows:

(i) Changes due to business combinations:

See Note 2. "Business Combinations and Divestiture" for client receivables, contract assets, and contract liabilities that were acquired as part of the Citoxlab acquisition on April 29, 2019.

(ii) Cumulative catch-up adjustments to revenue that affect the corresponding contract asset or contract liability, including adjustments arising from a change in the measure of progress, a change in an estimate of the transaction price (including any changes in the assessment of whether an estimate of variable consideration is constrained), or a contract modification:

During fiscal year 2019, an immaterial cumulative catch-up adjustment to revenue was recorded.

(iii) A change in the time frame for a right to consideration to become unconditional (that is, for a contract asset to be

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recorded as a client receivable):

Approximately 95% of unbilled revenue as of December 29, 2018 was billed during fiscal year 2019.

(iv) A change in the time frame for a performance obligation to be satisfied (that is, for the recognition of revenue arising from a contract liability):

Approximately 85% of contract liabilities as of December 29, 2018 were recognized as revenue during fiscal year 2019.

4. SEGMENT AND GEOGRAPHIC INFORMATION

The Company's three reportable segments are Research Models and Services (RMS), Discovery and Safety Assessment (DSA), and Manufacturing Support (Manufacturing). Asset information on a reportable segment basis is not disclosed as this information is not separately identified and internally reported to the Company's Chief Operating Decision Maker.

The following table presents revenue and other financial information by reportable segment:

	2019	2018	2017
		(in thousands)	
RMS			
Revenue	$ 537,089	$ 519,682	$ 493,615
Operating income	133,912	136,468	114,588
Depreciation and amortization	19,197	19,469	19,627
Capital expenditures	26,989	35,172	20,879
DSA			
Revenue	$ 1,618,995	$ 1,316,854	$ 980,022
Operating income	258,903	227,577	182,796
Depreciation and amortization	151,139	112,976	79,355
Capital expenditures	86,843	73,425	36,616
Manufacturing			
Revenue	$ 465,142	$ 429,560	$ 383,964
Operating income	145,420	136,212	123,898
Depreciation and amortization	23,584	22,529	22,893
Capital expenditures	23,617	23,323	15,188

The following tables present reconciliations of segment operating income, depreciation and amortization, and capital expenditures to the respective consolidated amounts:

	Operating Income			Depreciation and Amortization		
	2019	2018	2017	2019	2018	2017
			(in thousands)			
Total reportable segments	$ 538,235	$ 500,257	$ 421,282	$ 193,920	$ 154,974	$ 121,875
Unallocated corporate	(187,084)	(168,874)	(133,000)	4,175	6,805	9,284
Total consolidated	$ 351,151	$ 331,383	$ 288,282	$ 198,095	$ 161,779	$ 131,159

	Capital Expenditures		
	2019	2018	2017
		(in thousands)	
Total reportable segments	$ 137,449	$ 131,920	$ 72,683
Unallocated corporate	3,065	8,134	9,748
Total consolidated	$ 140,514	$ 140,054	$ 82,431

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Revenue for each significant product or service offering is as follows:

	2019	2018	2017
	(in thousands)		
RMS	$ 537,089	$ 519,682	$ 493,615
DSA	1,618,995	1,316,854	980,022
Manufacturing	465,142	429,560	383,964
Total revenue	$ 2,621,226	$ 2,266,096	$ 1,857,601

A summary of unallocated corporate expense consists of the following:

	2019	2018	2017
	(in thousands)		
Stock-based compensation	$ 37,855	$ 32,068	$ 27,114
Compensation, benefits, and other employee-related expenses	73,893	69,191	46,920
External consulting and other service expenses	16,639	18,652	22,224
Information technology	16,080	12,463	11,997
Depreciation	4,175	6,805	9,284
Acquisition and integration	26,877	16,295	3,728
Other general unallocated corporate	11,565	13,400	11,733
Total unallocated corporate expense	$ 187,084	$ 168,874	$ 133,000

Other general unallocated corporate expense consists of costs associated with departments such as senior executives, corporate accounting, legal, tax, human resources, treasury, and investor relations.

Revenue and long-lived assets by geographic area are as follows:

	U.S.	Europe	Canada	Asia Pacific	Other	Consolidated
	(in thousands)					
2019						
Revenue	$ 1,471,097	$ 726,421	$ 271,987	$ 146,218	$ 5,503	$ 2,621,226
Long-lived assets	602,654	253,665	127,495	60,213	101	1,044,128
2018						
Revenue	$ 1,267,620	$ 643,957	$ 206,382	$ 142,495	$ 5,642	$ 2,266,096
Long-lived assets	597,223	205,185	74,051	56,262	156	932,877
2017						
Revenue	$ 959,263	$ 569,812	$ 200,343	$ 126,462	$ 1,721	$ 1,857,601
Long-lived assets	446,574	203,911	82,228	49,020	240	781,973

Included in the Asia Pacific category above are operations located in China, Japan, South Korea, Australia, Singapore, and India. Included in the Other category above are operations located in Brazil and Israel. Revenue represents sales originating in entities physically located in the identified geographic area. Long-lived assets consist of property, plant, and equipment, net.

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5. SUPPLEMENTAL BALANCE SHEET INFORMATION

The composition of trade receivables, net is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Client receivables	$ 395,740	$ 370,131
Unbilled revenue	121,957	105,216
Total	517,697	475,347
Less: Allowance for doubtful accounts	(3,664)	(3,099)
Trade receivables, net	$ 514,033	$ 472,248

Net provisions of $3.0 million, $2.1 million, and $0.9 million were recorded to the allowance for doubtful accounts in fiscal years 2019, 2018, and 2017, respectively.

The composition of inventories is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Raw materials and supplies	$ 24,613	$ 22,378
Work in process	35,852	21,732
Finished products	100,195	83,782
Inventories	$ 160,660	$ 127,892

The composition of other current assets is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Prepaid income tax	$ 54,358	$ 47,157
Short-term investments	941	885
Restricted cash	431	465
Other	300	300
Other current assets	$ 56,030	$ 48,807

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The composition of property, plant and equipment, net is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Land	$ 63,077	$ 52,266
Buildings (1)	1,006,357	938,184
Machinery and equipment (1)	585,965	501,894
Leasehold improvements	84,630	59,854
Furniture and fixtures	28,304	26,700
Computer hardware and software (1)	179,865	166,398
Vehicles (1)	5,561	5,167
Construction in progress	67,939	56,549
Total	2,021,698	1,807,012
Less: Accumulated depreciation	(977,570)	(874,135)
Property, plant and equipment, net	$ 1,044,128	$ 932,877

(1) These balances include assets under finance leases. See Note 16, “Leases.”

Depreciation expense in fiscal years 2019, 2018 and 2017 was $108.6 million, $96.9 million and $89.8 million, respectively.

The composition of other assets is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Venture capital investments	$ 108,983	$ 87,545
Other investments	13,996	1,046
Life insurance policies	38,207	32,340
Restricted cash	1,601	1,411
Other	49,828	21,417
Other assets	$ 212,615	$ 143,759

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The composition of other current liabilities is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Current portion of operating lease right-of-use liabilities	$ 20,357	$ —
Accrued income taxes	26,066	24,120
Customer contract deposits	33,080	38,245
Other	11,095	8,915
Other current liabilities	$ 90,598	$ 71,280

The composition of other long-term liabilities is as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
U.S. Transition Tax	$ 52,066	$ 52,064
Long-term pension liability	43,054	24,671
Accrued executive supplemental life insurance retirement plan and deferred compensation plan	37,779	36,086
Long-term deferred revenue	20,983	34,420
Other	29,051	31,880
Other long-term liabilities	$ 182,933	$ 179,121

6. VENTURE CAPITAL AND OTHER INVESTMENTS

Venture capital investments were $109.0 million and $87.5 million as of December 28, 2019 and December 29, 2018, respectively. The Company's total commitment to the venture capital funds as of December 28, 2019 was $128.4 million, of which the Company funded $80.3 million through that date. During fiscal years 2019, 2018, and 2017, the Company received dividends totaling $11.4 million, $18.2 million, and $10.1 million, respectively. During fiscal years 2019, 2018, and 2017, the Company recognized gains related to the venture capital investments of $20.7 million, $15.9 million and $22.9 million, respectively. As of December 28, 2019 and December 29, 2018, the Company's consolidated retained earnings included $20.6 million and $14.1 million, respectively, of the undistributed earnings related to these investments.

Other investments were $14.0 million and $1.0 million as of December 28, 2019 and December 29, 2018, respectively. The Company recognized an insignificant amount of gains and losses related to these investments for fiscal years 2019 and 2018.

Gains and losses from venture capital and other investments are recorded in Other income, net in the accompanying consolidated statements of income.

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7. FAIR VALUE

Assets and liabilities measured at fair value on a recurring basis are summarized below:

	December 28, 2019			
	Level 1	Level 2	Level 3	Total
	(in thousands)			
Cash equivalents	$ —	$ 55,278	$ —	$ 55,278
Other assets:				
Life insurance policies	—	30,454	—	30,454
Total assets measured at fair value	$ —	$ 85,732	$ —	$ 85,732
Other current liabilities measured at fair value:				
Contingent consideration	$ —	$ —	$ 712	$ 712
Foreign currency forward contract	—	876	—	876
Total liabilities measured at fair value	$ —	$ 876	$ 712	$ 1,588

	December 29, 2018			
	Level 1	Level 2	Level 3	Total
	(in thousands)			
Cash equivalents	$ —	$ 45,982	$ —	$ 45,982
Other assets:				
Life insurance policies	—	24,541	—	24,541
Total assets measured at fair value	$ —	$ 70,523	$ —	$ 70,523
Other current liabilities:				
Contingent consideration	$ —	$ —	$ 3,033	$ 3,033
Foreign currency forward contract	—	1,319	—	1,319
Total liabilities measured at fair value	$ —	$ 1,319	$ 3,033	$ 4,352

During fiscal years 2019 and 2018, there were no transfers between fair value levels.

Contingent Consideration

The following table provides a rollforward of the contingent consideration related to previous business acquisitions. See Note 2, “Business Combinations and Divestiture”.

	Fiscal Year	
	2019	2018
	(in thousands)	
Beginning balance	$ 3,033	$ 298
Additions	2,869	3,315
Payments	(5,252)	—
Total gains or losses (realized/unrealized):		
Foreign currency translation	62	(298)
Reversal of previously recorded contingent liability and change in fair value	—	(282)
Ending balance	$ 712	$ 3,033

The unobservable inputs used in the fair value measurement of the Company’s contingent consideration are the probabilities of successful achievement of certain financial targets and a discount rate. Increases or decreases in any of the probabilities of

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success would result in a higher or lower fair value measurement, respectively. Increases or decreases in the discount rate would result in a lower or higher fair value measurement, respectively.

Debt Instruments

The book value of the Company's term and revolving loans, which are variable rate loans carried at amortized cost, approximates the fair value based on current market pricing of similar debt. As the fair value is based on significant other observable inputs, including current interest and foreign currency exchange rates, it is deemed to be Level 2 within the fair value hierarchy.

The book value of the Company's 2026 and 2028 Senior Notes is a fixed rate obligation carried at amortized cost. Fair value is based on quoted market prices as well as borrowing rates available to the Company. As the fair value is based on significant other observable outputs, it is deemed to be Level 2 within the fair value hierarchy. The book value and fair value of the Company's 2026 and 2028 Senior Notes is summarized below:

	December 28, 2019		December 29, 2018	
	Book Value	Fair Value	Book Value	Fair Value
2026 Senior Notes	$ 500,000	$ 537,500	$ 500,000	$ 495,000
2028 Senior Notes	500,000	510,000	—	—

8. GOODWILL AND INTANGIBLE ASSETS

Goodwill

The following table provides a rollforward of the Company's goodwill:

	December 30, 2017	Adjustments to Goodwill: Acquisitions	Adjustments to Goodwill: Foreign Exchange	December 29, 2018	Adjustments to Goodwill: Acquisitions	Adjustments to Goodwill: Foreign Exchange	December 28, 2019
			(in thousands)				
RMS	$ 58,122	$ —	$ (1,154)	$ 56,968	$ —	$ (382)	$ 56,586
DSA	1,610,176	460,223	(13,929)	2,056,470	293,380	373	2,350,223
Manufacturing	141,608	2,551	(5,464)	138,695	—	61	138,756
Gross carrying amount	1,809,906	462,774	(20,547)	2,252,133	293,380	52	2,545,565
Accumulated impairment loss - DSA	(1,005,000)	—	—	(1,005,000)	—	—	(1,005,000)
Goodwill	$ 804,906			$ 1,247,133			$ 1,540,565

Based on the Company's step one goodwill impairment test, which was performed in the fourth quarter for each of the fiscal years 2019, 2018 and 2017, the fair value of each reporting unit exceeded the reporting unit's book value and, therefore, goodwill was not impaired.

The increase in goodwill during fiscal year 2019 related primarily to the acquisition of Citoxlab in the DSA reportable segment. The increase in goodwill during fiscal year 2018 related primarily to the acquisitions of MPI Research and KWS BioTest in the DSA reportable segment, an immaterial acquisition of an Australian business in the Manufacturing reportable segment, and the impact of foreign exchange.

Intangible Assets, Net

The following table displays intangible assets, net by major class:

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	December 28, 2019			December 29, 2018		
	Gross	Accumulated Amortization	Net	Gross	Accumulated Amortization	Net
	(in thousands)					
Backlog	$ 28,865	$ (26,895)	$ 1,970	$ 20,900	$ (18,691)	$ 2,209
Technology	122,106	(57,737)	64,369	101,506	(41,870)	59,636
Trademarks and trade names	8,430	(4,901)	3,529	8,331	(4,640)	3,691
Other	18,279	(12,307)	5,972	17,448	(10,041)	7,407
Other intangible assets	177,680	(101,840)	75,840	148,185	(75,242)	72,943
Client relationships	934,668	(321,095)	613,573	791,725	(253,780)	537,945
Intangible assets	$ 1,112,348	$ (422,935)	$ 689,413	$ 939,910	$ (329,022)	$ 610,888

The increase in intangible assets, net during the fiscal year 2019 related primarily to the acquisition of Citoxlab. The increase in intangible assets, net during the fiscal year 2018 related primarily to the acquisitions of MPI Research and KWS BioTest.

Amortization expense of definite-lived intangible assets, including client relationships, for fiscal years 2019, 2018 and 2017 was $89.5 million, $64.8 million and $41.4 million, respectively. As of December 28, 2019, estimated amortization expense for intangible assets for each of the next five fiscal years is expected to be as follows:

Fiscal Year	Amortization Expense
	(in thousands)
2020	$ 97,024
2021	87,540
2022	76,204
2023	67,807
2024	60,918

9. LONG-TERM DEBT AND FINANCE LEASE OBLIGATIONS

Long-term debt, net and finance leases consists of the following:

	December 28, 2019	December 29, 2018
	(in thousands)	
Term loans	$ 193,750	$ 731,250
Revolving facility	676,134	397,452
2026 Senior Notes	500,000	500,000
2028 Senior Notes	500,000	—
Other debt	5,781	26,286
Finance leases (Note 16)	30,527	29,240
Total debt and finance leases	1,906,192	1,684,228
Less:		
Current portion of long-term debt	35,548	28,228
Current portion of finance leases (Note 16)	2,997	3,188
Current portion of long-term debt and finance leases	38,545	31,416
Long-term debt and finance leases	1,867,647	1,652,812
Debt discount and debt issuance costs	(17,981)	(16,214)
Long-term debt, net and finance leases	$ 1,849,666	$ 1,636,598

The acquisition of HemaCare on January 3, 2020 for approximately $380 million was funded through a combination of cash on hand and proceeds from the Company's Credit Facility under the multi-currency revolving facility. The increased borrowings occurred subsequent to December 28, 2019 and are not reflected in the table above.

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As of December 28, 2019 and December 29, 2018, the weighted average interest rate on the Company's debt was 3.46% and 4.24%, respectively.

Term Loans and Revolving Facility

On March 26, 2018, the Company amended and restated its $1.65 billion credit facility creating a $2.3 billion credit facility (Credit Facility). The amendment extended the maturity date and provided for a $750 million term loan and a $1.55 billion multi-currency revolving facility. The amendment was accounted for as a debt modification. In connection with the transaction, the Company capitalized $6.2 million within Long-term debt, net and finance leases in the accompanying consolidated balance sheets and expensed $1.0 million of debt issuance costs recorded within Interest expense in the accompanying consolidated statements of income for the year ended 2018. The term loan facility matures in 19 quarterly installments with the last installment due March 26, 2023. The revolving facility matures on March 26, 2023, and requires no scheduled payment before that date. On September 25, 2019, the Company amended and restated the Credit Facility for certain administrative matters.

On October 23, 2019, the Company prepaid $500.0 million of the term loan with proceeds from a $500.0 million unregistered private offering (see 2028 Senior Notes Offering below) which was treated as a debt modification. Additionally, on November 4, 2019, the Company amended and restated the Credit Facility to increase the multi-currency revolving facility by $500.0 million, from $1.55 billion to $2.05 billion. In connection with these transactions, the Company capitalized $0.5 million within Long-term debt, net and finance leases in the accompanying consolidated balance sheets and expensed $1.6 million of debt issuance costs recorded within Interest expense in the accompanying consolidated statements of income for the year ended 2019. Under specified circumstances, the Company has the ability to increase the term loan and/or revolving facility by up to $1.0 billion in the aggregate.

The interest rates applicable to the term loan and revolving facility under the Credit Facility are, at the Company's option, equal to either the base rate (which is the higher of (1) the prime rate, (2) the federal funds rate plus 0.50%, or (3) the one-month adjusted LIBOR rate plus 1.0%) or the adjusted LIBOR rate, plus an interest rate margin based upon the Company's leverage ratio.

The Credit Facility includes certain customary representations and warranties, events of default, notices of material adverse changes to the Company's business and negative and affirmative covenants. These covenants include (1) maintenance of a ratio of consolidated earnings before interest, taxes, depreciation and amortization (EBITDA) less capital expenditures to consolidated cash interest expense, for any period of four consecutive fiscal quarters, of no less than 3.50 to 1.0 as well as (2) maintenance of a ratio of consolidated indebtedness to consolidated EBITDA for any period of four consecutive fiscal quarters, of no more than 4.00 to 1.0. As of December 28, 2019, the Company was compliant with all covenants.

The obligations of the Company under the Credit Facility are collateralized by substantially all of the assets of the Company.

During fiscal years 2019 and 2018, the Company had multiple U.S. dollar denominated loans borrowed by a non-U.S. Euro functional currency entity under the Company's Credit Facility, which ranged from $300 million to $400 million each. This resulted in foreign currency losses recognized in Other income, net of $9.6 million and less than $0.1 million during fiscal years 2019 and 2018, respectively, related to the remeasurement of the underlying debt. The Company entered into foreign exchange forward contracts to limit its foreign currency exposures related to these borrowings and recognized gains of $18.7 million and $1.5 million during fiscal years 2019 and 2018, respectively, within Interest expense. As of December 28, 2019, the Company did not have any outstanding borrowings in a currency different than its respective functional currency. See Note 14, "Foreign Currency Contracts", for further discussion.

Base Indenture for Senior Notes Offerings

On April 3, 2018, the Company entered into an indenture (Base Indenture) with MUFG Union Bank, N.A., (Trustee). The purpose of the Indenture was to allow the Company the ability to issue senior notes. The Company has entered into two supplemental indentures in connection with two unregistered offerings, which are described below.

The Indenture contains certain covenants including, but not limited to, limitations and restrictions on the ability of the Company and its U.S. subsidiaries to (i) create certain liens, (ii) enter into any Sale and Leaseback Transaction (as defined in the Indenture) with respect to any property, and (iii) merge, consolidate, sell or otherwise dispose of all or substantially all of their assets. These covenants are subject to a number of conditions, qualifications, exceptions and limitations. Any event of default, as defined, could result in the acceleration of the repayment of the obligations.

2026 Senior Notes Offering

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On April 3, 2018, the Company entered into the first supplemental indenture (First Supplemental Indenture) with the Trustee in connection with an offering of $500 million in aggregate principal amount of the Company's 5.5% Senior Notes (2026 Senior Notes), due in 2026, in an unregistered offering. Under the terms of the First Supplemental Indenture, interest on the Senior Notes is payable semi-annually on April 1 and October 1, beginning on October 1, 2018. The 2026 Senior Notes are guaranteed fully and unconditionally, jointly and severally on a senior unsecured basis by the Company and certain of its U.S. subsidiaries. In connection with the transaction, the Company incurred $7.4 million of debt issuance costs, which the Company capitalized upon issuance on April 3, 2018 and recorded within Long-term debt, net and finance leases in the accompanying consolidated balance sheets.

The Company may redeem all or part of the 2026 Senior Notes at any time prior to April 1, 2021, at its option, at a redemption price equal to 100.0% of the principal amount of such Senior Notes plus the Applicable Premium (as defined in the First Supplemental Indenture). The Company may also redeem up to 40.0% of the Senior Notes with the proceeds of certain equity offerings completed before April 1, 2021, at a redemption price equal to 105.5% of the principal amount of such 2026 Senior Notes. On or after April 1, 2021, the Company may on any one or more occasions redeem all or a part of the 2026 Senior Notes, at the redemption prices specified in the Indenture based on the applicable date of redemption. Upon the occurrence of a Change of Control Triggering Event (as defined in the Indenture), the Company will be required to offer to repurchase the 2026 Senior Notes at a purchase price equal to 101.0% of the aggregate principal amount of such 2026 Senior Notes. Any redemption of the 2026 Senior Notes would also require settlement of accrued and unpaid interest, if any, up to but excluding the redemption date.

Net proceeds from the 2026 Senior Notes of $493.8 million were used to partially repay the outstanding revolving credit facility on April 3, 2018 as well as fund the acquisition of MPI Research.

2028 Senior Notes Offering

On October 23, 2019, the Company entered into a second supplemental indenture (Second Supplemental Indenture) with the Trustee in connection with the offering of $500 million in aggregate principal amount of the Company's 4.25% Senior Notes (2028 Senior Notes), due in 2028, in an unregistered offering. Under the terms of the Second Supplemental Indenture, interest on the 2028 Senior Notes is payable semi-annually on May 1 and November 1, beginning on May 1, 2020. The 2028 Senior Notes are guaranteed fully and unconditionally, jointly and severally on a senior unsecured basis by the Company and certain of its U.S. subsidiaries. In connection with the transaction, the Company incurred approximately $6 million of debt issuance costs, which were capitalized upon the 2028 Senior Notes issuance on October 23, 2019, and was recorded within Long-term debt, net and finance leases in the accompanying consolidated balance sheets.

The Company may redeem all or part of the 2028 Senior Notes at any time prior to May 1, 2023, at its option, at a redemption price equal to 100% of the principal amount of such 2028 Senior Notes plus the Applicable Premium (as defined in the Indenture). The Company may also redeem up to 40% of the 2028 Senior Notes with the proceeds of certain equity offerings completed before May 1, 2023, at a redemption price equal to 104.25% of the principal amount of such 2028 Senior Notes. On or after May 1, 2023, the Company may on any one or more occasions redeem all or a part of the 2028 Senior Notes, at the redemption prices specified in the Indenture based on the applicable date of redemption. Upon the occurrence of a Change of Control Triggering Event (as defined in the Indenture), the Company will be required to offer to repurchase the Senior Notes at a purchase price equal to 101% of the aggregate principal amount of such Senior Notes. Any redemption of the Senior Notes would also require settlement of accrued and unpaid interest, if any, up to but excluding the redemption date.

Net proceeds from the 2028 Senior Notes of approximately $494 million and available cash were used to prepay a portion of the term loan on October 23, 2019.

Commitment Letter

On February 12, 2018, the Company secured an $830 million commitment under a 364-day senior unsecured bridge loan facility (Bridge Facility) for the purpose of financing the acquisition of MPI Research. The Bridge Facility was terminated as of April 3, 2018 upon the successful acquisition of MPI Research. Debt issuance costs of $1.8 million, which were capitalized upon the execution of the Bridge Facility, were expensed upon termination of the agreement on April 3, 2018. In addition, the Company incurred and expensed $2.0 million of fees pertaining to a temporary backstop facility related to the negotiation of the Credit Facility during the three months ended March 31, 2018. These costs were included within Interest expense in the accompanying consolidated statements of income.

Principal Maturities

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Principal maturities of existing debt for the periods set forth in the table below, are as follows:

	Principal
	(in thousands)
2020	$ 35,536
2021	61,151
2022	93,966
2023	682,602
2024	468
Thereafter	1,001,942
Total	$ 1,875,665

Letters of Credit

As of December 28, 2019 and December 29, 2018, the Company had $7.5 million and $6.5 million, respectively, in outstanding letters of credit.

10. EQUITY AND NONCONTROLLING INTERESTS

Earnings Per Share

The following table reconciles the numerator and denominator in the computations of basic and diluted earnings per share:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
Numerator:			
Income from continuing operations, net of income taxes	$ 254,061	$ 227,218	$ 125,586
Income (loss) from discontinued operations, net of income taxes	—	1,506	(137)
Less: Net income attributable to noncontrolling interests	2,042	2,351	2,094
Net income attributable to common shareholders	$ 252,019	$ 226,373	$ 123,355
Denominator:			
Weighted-average shares outstanding—Basic	48,730	47,947	47,481
Effect of dilutive securities:			
Stock options, restricted stock, restricted stock units and performance share units	963	1,071	1,083
Weighted-average shares outstanding—Diluted	49,693	49,018	48,564

Options to purchase 0.4 million shares, 0.5 million shares, and 0.6 million shares for fiscal years 2019, 2018 and 2017, respectively, as well as a non-significant number of restricted shares, RSUs, and performance share units (PSUs), were not included in computing diluted earnings per share because their inclusion would have been anti-dilutive. Basic weighted-average shares outstanding for fiscal years 2019, 2018 and 2017 excluded the impact of 1.0 million shares, 1.0 million shares and 1.1 million shares, respectively, of non-vested restricted stock, RSUs and PSUs.

Treasury Shares

In July 2010, the Company's Board of Directors authorized a $500.0 million stock repurchase program, and subsequently approved increases to the stock repurchase program of $250.0 million in 2010, $250.0 million in 2013, $150.0 million in 2014, and $150.0 million in 2017, for an aggregate authorization of $1.3 billion. Under its authorized stock repurchase program, the Company did not repurchase any shares in fiscal years 2019 and 2018. The Company repurchased 1.0 million shares totaling $90.6 million in fiscal year 2017. As of December 28, 2019, the Company had $129.1 million remaining on the authorized stock repurchase program.

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The Company's stock-based compensation plans permit the netting of common stock upon vesting of restricted stock, RSUs, and PSUs in order to satisfy individual statutory tax withholding requirements. The Company acquired 0.1 million shares for $18.1 million, 0.1 million shares for $13.8 million, and 0.2 million shares for $16.3 million in fiscal years 2019, 2018 and 2017, respectively, from such netting.

In fiscal years 2019 and 2018, the Company's Board of Directors approved the cancellation and return to the Company's authorized and unissued capital stock of 0.1 million treasury shares totaling $18.1 million and 40.2 million treasury shares totaling $1.7 billion, respectively, reducing treasury stock on the Company's consolidated balance sheet. The Company allocated the excess of the repurchase price over the par value of shares acquired to reduce both retained earnings and additional paid-in capital for $13.8 million and $4.3 million, respectively, in fiscal 2019 and $0.5 billion and $1.2 billion, respectively, in fiscal year 2018.

Accumulated Other Comprehensive Income (Loss)

Changes to each component of accumulated other comprehensive income (loss), net of income taxes, are as follows:

	Foreign Currency Translation Adjustment and Other	Pension and Other Post-Retirement Benefit Plans	Total
		(in thousands)	
December 30, 2017	$ (77,545)	$ (67,186)	$ (144,731)
Other comprehensive loss before reclassifications (1)	(27,352)	(1,659)	(29,011)
Amounts reclassified from accumulated other comprehensive income (loss)	—	2,477	2,477
Net current period other comprehensive (loss) income	(27,352)	818	(26,534)
Amount reclassified from accumulated other comprehensive loss due to the adoption of ASU 2018-02	—	3,330	3,330
Income tax (benefit) expense	(2,698)	806	(1,892)
December 29, 2018	(102,199)	(70,504)	(172,703)
Other comprehensive income (loss) before reclassifications (1)	14,444	(25,165)	(10,721)
Amounts reclassified from accumulated other comprehensive income (loss)	—	1,772	1,772
Net current period other comprehensive income (loss)	14,444	(23,393)	(8,949)
Income tax (benefit)	(177)	(3,456)	(3,633)
December 28, 2019	$ (87,578)	$ (90,441)	$ (178,019)

(1) The impact of the foreign currency translation adjustment to other comprehensive income (loss) before reclassifications was primarily due to the effect of changes in foreign currency exchange rates of the Euro, British Pound, and Canadian Dollar and to a lesser extent due to the impact of changes in the Chinese Yuan Renminbi and Japanese Yen.

Nonredeemable Noncontrolling Interest

The Company has an investment in an entity whose financial results are consolidated in the Company's financial statements, as it has the ability to exercise control over this entity. The interest of the noncontrolling party in this entity has been recorded as noncontrolling interest within Equity in the accompanying consolidated balance sheets. The activity within the nonredeemable noncontrolling interest during fiscal years 2019, 2018, and 2017 was not significant.

Redeemable Noncontrolling Interests

In January 2013, the Company acquired a 75% ownership interest in Vital River, a commercial provider of research models and related services in China, for $24.2 million, net of $2.7 million of cash acquired. Concurrent with the acquisition, the Company entered into an agreement with the noncontrolling interest holders that provided the Company with the right to purchase, and the noncontrolling interest holders with the right to sell, the remaining 25% of the entity for cash at its fair value beginning in January 2016. As the noncontrolling interest holders have the ability to require the Company to purchase the remaining interest, the noncontrolling interest is classified in the mezzanine section of the consolidated balance sheets, which is presented above

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the equity section and below liabilities. The agreement does not limit the amount that the Company could be required to pay to purchase the remaining equity interest.

During fiscal years 2016 through the 2019, the following transactions and amendments impacted the Vital River redeemable noncontrolling interest as follows:

- On July 7, 2016, the Company purchased an additional 12% equity interest in Vital River for $10.8 million, resulting in total ownership of 87%. Concurrent with the transaction, the original agreement was amended providing the Company with the right to purchase, and the noncontrolling interest holders with the right to sell, the remaining 13% equity interest at a contractually defined redemption value, subject to a redemption floor, which represents a derivative embedded within the equity instrument. These rights are exercisable beginning in 2019 and are accelerated in certain events. Subsequent to the amendment during fiscal years 2016 through 2019, the redeemable noncontrolling interest was measured at the greater of the amount that would be paid if settlement occurred as of the balance sheet date based on the contractually defined redemption value ($18.5 million as of December 29, 2018) and its carrying amount adjusted for net income (loss) attributable to the noncontrolling interest.
- On June 13, 2019, the Company purchased an additional 5% equity interest in Vital River for $7.9 million, resulting in total ownership of 92%. The Company recorded a $0.8 million gain in equity equal to the excess fair value of the 5% equity interest over the purchase price. Concurrent with the transaction, the pre-existing agreement was further amended to provide the Company with the right to purchase, and the noncontrolling interest holders with the right to sell, the remaining 8% equity interest (redeemable noncontrolling interest) at a contractually defined redemption value, subject to a redemption floor, which represents a derivative embedded within the equity instrument. These rights are exercisable beginning in 2022 and are accelerated in certain events. The Company recorded a charge of $2.2 million in Selling, general and administrative expenses within the consolidated statements of income, equal to the excess fair value of the hybrid instrument (equity interest with embedded derivative) over the fair value of the 8% equity interest. The redeemable noncontrolling interest is measured at the greater of the amount that would be paid if settlement occurred as of the balance sheet date based on the contractually defined redemption value ($15.5 million as of December 28, 2019) and the carrying amount adjusted for net income (loss) attributable to the noncontrolling interest. As the noncontrolling interest holders have the ability to require the Company to purchase the remaining 8% interest, the noncontrolling interest is classified in the mezzanine section of the consolidated balance sheets, which is presented above the equity section and below liabilities. The agreement does not limit the amount that the Company could be required to pay to purchase the remaining 8% equity interest.

As part of the Citoxlab acquisition on April 29, 2019, the Company acquired a less than wholly owned subsidiary that is fully consolidated under the voting interest model. The Company acquired an approximate 90% equity interest, which includes an approximate 10% redeemable noncontrolling interest. The noncontrolling interest holders have the ability to require the Company to purchase the remaining approximate 10% interest at certain dates in the future between 2021 through 2023. The noncontrolling interest is classified in the mezzanine section of the consolidated balance sheets and is approximately $4 million as of December 28, 2019.

On August 28, 2019, the Company acquired an 80% equity interest in a supplier, which included a 20% redeemable noncontrolling interest. The contract provides the Company the right to purchase, and the noncontrolling interest holders with the right to sell, the remaining 20% equity interest at its appraised value. These rights are exercisable beginning in 2022. The redeemable noncontrolling interest is measured at the greater of the amount that would be paid if settlement occurred as of the balance sheet date based on the appraised value and the carrying amount adjusted for net income (loss) attributable to the noncontrolling interest or a pre-determined floor value. As the noncontrolling interest holders have the ability to require the Company to purchase the remaining 20% interest, the noncontrolling interest is classified in the mezzanine section of the consolidated balance sheets, which is presented above the equity section and below liabilities. The agreement does not limit the amount that the Company could be required to pay to purchase the remaining 20% equity interest.

The following table provides a rollforward of the activity related to the Company’s redeemable noncontrolling interests:

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	Fiscal Year	
	2019	2018
	(in thousands)	
Beginning balance	$ 18,525	$ 16,609
Adjustment to Vital River redemption value	1,451	2,069
Purchase of Vital River 5% equity interest	(8,745)	—
Change in fair value of Vital River 8% equity interest, included in additional paid-in capital	2,708	—
Modification of Vital River 8% purchase option	2,196	—
Acquisition of an approximate 10% non-controlling interest through acquiring Citoxlab	4,035	—
Acquisition of a 20% non-controlling interest through acquiring a supplier	8,740	—
Net (loss) income attributable to noncontrolling interests	(42)	800
Foreign currency translation	(221)	(953)
Ending balance	$ 28,647	$ 18,525

11. INCOME TAXES

The components of income from continuing operations before income taxes and the related provision for income taxes are presented below:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
Income from continuing operations before income taxes:			
U.S.	$ 108,326	$ 95,062	$ 123,896
Non-U.S.	195,758	186,619	173,059
	$ 304,084	$ 281,681	$ 296,955
Income tax provision (benefit):			
Current:			
Federal	$ 18,101	$ 17,390	$ 93,871
Foreign	43,489	38,557	37,150
State	9,915	8,837	12,361
Total current	71,505	64,784	143,382
Deferred:			
Federal	(3,226)	(7,145)	9,416
Foreign	(17,111)	(4,104)	14,953
State	(1,145)	928	3,618
Total deferred	(21,482)	(10,321)	27,987
	$ 50,023	$ 54,463	$ 171,369

Included in the fiscal year 2019 tax expense of $50.0 million is a $20.6 million tax benefit for the recognition of $315.5 million of historical foreign net operating loss deferred tax assets, partially offset by a $294.9 million valuation allowance. Prior to 2019, these deferred tax assets were not recognized as the Company believed the ability to utilize the net operating losses was remote. As a result of both U.S. Tax Reform and European tax legislation, the Company made changes in 2019 to its financing structure, resulting in the ability to utilize a portion of the net operating losses previously considered remote in nature.

The Company's accounting for the elements of U.S. Tax Reform is complete based on all published tax law and corresponding guidance. However, proposed and final clarifying guidance is anticipated for various aspects of U.S. Tax Reform which are relevant to the Company. The effects of any additional guidance will be recorded in the period such guidance is issued.

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Reconciliations of the statutory U.S. federal income tax rate to effective tax rates are as follows:

	Fiscal Year		
	2019	2018	2017
U.S. statutory income tax rate	21.0 %	21.0 %	35.0 %
Foreign tax rate differences	2.7	0.5	(6.8)
State income taxes, net of federal tax benefit	2.6	2.4	2.0
Non-deductible compensation	1.7	1.0	1.3
Research tax credits and enhanced deductions	(4.4)	(2.9)	(2.4)
Stock-based compensation	(2.2)	(2.1)	(3.2)
Enacted tax rate changes	(0.7)	(0.1)	(4.2)
Transition Tax	—	(0.3)	24.8
Impact of tax uncertainties	(2.6)	(1.1)	(0.4)
Tax on unremitted earnings	1.7	1.2	7.3
Impact of acquisitions and restructuring	2.7	0.3	3.8
Net operating loss deferred tax asset recognition, net of valuation allowance (NOL DTA)	(6.8)	—	—
Other	0.8	(0.6)	0.5
Effective income tax rate	16.5 %	19.3 %	57.7 %

The components of deferred tax assets and liabilities are as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Deferred tax assets:		
Compensation	$ 40,582	$ 36,724
Accruals and reserves	13,687	13,183
Net operating loss and credit carryforwards	367,269	35,679
Operating lease liability	33,785	—
Other	7,181	5,060
Valuation allowance	(309,962)	(9,788)
Total deferred tax assets	152,542	80,858
Deferred tax liabilities:		
Goodwill and other intangibles	(174,847)	(154,743)
Depreciation related	(29,317)	(19,373)
Venture capital investments	(12,806)	(10,557)
Tax on unremitted earnings	(17,282)	(14,140)
Right-of-use assets	(34,953)	—
Other	(5,961)	(2,296)
Total deferred tax liabilities	(275,166)	(201,109)
Net deferred taxes	$ (122,624)	$ (120,251)

The valuation allowance increased by $300.2 million from $9.8 million as of December 29, 2018 to $310.0 million as of December 28, 2019. The increase is primarily related to the recognition of $315.5 million of net operating loss deferred tax assets due to changes in the Company's financing structure, $294.9 million of which the Company does not believe is more likely than not to be utilized.

As of December 28, 2019, the Company had foreign net operating loss carryforwards of $337.3 million, as compared to $35.7 million as of December 29, 2018. Of this amount, $23.3 million are definite-lived and begin to expire in 2020, and the remainder of $314.0 million can be carried forward indefinitely. The Company has tax credit carryforwards of $30.1 million,

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which will begin to expire after 2035 and beyond. Additionally, the Company records a benefit to operating income for research and development and other credits in Quebec, France, the Netherlands, and the U.K. related to its DSA facilities.

The Company has recognized its deferred tax assets on the belief that it is more likely than not that they will be realized. The only exceptions relate to deferred tax assets primarily for net operating losses in Hong Kong, Luxembourg, certain capital losses, and fixed assets in the U.K.

A reconciliation of the Company's beginning and ending unrecognized income tax benefits is as follows:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
Beginning balance	$ 18,827	$ 24,710	$ 24,186
Additions to tax positions for current year	3,691	2,477	1,791
Additions to tax positions for prior years	5,234	—	1,428
Reductions to tax positions for prior years	(1,033)	(4,543)	—
Settlements	(274)	(3,380)	(1,754)
Expiration of statute of limitations	(6,780)	(437)	(941)
Ending balance	$ 19,665	$ 18,827	$ 24,710

The $0.8 million increase in unrecognized income tax benefits during fiscal year 2019 as compared to the corresponding period in 2018 is primarily attributable to increases due to business combinations and an additional year of Canadian SR&ED credit, partially offset by expiration of statutes of limitations.

The amount of unrecognized income tax benefits that, if recognized, would favorably impact the effective tax rate was $17.0 million as of December 28, 2019 and $17.6 million as of December 29, 2018. The $0.6 million decrease is primarily attributable to expiration of statutes of limitations, partially offset by increases due to business combinations and an additional year of Federal Canadian SR&ED credit. It is reasonably possible as of December 28, 2019 that the liability for unrecognized tax benefits for the uncertain tax position will decrease by $4.0 million over the next twelve month period, primarily as a result of lapsing statutes of limitations. The Company continues to recognize interest and penalties related to unrecognized income tax benefits in income tax expense. The total amount of accrued interest related to unrecognized income tax benefits as of December 28, 2019 and December 29, 2018 was $2.3 million and $2.7 million, respectively. There were no accrued penalties related to unrecognized income tax benefits as of December 28, 2019 or as of December 29, 2018.

The Company conducts business in a number of tax jurisdictions. As a result, it is subject to tax audits on a regular basis including, but not limited to, such major jurisdictions as the U.S., the U.K., China, France, Germany, and Canada. With few exceptions, the Company is no longer subject to U.S. and international income tax examinations for years before 2016.

The Company and certain of its subsidiaries have ongoing tax controversies in the U.S., France and Canada. The Company does not anticipate resolution of these audits will have a material impact on its financial statements.

12. EMPLOYEE BENEFIT PLANS

Pension Plans

The Charles River Laboratories, Inc. Pension Plan (U.S. Pension Plan) is a qualified, non-contributory defined benefit plan covering certain U.S. employees. Effective 2002, the U.S. Pension Plan was amended to exclude new participants from joining and in 2008 the accrual of benefits was frozen. On January 31, 2019, the Company commenced the process to terminate the U.S. Pension Plan and expects to complete the termination process during fiscal year 2020. As part of the planned termination, the Company re-balanced assets to a target asset allocation (primarily fixed income investments) to better match our assets to the characteristics of the liabilities. At December 28, 2019, the U.S Pension Plan has a benefit obligation of $94.4 million and plan assets of $91.2 million. The benefit obligation has been valued at the amount expected to be required to settle the obligations. Assumptions utilized considered the portion of obligations expected to be settled through participant acceptance of lump sum payments or annuities and the cost to purchase annuities, which are subject to change upon actual plan settlement. Increasing the U.S Pension Plan's obligations to reflect the expected settlement value resulted in an actuarial loss of approximately $6 million, which was recorded to Other comprehensive income as part of the annual revaluation for fiscal year 2019. In the event that approvals are received and we proceed with effecting termination of this plan, settlement of the obligation is expected to occur in the second half of 2020. Upon settlement of the benefit obligation, the Company will

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reclassify the related pension losses, currently recorded within Accumulated other comprehensive loss on the consolidated balance sheet, to Other expense, net in the consolidated statements of income. As of December 28, 2019, the Company had unrecognized losses related to the U.S. Pension Plan of approximately $14 million.

The Charles River Pension Plan (U.K. Pension Plan) is a defined contribution and defined benefit pension plan covering certain U.K. employees. Benefits are based on participants' final pensionable salary and years of service. Participants' rights vest immediately. Effective December 31, 2002, the plan was amended to exclude new participants from joining the defined benefit section of the plan and a defined contribution section was established for new entrants. Contributions under the defined contribution plan are determined as a percentage of gross salary. In the fourth quarter of 2015, the U.K. Pension Plan was amended such that the members of the defined benefit section of the plan ceased to accrue additional benefits; however, their benefits continue to be adjusted for changes in their final pensionable salary or a specified inflation index, as applicable.

In addition, the Company has several defined benefit plans in certain other countries in which it maintains an operating presence, including Canada, France, Germany, Japan, Italy, and the Netherlands.

The net periodic benefit cost (income) associated with these plans for fiscal years 2019, 2018 and 2017 totaled $1.5 million, $(1.5) million and $1.6 million, respectively.

Charles River Laboratories Deferred Compensation Plan and Executive Supplemental Life Insurance Retirement Plan

The Company maintains a non-qualified deferred compensation plan, known as the Charles River Laboratories Deferred Compensation Plan (DCP), which allows a select group of eligible employees to defer a portion of their compensation. At the present time, no contributions are credited to the DCP, except as set forth below. Participants must specify the distribution date for deferred amounts at the time of deferral, in accordance with applicable IRS regulations. Generally, amounts may be paid in lump sum or installments upon retirement or termination of employment, or later if the employee terminates employment after age 55 and before age 65. Amounts may also be distributed during employment, subject to a minimum deferral requirement of three years.

The Company provides certain active employees an annual contribution into their DCP account of 10% of the employee's base salary plus the lesser of their target annual bonus or actual annual bonus.

In addition to the DCP, certain officers and key employees also participate, or in the past participated, in the Company's Executive Supplemental Life Insurance Retirement Plan (ESLIRP), which is a non-funded, non-qualified arrangement. Annual benefits under this plan will equal a percentage of the highest five consecutive years of compensation, offset by amounts payable under the U.S. Pension Plan and Social Security. In connection with the establishment of the DCP, certain active ESLIRP participants, who agreed to convert their accrued ESLIRP benefit to a comparable deferred compensation benefit, discontinued their direct participation in the ESLIRP. Instead, the present values of the accrued benefits of ESLIRP participants were credited to their DCP accounts, and future accruals are converted to present values and credited to their DCP accounts annually. In fiscal year 2019, one executive officer, who converted their ESLIRP benefit into the DCP, announced their intention to retire in May 2020 and therefore the DCP liability reflects the expected departure.

The net periodic benefit cost associated with these plans for fiscal years 2019, 2018 and 2017 totaled $2.5 million, $2.9 million and $2.3 million, respectively.

The Company has invested in several corporate-owned key-person life insurance policies with the intention of using these investments to fund the ESLIRP and the DCP. Participants have no interest in any such investments. As of December 28, 2019 and December 29, 2018, the cash surrender value of these life insurance policies were $38.2 million and $32.3 million, respectively.

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The following table provides a reconciliation of benefit obligations and plan assets of the Company's pension, DCP and ESLIRP plans:

	December 28, 2019	December 29, 2018
	(in thousands)	
Change in projected benefit obligations:		
Benefit obligation at beginning of year	$ 362,805	$ 392,964
Service cost	2,833	2,612
Interest cost	11,583	10,850
Other	850	1,499
Benefit payments	(11,062)	(8,886)
Settlements	(74)	—
Special/Contractual Termination Benefits	166	—
Plan amendments	—	104
Transfer in from acquisition	6,818	—
Actuarial loss (gain)	66,432	(21,168)
Administrative expenses paid	(470)	(195)
Effect of foreign exchange	7,528	(14,975)
Benefit obligation at end of year	$ 447,409	$ 362,805
Change in fair value of plan assets:		
Fair value of plan assets at beginning of year	$ 305,709	$ 304,325
Actual return on plan assets	53,741	(7,419)
Employer contributions	2,105	31,174
Settlements	(74)	—
Transfer in from acquisition	119	—
Benefit payments	(11,062)	(8,886)
Administrative expenses paid	(470)	(195)
Effect of foreign exchange	7,113	(13,290)
Fair value of plan assets at end of year	$ 357,181	$ 305,709
Net balance sheet liability	$ 90,228	$ 57,096
Amounts recognized in balance sheet:		
Noncurrent assets	$ 1,742	$ 3,280
Current liabilities	12,788	1,095
Noncurrent liabilities	79,182	59,281

Amounts recognized in accumulated other comprehensive loss related to the Company's pension, DCP and ESLIRP plans are as follows:

	Fiscal Year	
	2019	2018
	(in thousands)	
Net actuarial loss	$ 116,930	$ 93,483
Net prior service cost (credit)	(2,096)	(2,585)
Net amount recognized	$ 114,834	$ 90,898

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The accumulated benefit obligation and fair value of plan assets for the Company's pension, DCP and ESLIRP plans with accumulated benefit obligations in excess of plan assets are as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Accumulated benefit obligation	$ 410,243	$ 254,138
Fair value of plan assets	337,344	207,538

The projected benefit obligation and fair value of plan assets for the Company's pension, DCP and ESLIRP plans with projected benefit obligations in excess of plan assets are as follows:

	December 28, 2019	December 29, 2018
	(in thousands)	
Projected benefit obligation	$ 435,638	$ 273,625
Fair value of plan assets	343,688	213,249

The amounts in accumulated other comprehensive income expected to be recognized as components of net periodic benefit cost over the next fiscal year are as follows:

	December 28, 2019
	(in thousands)
Amortization of net actuarial loss	$ 6,344
Amortization of net prior service credit	(501)

Components of net periodic benefit cost for the Company's pension, DCP and ESLIRP plans are as follows:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
Service cost	$ 2,833	$ 2,612	$ 3,110
Interest cost	11,583	10,850	11,642
Expected return on plan assets	(13,005)	(15,516)	(14,249)
Amortization of prior service credit	(489)	(514)	(496)
Amortization of net loss	2,250	2,990	3,845
Other	850	910	—
Net periodic cost (benefit)	$ 4,022	$ 1,332	$ 3,852

Assumptions

Weighted-average assumptions used to determine projected benefit obligations are as follows:

	December 28, 2019	December 29, 2018
Discount rate	2.14%	3.21%
Rate of compensation increase	2.99%	3.23%

The discount rate reflects the rate the Company would have to pay to purchase high-quality investments that would provide cash sufficient to settle its current pension obligations. Specifically for the expected termination of the U.S. Pension Plan, estimated costs of lump sum payments and annuity purchases are reflected in the discount rate. A 25 basis point change across all discount rates changes the projected benefit obligation by approximately $20 million for all Company plans.

Weighted-average assumptions used to determine net periodic benefit cost are as follows:

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	December 28, 2019	December 29, 2018	December 30, 2017
Discount rate	3.21%	2.82%	3.01%
Expected long-term return on plan assets	4.28%	5.18%	5.41%
Rate of compensation increase	3.23%	3.16%	3.25%

A 0.5% decrease in the expected rate of return would increase annual pension expense by $1.8 million.

In fiscal years 2019 and 2018, new mortality improvement scales were issued in the U.S. and the United Kingdom (U.K.) reflecting a decline in longevity projection from previous releases the Company adopted, which decreased the Company's benefit obligations by $2.8 million and $1.7 million as of December 28, 2019 and December 29, 2018, respectively.

Plan Assets

The Company invests its pension assets with the objective of achieving a total long-term rate of return sufficient to fund future pension obligations and to minimize future pension contributions. The Company is willing to tolerate a commensurate level of risk to achieve this objective. The Company controls its risk by maintaining a diversified portfolio of asset classes. Plan assets did not include any of the Company's common stock as of December 28, 2019 or December 29, 2018. The weighted-average target asset allocations are 24.0% to equity securities, 24.6% to fixed income securities and 51.4% to other securities.

The fair value of the Company's pension plan assets by asset category are as follows:

	December 28, 2019				December 29, 2018			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
	(in thousands)							
Cash and cash equivalents	$ 2,388	$ 1,022	$ —	$ 3,410	$ 7,317	$ —	$ —	$ 7,317
Equity securities (1)	7,621	84,377	—	91,998	72,237	—	—	72,237
Debt securities (2)	40,281	89,684	—	129,965	17,147	4,100	—	21,247
Mutual funds (3)	6,324	68,632	—	74,956	86,282	59,984	—	146,266
Other (4)	551	54,787	1,514	56,852	718	56,283	1,641	58,642
Total	$ 57,165	$ 298,502	$ 1,514	$ 357,181	$ 183,701	$ 120,367	$ 1,641	$ 305,709

(1) This category comprises equity investments and securities held by non-U.S. pension plans valued at the quoted closing price, and translated into U.S. dollars using a foreign currency exchange rate at year end.

(2) This category comprises debt investments and securities held by U.S. and non-U.S. pension plans valued at the quoted closing price. For non-U.S. pension plans, the quoted closing price is translated into U.S. dollars using a foreign currency exchange rate at year end. Holdings primarily include investment-grade corporate bonds and U.S. treasuries at various durations.

(3) This category comprises non-U.S. mutual funds valued at the net asset value of shares held at year end and translated into U.S. dollars using a foreign currency exchange rate at year end.

(4) This category mainly comprises fixed income securities tied to various U.K. government bond yields held by non-US pension plans valued at the net asset value of shares held at year-end, and translated into U.S. dollars using a foreign currency exchange rate at year end.

The activity within the Level 3 pension plan assets was non-significant during the periods presented.

During fiscal year 2019, the Company contributed $0.8 million to the pension plans and expects to contribute approximately $11.9 million in fiscal year 2020. During fiscal year 2019, the Company contributed $1.3 million directly to certain participants outside of plan assets.

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Expected benefit payments are estimated using the same assumptions used in determining the Company's benefit obligation as of December 28, 2019. Benefit payments will depend on future employment and compensation levels, among other factors, and changes in any of these factors could significantly affect these estimated future benefit payments. Estimated future benefit payments during the next five years and in the aggregate for fiscal years 2025 through 2029, are as follows. Payments in fiscal year 2020 reflect the estimated payments of approximately $94 million to participants in connection with the U.S. Pension Plan termination and $8 million to an executive officer expected to retire:

Fiscal Year	Pension Plans
	(in thousands)
2020	$ 111,848
2021	9,420
2022	10,344
2023	40,911
2024	10,814
2025-2029	59,646

Post-Retirement Health and Life Insurance Plans

The Company's Canadian location offers post-retirement life insurance benefits to its employees and post-retirement medical and dental insurance coverage to certain executives. The plan is non-contributory and unfunded. As of December 28, 2019 and December 29, 2018, the accumulated benefit obligation related to the plan was $1.1 million and $1.5 million, respectively. The amounts included in other accumulated comprehensive income as well as expenses related to the plan were non-significant for fiscal years 2019, 2018 and 2017.

Charles River Laboratories Employee Savings Plan

The Charles River Laboratories Employee Savings Plan is a defined contribution plan in the form of a qualified 401(k) plan in which substantially all U.S. employees are eligible to participate upon employment. The plan contains a provision whereby the Company matches a percentage of employee contributions. During fiscal years 2019, 2018 and 2017, the costs associated with this defined contribution plan totaled $19.1 million, $13.4 million and $11.6 million, respectively.

13. STOCK-BASED COMPENSATION

The Company has stock-based compensation plans under which employees and non-employee directors may be granted stock-based awards such as stock options, restricted stock, restricted stock units (RSUs), and performance share units (PSUs).

During fiscal years 2019, 2018 and 2017, the primary share-based awards and their general terms and conditions are as follows:

- Stock options, which entitle the holder to purchase a specified number of shares of common stock at an exercise price equal to the closing market price of common stock on the date of grant; typically vest over 4 years; and typically expire 5 years from date of grant.
- RSUs, which represent an unsecured promise to grant at no cost a set number of shares of common stock upon the completion of the vesting schedule, and typically vest over 2 to 4 years. With respect to RSUs, recipients are not entitled to cash dividends and have no voting rights on the stock during the vesting period.
- PSUs, which entitle the holder to receive at no cost, a specified number of shares of common stock within a range of shares from zero to a specified maximum and typically vest over 3 years. Payout of this award is contingent upon achievement of certain performance and market conditions.

In May 2007, the Company's shareholders approved the 2007 Incentive Plan, which was amended in 2009, 2011, 2013 and 2015 (2007 Plan). The 2007 Plan provided no further awards to be granted under preexisting stock option and incentive plans; provided, however, that any shares that have been forfeited or canceled in accordance with the terms of the applicable award under a preexisting plan may be subsequently awarded in accordance with the terms of the preexisting plan. The 2007 Plan allows a maximum of 18.7 million shares to be awarded, of which restricted stock grants, RSUs, and performance based stock awards count as 2.3 shares and stock options count as 1.0 share. Any stock options and other share-based awards that were granted under prior plans and were outstanding in May 2007 continue in accordance with the terms of the respective plans.

In May 2016, the Company's shareholders approved the 2016 Incentive Plan (2016 Plan). The 2016 Plan provided no further awards to be granted under preexisting stock option and incentive plans; provided, however, that any shares that have been

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forfeited or canceled in accordance with the terms of the applicable award under a preexisting plan may be subsequently awarded in accordance with the terms of the preexisting plan. The 2016 Plan allows a maximum of 6.1 million shares to be awarded, of which restricted stock grants, RSUs, and performance based stock awards count as 2.3 shares and stock options count as 1.0 share. Any stock options and other share-based awards that were granted under prior plans and were outstanding in May 2016 continue in accordance with the terms of the respective plans.

In May 2018, the Company's shareholders approved the 2018 Incentive Plan (2018 Plan). The 2018 Plan provided no further awards to be granted under preexisting stock option and incentive plans; provided, however, that any shares that have been forfeited or canceled in accordance with the terms of the applicable award under a preexisting plan may be subsequently awarded in accordance with the terms of the preexisting plan. The 2018 Plan allows a maximum of 7.2 million shares to be awarded, of which restricted stock grants, RSUs, and performance based stock awards count as 2.3 shares and stock options count as 1.0 share. Any stock options and other share-based awards that were granted under prior plans and were outstanding in May 2018 continue in accordance with the terms of the respective plans.

As of December 28, 2019, approximately 5.8 million shares were authorized for future grants under the Company's share-based compensation plans. The Company settles employee share-based compensation awards with newly issued shares. The following table provides stock-based compensation by the financial statement line item in which it is reflected:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
Cost of revenue	$ 9,038	$ 6,285	$ 6,509
Selling, general and administrative	48,233	41,061	37,494
Stock-based compensation, before income taxes	57,271	47,346	44,003
Provision for income taxes	(9,465)	(9,188)	(13,428)
Stock-based compensation, net of income taxes	$ 47,806	$ 38,158	$ 30,575

No stock-based compensation related costs were capitalized in fiscal years 2019, 2018 and 2017.

Stock Options

The following table summarizes stock option activity under the Company's stock-based compensation plans:

	Number of shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life	Aggregate Intrinsic Value
	(in thousands)		(in years)	(in thousands)
Options outstanding as of December 29, 2018	1,556	$ 86.44		
Options granted	454	$ 144.42		
Options exercised	(442)	$ 78.49		
Options canceled	(61)	$ 113.17		
Options outstanding as of December 28, 2019	1,507	$ 105.19	2.7	$ 70,459
Options exercisable as of December 28, 2019	390	$ 77.87	1.5	$ 28,897
Options expected to vest as of December 28, 2019	1,117	$ 114.73	3.1	$ 41,562

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

	Fiscal Year		
	2019	2018	2017
Expected life (in years)	3.6	3.7	3.6
Expected volatility	27%	25%	24%
Risk-free interest rate	2.4%	2.4%	1.6%
Expected dividend yield	0%	0%	0%

The weighted-average grant date fair value of stock options granted was $33.97, $24.80 and $18.33 for fiscal years 2019, 2018 and 2017, respectively.

As of December 28, 2019, the unrecognized compensation cost related to unvested stock options expected to vest was $16.5 million. This unrecognized compensation will be recognized over an estimated weighted-average amortization period of 2.3 years.

The total intrinsic value of options exercised during fiscal years 2019, 2018 and 2017 was $27.0 million, $29.0 million and $30.0 million, respectively, with intrinsic value defined as the difference between the market price on the date of exercise and the exercise price.

Restricted Stock Units

The following table summarizes the restricted stock units activity for fiscal year 2019:

	Restricted Stock Units	Weighted Average Grant Date Fair Value
	(in thousands)	
December 29, 2018	490	$ 93.80
Granted	221	$ 142.85
Vested	(185)	$ 89.34
Canceled	(30)	$ 115.10
December 28, 2019	496	$ 116.07

As of December 28, 2019, the unrecognized compensation cost related to shares of unvested RSUs expected to vest was $32.6 million, which is expected to be recognized over an estimated weighted-average amortization period of 2.3 years. The total fair value of RSU grants that vested during fiscal years 2019, 2018 and 2017 was $16.5 million, $15.5 million and $13.6 million, respectively.

Performance Based Stock Award Program

The Company issues PSUs to certain corporate officers. The number of shares of common stock issued for each PSU is adjusted based on a performance condition linked to the Company's financial performance. Certain awards are further adjusted based on a market condition, which is calculated based on the Company's stock performance relative to a peer group over the three-year vesting period. The fair value of the market condition is reflected in the fair value of the award at grant date.

The Company utilizes a Monte Carlo simulation valuation model to value these awards. Information pertaining to the Company's PSUs and the related estimated weighted-average assumptions used to calculate their fair value were as follows:

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	Fiscal Year		
	2019	2018	2017
	(shares in thousands)		
PSUs granted	160	200	198
Weighted average grant date fair value	$ 164.47	$ 117.89	$ 99.96
Key Assumptions:			
Expected volatility	25%	26%	26%
Risk-free interest rate	2.4%	2.4%	1.3%
Expected dividend yield	0%	0%	0%
Total shareholder return of 20-trading day average stock price on grant date	17.7%	2.9%	17.7%

The maximum number of common shares to be issued upon vesting of PSUs is 0.3 million. For fiscal years 2019, 2018 and 2017, the Company recognized stock-based compensation related to PSUs of $25.3 million, $20.4 million and $18.9 million, respectively. The total fair value of PSUs that vested during fiscal years 2019, 2018 and 2017 was $20.2 million, $18.3 million and $14.4 million, respectively.

In fiscal years 2019, 2018 and 2017, the Company also issued approximately 15,000, 17,000 and 15,000 PSUs using a weighted-average grant date fair value per share of $144.67, $109.34 and $88.05 respectively. These PSUs vest upon the achievement of financial targets and other performance measures.

14. FOREIGN CURRENCY CONTRACTS

Cross currency loans

The Company entered into foreign exchange forward contracts during fiscal 2019 and 2018 to limit its foreign currency exposure related U.S. dollar denominated loans borrowed by a non-U.S. Euro functional currency entity under the Company's Credit Facility. These contracts are not designated as hedging instruments. Any gains or losses on these forward contracts are recognized immediately within Interest expense in the consolidated statements of income.

The Company had no open forward contracts related to a U.S. dollar denominated loan borrowed by a non-U.S. Euro functional currency as of December 28, 2019. One contract remained open as of December 29, 2018, which has a duration of approximately 3 months, and is recorded at fair value in the Company's accompanying consolidated balance sheets. The notional amount and fair value of the open contract is summarized as follows:

December 29, 2018		
Notional Amount	Fair Value	Balance Sheet Location
(in thousands)		
$ 343,300	$ (1,319)	Other current liabilities

The following table summarizes the effect of the foreign exchange forward contracts entered into to limit the Company's foreign currency exposure related to U.S. dollar denominated loans borrowed by a non-U.S. Euro functional currency entity under the Credit Facility on the Company's consolidated statements of income:

	Fiscal Year			
	2019		2018	
Location of gain (loss)	Financial statement caption amount	Amount of gain (loss)	Financial statement caption amount	Amount of gain (loss)
	(in thousands)			
Interest expense	$ 60,882	$ 18,672	$ 63,772	1,486

Intercompany loans

The Company periodically enters into foreign exchange forward contracts to limit its foreign currency exposure related to certain intercompany loans. These contracts are not designated as hedging instruments. Any gains or losses on forward

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contracts associated with intercompany loans are recognized immediately in Other income, net and are largely offset by the remeasurement of the underlying intercompany loans.

The Company entered into foreign currency forward contracts during 2019. One contract remained open at December 28, 2019, which had a duration of less than one month and is recorded at fair value in the Company's accompanying consolidated balance sheets. The Company did not have any significant foreign currency forward contracts related to certain intercompany loans during fiscal years 2018 and 2017. The notional amount and fair value of the open contract is summarized as follows:

December 28, 2019		
Notional Amount	Fair Value	Balance Sheet Location
(in thousands)		
$ 115,038	$ (876)	Other current liabilities

The following table summarizes the effect of the foreign exchange forward contracts in connection with certain intercompany loans on the Company's consolidated statements of income:

	Fiscal Year	
	2019	
Location of gain (loss)	Financial statement caption amount	Amount of gain (loss)
	(in thousands)	
Other income, net	$ 12,293	$ (121)

15. RESTRUCTURING AND ASSET IMPAIRMENTS

Global Restructuring Initiatives

In recent fiscal years, the Company has undertaken productivity improvement initiatives within all reportable segments at various locations across the U.S., Canada, Europe, China, and Japan. This includes workforce right-sizing and scalability initiatives, resulting in severance and transition costs; and cost related to the consolidation of facilities, resulting in asset impairment and accelerated depreciation charges. The Company does not have any significant remaining lease obligations for facilities associated with restructuring activities.

The following table presents a summary of restructuring costs related to these initiatives by classification within the consolidated statements of income:

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	Severance and Transition Costs	Asset Impairments and Other Costs	Total
		(in thousands)	
December 28, 2019			
Cost of services provided and products sold (excluding amortization of intangible assets)	$ 4,348	$ 2,367	$ 6,715
Selling, general and administrative	7,106	18	7,124
Total	$ 11,454	$ 2,385	$ 13,839
December 29, 2018			
Cost of services provided and products sold (excluding amortization of intangible assets)	$ 923	$ 27	$ 950
Selling, general and administrative	6,597	21	6,618
Total	$ 7,520	$ 48	$ 7,568
December 30, 2017			
Cost of services provided and products sold (excluding amortization of intangible assets)	$ 1,944	$ 929	$ 2,873
Selling, general and administrative	1,905	—	1,905
Total	$ 3,849	$ 929	$ 4,778

The following table presents restructuring costs by reportable segment for these productivity improvement initiatives:

	Fiscal Year		
	2019	2018	2017
	(in thousands)		
RMS	$ 3,110	$ —	$ 291
DSA	7,307	1,063	1,604
Manufacturing	3,032	1,227	2,883
Unallocated corporate	390	5,278	—
Total	$ 13,839	$ 7,568	$ 4,778

2017 RMS Restructuring Initiative

In the fourth quarter of fiscal year 2017, the Company committed to a plan to further reduce costs and improve operating efficiencies in its RMS reportable segment. The plan included ceasing production within the Company's facility in Maryland and reducing its workforce at various global RMS facilities during 2018. On August 1, 2018, the Company's Board of Directors approved a modification to the plan which repurposed the facility in Maryland to be used for alternative initiatives. The Company's existing lease obligation continues through 2028 and the Company expects to remain in the facility for the duration of the lease term.

The following table presents a summary of severance and transition costs, and asset impairments (referred to as restructuring costs) related to this initiative during fiscal years 2018 and 2017 by classification within the consolidated statements of income. The Company did not incur any restructuring costs during fiscal year December 28, 2019.

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	Severance and Transition Costs	Asset Impairments and Other Costs	Total
		(in thousands)	
December 29, 2018			
Cost of services provided and products sold (excluding amortization of intangible assets)	$ 847	$ 822	$ 1,669
Selling, general and administrative	314	—	314
Total	$ 1,161	$ 822	$ 1,983
December 30, 2017			
Cost of services provided and products sold (excluding amortization of intangible assets)	$ 362	$ 17,716	$ 18,078
Selling, general and administrative	67	—	67
Total	$ 429	$ 17,716	$ 18,145

Restructuring costs incurred during 2017 were $18.1 million, which primarily related to non-cash asset impairments and accelerated depreciation charges of $17.7 million. The costs incurred during 2018 were $2.0 million, which primarily related to cash payments for severance and transition costs of $1.2 million. All of the costs are recorded in the RMS reportable segment. All severance and transition costs have been paid as of December 28, 2019 and no further restructuring costs related to the 2017 RMS Restructuring Initiative are expected to be incurred.

Rollforward of restructuring activities

The following table provides a rollforward for all of the Company's severance and transition costs, and certain lease obligation liabilities related to restructuring activities:

	Fiscal Year		
	2019	2018	2017
		(in thousands)	
Beginning balance	$ 2,921	$ 6,856	$ 8,102
Expense (excluding non-cash charges)	12,674	8,681	4,278
Payments / utilization	(9,206)	(12,341)	(6,103)
Foreign currency adjustments	17	(275)	579
Ending balance	$ 6,406	$ 2,921	$ 6,856

As of December 28, 2019 and December 29, 2018, $6.3 million and $2.4 million of severance and other personnel related costs liabilities and lease obligation liabilities, respectively, were included in accrued compensation and accrued liabilities within the Company's consolidated balance sheets and $0.1 million and $0.5 million, respectively, were included in other long-term liabilities within the Company's consolidated balance sheets.

16. LEASES

Adoption of ASC Topic 842, "Leases" (ASC 842)

ASC 842 became effective for the Company on December 30, 2018 and was adopted using the modified retrospective method for all leases that had commenced as of the effective date, along with certain available practical expedients. The Company elected to recognize any effects of applying the new standard as a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption, which there were none. In addition, the Company elected to adopt the package of practical expedients permitted under the transition guidance within the new standard. The practical expedient package applied to leases that commenced prior to the effective date of the new standard and permits a reporting entity not to: i) reassess whether any expired or existing contracts are or contain leases, ii) reassess the historical lease classification for any expired or existing leases, and iii) reassess initial direct costs for any existing leases.

The reporting results for fiscal year 2019 reflect the application of ASC 842 guidance while the historical results for fiscal year 2018 were prepared under the guidance of ASC 840. The adoption of the new standard did not have a significant impact upon the Company's consolidated statements of income and cash flows. The adoption of the new standard resulted in the following impact to the consolidated balance sheets: i) no significant change in the carrying values of assets and liabilities related to the Company's finance leases, previously referred to as capital leases (See Note 9, "Long-Term Debt and Finance Lease Obligations"), ii) the derecognition of assets and related liabilities pertaining to certain build-to-suit arrangements previously accounted for under ASC 840 and recording them under the guidance of ASC 842, and iii) the recording of right-of-use assets and corresponding lease liabilities pertaining to the Company's operating leases on the consolidated balance sheets, adjusted for

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existing balances of prepaid rent and deferred rent liabilities as of the transition date. The cumulative effect of applying ASC 842 to all leases that had commenced as of December 29, 2018 was as follows:

Balance sheet captions impacted by ASC 842	December 30, 2018 (Prior to adoption of ASC 842)	Effect of the adoption of ASC 842		December 30, 2018 (As adjusted)
		(in thousands)		
Prepaid assets	$ 53,447	$ (4,413)	(1)	$ 49,034
Property, plant and equipment, net	932,877	(23,448)	(2)	909,429
Operating lease right-of-use assets, net	—	134,172	(3)	134,172
Other assets	143,759	(4,989)	(4)	138,770
Other current liabilities	71,280	15,935	(5)	87,215
Operating lease right-of-use liabilities	—	111,570	(6)	111,570
Long-term debt, net and finance leases	1,636,598	(26,183)	(7)	1,610,415

ASC 842 adoption adjustments:

(1) Short term prepaid rent reclassified from Prepaid assets to the Operating lease right-of-use assets, net.

(2) Derecognition of approximately $26 million of leased properties, recorded in Property, plant and equipment, net, specifically Construction-in-process, that were recognized under the previously existing build-to-suit accounting rules; partially offset by Prepaid assets related to finance leases reclassified from Prepaid assets.

(3) Recognition of Operating lease right-of-use assets, net, and adjusted for prepaid rent and deferred rent liability reclassification adjustments identified in adjustments (1) (4) (5).

(4) Long-term prepaid rent reclassified from Other assets to Operating lease right-of-use assets, net.

(5) Recognition of short-term portion of the Operating lease right-of-use liabilities offset by reclassification of deferred rent liability to Operating lease right-of-use assets, net.

(6) Recognition of long-term portion of the Operating lease right-of-use liabilities.

(7) Derecognition of approximately $26 million of Other debt associated with leased properties that were recognized under the previously existing build-to-suit accounting rules.

Operating and Finance Leases

Right-of-use lease assets and lease liabilities are reported in the Company's consolidated balance sheets as follows:

	December 28, 2019 (in thousands)
Operating leases	
Operating lease right-of-use assets, net	$ 140,085
Other current liabilities	$ 20,357
Operating lease right-of-use liabilities	116,252
Total operating lease liabilities	$ 136,609
Finance leases	
Property, plant and equipment, net	$ 32,519
Current portion of long-term debt and finance leases	$ 2,997
Long-term debt, net and finance leases	27,530
Total finance lease liabilities	$ 30,527

The components of operating and finance lease costs for fiscal year 2019 were as follows:

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	Fiscal Year December 28, 2019 (in thousands)
Operating lease costs	$ 30,885
Finance lease costs:	
Amortization of right-of-use assets	4,007
Interest on lease liabilities	1,349
Short-term lease costs	1,056
Variable lease costs	3,161
Sublease income	(994)
Total lease costs	$ 39,464

Other information related to leases was as follows:

Supplemental cash flow information

	Fiscal Year December 28, 2019 (in thousands)
Cash flows included in the measurement of lease liabilities:	
Operating cash flows from operating leases	$ 27,153
Operating cash flows from finance leases	1,406
Finance cash flows from finance leases	3,766
Non-cash leases activity:	
Right-of-use lease assets obtained in exchange for new operating lease liabilities	$ 24,382
Right-of-use lease assets obtained in exchange for new finance lease liabilities	4,819

Lease term and discount rate

	As of December 28, 2019
Weighted-average remaining lease term (in years)	
Operating lease	8.23
Finance lease	12.97
Weighted-average discount rate	
Operating lease	4.36
Finance lease	4.58

At the lease commencement date, the discount rate implicit in the lease is used to discount the lease liability if readily determinable. If not readily determinable or leases do not contain an implicit rate, the Company's incremental borrowing rate is used as the discount rate.

As of December 28, 2019, maturities of operating and finance lease liabilities for each of the following five years and a total thereafter were as follows:

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	Operating Leases	Finance Leases
	(in thousands)	
2020	$ 25,955	$ 4,308
2021	25,028	3,832
2022	20,614	3,819
2023	16,853	2,929
2024	16,007	2,141
Thereafter	60,371	23,650
Total minimum future lease payments	164,828	40,679
Less: Imputed interest	28,219	10,152
Total lease liabilities	$ 136,609	$ 30,527

Total minimum future lease payments (predominantly operating leases) of approximately $57 million for leases that have not commenced as of December 28, 2019, as the Company does not yet control the underlying assets, are not included in the consolidated financial statements. These leases are expected to commence between fiscal years 2020 and 2024 with lease terms of approximately 4 to 15 years.

As of December 29, 2018, minimum future lease payments under non-cancellable leases for each of the following five years and a total thereafter were as follows:

	Operating Leases (1)	Finance Leases (1)
	(in thousands)	
2019	$ 25,411	$ 3,972
2020	22,400	3,759
2021	21,544	2,869
2022	18,535	2,967
2023	15,398	2,209
Thereafter	66,870	24,304
Total minimum future lease payments	$ 170,158	$ 40,080

(1) Lease commitments are presented under the guidance of ASC 840 and includes approximately $14 million of minimum future lease payments for leases that had not commenced as of December 29, 2018. These commitments relate to existing leases for which the Company does not yet control certain expansion space.

17. COMMITMENTS AND CONTINGENCIES

Insurance

The Company maintains certain insurance policies that maintain large deductibles up to approximately $1.0 million, some with or without stop-loss limits, depending on market availability. Insurance policies at certain locations are based on a percentage of the insured assets, for which deductibles for certain property may exceed $5.0 million in the event of a catastrophic event.

Litigation

Various lawsuits, claims and proceedings of a nature considered normal to its business are pending against the Company. While the outcome of any of these proceedings cannot be accurately predicted, the Company does not believe the ultimate resolution of any of these existing matters would have a material adverse effect on the Company's business or financial condition.

Guarantees

The Company enters into certain agreements with other parties in the ordinary course of business that contain indemnification provisions. These typically include agreements with directors and officers, business partners, contractors, landlords, and customers. Under these provisions, the Company generally indemnifies and holds harmless the indemnified party for losses suffered or incurred by the indemnified party as a result of the Company's activities. These indemnification provisions generally survive termination of the underlying agreement. The maximum potential amount of future payments the Company could be required to make under these indemnification provisions is unlimited. However, to date the Company has not incurred

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material costs to defend lawsuits or settle claims related to these indemnification provisions. As a result, the estimated fair value of these obligations is minimal.

Purchase Obligations

The Company enters into unconditional purchase obligations, in the ordinary course of business, that include agreements to purchase goods or services that are enforceable and legally binding and that specify all significant terms including: fixed or minimum quantities to be purchased; fixed, minimum or variable price provisions; and the approximate timing of the transaction. Purchase obligations exclude agreements that are cancellable at any time without penalty. The aggregate amount of the Company's unconditional purchase obligations totaled $154.0 million as of December 28, 2019 and is expected to be paid as follows:

	Payments Due by Period			
	Less than 1 Year	1 - 3 Years	3 - 5 Years	Total
	(in millions)			
Unconditional purchase obligations	$ 106.1	$ 45.0	$ 2.9	$ 154.0

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18. SELECTED QUARTERLY FINANCIAL DATA (unaudited)

The following table contains quarterly financial information for fiscal years 2019 and 2018. The operating results for any quarter are not necessarily indicative of future period results.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(in thousands, except per share amounts)			
Fiscal Year 2019				
Total revenue	$ 604,569	$ 657,568	$ 667,951	$ 691,138
Gross profit (1)	211,777	238,104	246,116	262,314
Operating income	69,792	79,768	92,802	108,789
Net income attributable to common shareholders	55,133	43,728	72,810	80,348
Earnings per common share				
Basic:				
Continuing operations attributable to common shareholders	$ 1.14	$ 0.90	$ 1.49	$ 1.64
Discontinued operations	$ —	$ —	$ —	$ —
Net income attributable to common shareholders	$ 1.14	$ 0.90	$ 1.49	$ 1.64
Diluted:				
Continuing operations attributable to common shareholders	$ 1.11	$ 0.88	$ 1.46	$ 1.61
Discontinued operations	$ —	$ —	$ —	$ —
Net income attributable to common shareholders	$ 1.11	$ 0.88	$ 1.46	$ 1.61
Fiscal Year 2018				
Total revenue	$ 493,970	$ 585,301	$ 585,295	$ 601,530
Gross profit (1)	181,469	215,981	216,200	226,417
Operating income	67,829	76,710	84,362	102,482
Net income attributable to common shareholders	52,631	53,709	60,368	59,665
Earnings per common share				
Basic:				
Continuing operations attributable to common shareholders	$ 1.10	$ 1.08	$ 1.25	$ 1.24
Discontinued operations	$ —	$ 0.03	$ —	$ —
Net income attributable to common shareholders	$ 1.10	$ 1.11	$ 1.25	$ 1.24
Diluted:				
Continuing operations attributable to common shareholders	$ 1.08	$ 1.06	$ 1.22	$ 1.21
Discontinued operations	$ —	$ 0.03	$ —	$ —
Net income attributable to common shareholders	$ 1.08	$ 1.10	$ 1.22	$ 1.21

(1) Gross profit is calculated as total revenue minus cost of revenue (excluding amortization of intangible assets).

Full-year amounts may not sum due to rounding.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

(a) Evaluation of Disclosure Controls and Procedures

Based on their evaluation, required by paragraph (b) of Rules 13a-15 or 15d-15, promulgated by the Securities Exchange Act of 1934, as amended (Exchange Act), the Company's principal executive officer and principal financial officer have concluded that the Company's disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) of the Exchange Act, are effective, at a reasonable assurance level, as of December 28, 2019, to ensure that information required to be disclosed by the Company in reports that it files or submits under the Exchange Act is recorded, processed, summarized, and reported within the time periods specified in Securities and Exchange Commission rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by the Company in the

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reports that it files or submits under the Exchange Act is accumulated and communicated to the Company's management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure. In designing and evaluating the disclosure controls and procedures, our management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurances of achieving the desired control objectives, and management necessarily was required to apply its judgment in designing and evaluating the controls and procedures.

Management's Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Securities Exchange Act of 1934, as amended). Our 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. 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.

Under the supervision and with the participation of our management, including our CEO and CFO, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in Internal Control-Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our assessment and those criteria, management concluded that the Company maintained effective internal control over financial reporting as of December 28, 2019.

We have excluded the business acquisitions completed during fiscal year 2019, including Citoxlab and the acquisition of a DSA supplier, from the assessment of the effectiveness of internal control over financial reporting as of December 28, 2019. Total assets and total revenue of the acquired businesses collectively represent 5.0% and 4.7%, respectively, of the related consolidated financial statement amounts as of and for fiscal year ended December 28, 2019.

The effectiveness of our internal control over financial reporting as of December 28, 2019, has been audited by PricewaterhouseCoopers LLP, an Independent Registered Public Accounting Firm, as stated in their report which appears in Item 8, "Financial Statements and Supplementary Data" in this Annual Report on Form 10-K.

(b) Changes in Internal Controls

During fiscal year 2019, the Company continued to execute a plan to centralize certain accounting transaction processing functions to internal shared service centers. There were no other material changes in the Company's internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of the Exchange Act Rules 13a-15 or 15d-15 that occurred during the fourth quarter of 2019 that materially affected, or were reasonably likely to materially affect, the Company's internal control over financial reporting.

Item 9B. Other Information

None.

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PART III

Item 10. Directors, Executive Officers and Corporate Governance

A. Directors and Compliance with Section 16(a) of the Exchange Act

Any information required by this Item regarding our directors and compliance with Section 16(a) of the Exchange Act by our officers and directors will be included in the 2020 Proxy Statement under the sections captioned "Nominees for Directors" and "Delinquent Section 16(a) Reports" and is incorporated herein by reference thereto. The information required by this Item regarding our corporate governance will be included in the 2020 Proxy Statement under the section captioned "Corporate Governance" and is incorporated herein by reference thereto.

B. Our Executive Officers

The information required by this Item regarding our executive officers is reported in Part I of this Form 10-K under the heading "Item 1. Business"

C. Audit Committee Financial Expert

The information required by this Item regarding the audit committee of the Board of Directors and financial experts will be included in the 2020 Proxy Statement under the section captioned "The Board of Directors and its Committees-Audit Committee and Financial Experts" and is incorporated herein by reference thereto.

D. Code of Ethics

We have adopted a Code of Business Conduct and Ethics that applies to all of our employees and directors, including our principal executive officer, principal financial officer, principal accounting officer, controller, or persons performing similar functions. Our Code of Business Conduct and Ethics is posted on our website and can be accessed by selecting the "Corporate Governance" link at http://ir.criver.com. We will provide to any person, without charge, a copy of our Code of Business Conduct and Ethics. To obtain a copy, please mail a request to the Secretary, Charles River Laboratories International, Inc., 251 Ballardvale Street, Wilmington, MA 01887. Information on our website is not incorporated by reference in this annual report.

E. Changes to Board Nomination Procedures

Since December 2008, there have been no material changes to the procedures by which security holders may recommend nominees to our Board of Directors.

Item 11. Executive Compensation

The information required by this Item will be included in the 2020 Proxy Statement under the sections captioned "2019 Director Compensation," "Compensation Discussion and Analysis," "Executive Compensation and Related Information," "Compensation Committee Interlocks and Insider Participation" and "Report of Compensation Committee," and is incorporated herein by reference thereto.

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

The information required by this Item will be included in the 2020 Proxy Statement under the sections captioned "Beneficial Ownership of Securities" and "Equity Compensation Plan Information" and is incorporated herein by reference thereto.

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

The information required by this Item will be included in the 2020 Proxy Statement under the sections captioned "Related Person Transaction Policy" and "Corporate Governance-Director Qualification Standards; Director Independence" and is incorporated herein by reference thereto.

Item 14. Principal Accountant Fees and Services

The information required by this Item will be included in the 2020 Proxy Statement under the section captioned "Statement of Fees Paid to Independent Registered Public Accounting Firm" and is incorporated herein by reference thereto.

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PART IV

Item 15. Exhibits and Financial Statement Schedules

Item 15(a)(1) and (2) Financial Statements and Schedules

See "Index to Consolidated Financial Statements and Financial Statements Schedules" at Item 8 to this Annual Report on Form 10-K. Other financial statement schedules have not been included because they are not applicable or the information is included in the financial statements or notes thereto.

Item 15(a)(3) and Item 15(b) Exhibits

The exhibits filed as part of this Annual Report on Form 10-K are listed in the Exhibit Index immediately preceding the exhibits. We have identified in the Exhibit Index each management contract and compensation plan filed as an exhibit to this Annual Report on Form 10-K in response to Item 15(c) of Form 10-K.

Item 16. Form 10-K Summary

None.

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SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

CHARLES RIVER LABORATORIES INTERNATIONAL, INC.

February 11, 2020 By: /s/ DAVID R. SMITH

David R. Smith

Corporate Executive Vice President and Chief Financial Officer

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

Signatures	Title	Date
By: /s/ JAMES C. FOSTER James C. Foster	*Chairman, President and Chief Executive Officer*	February 11, 2020
By: /s/ DAVID R. SMITH David R. Smith	*Corporate Executive Vice President and Chief Financial Officer*	February 11, 2020
By: /s/ MICHAEL G. KNELL Michael G. Knell	*Corporate Senior Vice President and Chief Accounting Officer*	February 11, 2020
By: /s/ ROBERT J. BERTOLINI Robert J. Bertolini	*Director*	February 11, 2020
By: /s/ STEPHEN D. CHUBB Stephen D. Chubb	*Director*	February 11, 2020
By: /s/ DEBORAH T. KOCHEVAR Deborah T. Kochevar	*Director*	February 11, 2020
By: /s/ MARTIN MACKAY Martin Mackay	*Director*	February 11, 2020
By: /s/ JEAN-PAUL MANGEOLLE Jean-Paul Mangeolle	*Director*	February 11, 2020
By: /s/ GEORGE E. MASSARO George E. Massaro	*Director*	February 11, 2020
By: /s/ GEORGE M. MILNE, JR. George M. Milne, Jr.	*Director*	February 11, 2020
By: /s/ C. RICHARD REESE C. Richard Reese	*Director*	February 11, 2020
By: /s/ RICHARD F. WALLMAN Richard F. Wallman	*Director*	February 11, 2020
By: /s/ VIRGINIA M. WILSON Virginia M. Wilson	*Director*	February 11, 2020

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EXHIBIT INDEX

Exhibit No.	Description	Filed with this Form 10-K	Incorporation by Reference		
			Form	Filing Date	Exhibit No.
3.1	Second Amended and Restated Certificate of Incorporation of Charles River Laboratories International, Inc. dated June 5, 2000		S-1/A	June 23, 2000	3.1
3.2	Fifth Amended and Restated By-Laws of Charles River Laboratories International, Inc.		8-K	May 16, 2016	3.2
4.1	Form of Common Stock certificate, $0.01 par value, of Charles River Laboratories International, Inc.		S-1/A	June 23, 2000	4.1
4.2	Description of Securities	X			
4.3*	Charles River Laboratories International, Inc. Form of Performance Share Unit granted under the 2007 Incentive Plan		10-K	February 27, 2013	4.4
4.4*	Charles River Laboratories International, Inc. Form of Performance Share Unit granted under the 2016 Incentive Plan		10-K	February 14, 2017	4.3
4.5	Charles River Laboratories International, Inc. Form of Performance Share Unit granted under the 2018 Incentive Plan		10-Q	Jul 31, 2019	4.1
4.6	Charles River Laboratories International, Inc. Indenture Agreement with MUFG Union Bank, N.A. as Trustee dated April 3, 2018		8-K	April 3, 2018	4.1
4.7	Charles River Laboratories International, Inc. First Supplemental Indenture dated as of April 3, 2018 to the Indenture dated as of April 3, 2018		8-K	April 3, 2018	4.2
4.8	Form of Note for 5.500% Senior Notes due 2026		8-K	April 3, 2018	4.3
4.9	Charles River Laboratories International, Inc. Second Supplemental Indenture, dates as of October 23, 2019, to the Indenture dated as of April 3, 2018		8-K	October 23, 2019	4.1
4.10	Form of Note for 4.250% Senior Notes due 2028		8-K	October 23, 2019	4.2
10.1*	Charles River Laboratories International, Inc. 2007 Incentive Plan, as amended		10-K	February 17, 2015	10.13
10.2*	Charles River Laboratories International, Inc. 2016 Incentive Plan		10-Q	August 3, 2016	10.1
10.3*	Charles River Laboratories International, Inc. 2018 Incentive Plan dated March 20, 2018		10-Q	May 10, 2018	10.2
10.4*	Charles River Laboratories International, Inc. Form of Stock Option granted under the 2007 Incentive Plan, as amended		10-K	February 20, 2008	10.17
10.5*	Charles River Laboratories International, Inc. Form of Stock Option granted under the 2016 Incentive Plan		10-K	February 14, 2017	10.4
10.6*	Charles River Laboratories International, Inc. Form of Restricted Stock Award granted under the 2007 Incentive Plan, as amended		10-K	February 20, 2008	10.18
10.7*	Charles River Laboratories International, Inc. Form of Restricted Stock Unit granted under the 2007 Incentive Plan		10-K	February 14, 2017	10.6
10.8*	Charles River Laboratories International, Inc. Form of Restricted Stock Unit granted under the 2016 Incentive Plan		10-K	February 14, 2017	10.7
10.9*	Charles River Laboratories International, Inc. Form of Non-Qualified Stock Option granted under the 2018 Incentive Plan		10-Q	Jul 31, 2019	10.1
10.10*	Charles River Laboratories International, Inc. Form of Restricted Stock Unit granted under the 2018 Incentive Plan		10-Q	Jul 31, 2019	10.2
10.11*	Charles River Corporate Officer Separation Plan dated April 30, 2010		10-Q	August 3, 2010	10.1
10.12*	Form of Change in Control Agreement		10-K	February 23, 2009	10.7
10.13*	Executive Incentive Compensation Plan dated January 1, 2016		10-K	February 12, 2016	10.4
10.14*	Charles River Laboratories International, Inc. Non-Employee Directors Deferral Plan dated April 5, 2016		10-Q	May 4, 2016	10.1
10.15*	Charles River Laboratories, Inc. Executive Life Insurance/Supplemental Retirement Income Plan		10-K	March 9, 2005	10.23
10.16*	Charles River Laboratories amended and restated Deferred Compensation Plan, as amended		10-K	February 27, 2012	10.11

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Exhibit No.	Description	Filed with this Form 10-K	Incorporation by Reference		
			Form	Filing Date	Exhibit No.
10.17*	Amended and Restated Deferred Compensation Plan Document dated July 17, 2012		10-Q	August 7, 2012	10.1
10.18*	Employment Agreement by and Between James C. Foster and the Company dated February 12, 2018		8-K	February 13, 2018	99.2
10.19*	Agreement between David Smith and Charles River Laboratories, Inc. dated March 3, 2015		10-K	February 12, 2016	10.16
10.20	Charles River Laboratories International, Inc. Eighth Amended and Restated Credit Agreement dated March 26, 2018		8-K	March 26, 2018	10.1
10.21	Charles River Laboratories International, Inc. Second Amendment dated September 25, 2019 relating to the Eighth Amended and Restated Credit Agreement dated March 26, 2018		10-Q	November 6, 2019	10.2
10.22	Charles River Laboratories International, Inc. Third Amendment dated November 4, 2019 relating to the Eighth Amended and Restated Credit Agreement dated March 26, 2018		10-Q	November 6, 2019	10.3
10.23*	Agreement between David Johst and Charles River Laboratories, Inc. effective July 26, 2019		10-Q	November 6, 2019	10.1
10.24	Share Sale and Purchase Agreement dated April 27, 2019		8-K	May 1, 2019	2.1
21.1	Subsidiaries of Charles River Laboratories International, Inc.	X			
23.1	Consent of PricewaterhouseCoopers LLP	X			
31.1	Rule 13a-14(a)/15d-14(a) Certification of Chief Executive Officer	X			
31.2	Rule 13a-14(a)/15d-14(a) Certification of Chief Financial Officer	X			
32.1	Section 1350 Certification of the Chief Executive Officer and Chief Financial Officer	X			
101.INS	eXtensible Business Reporting Language (XBRL) Instance Document	X			
101.SCH	XBRL Taxonomy Extension Schema	X			
101.CAL	XBRL Taxonomy Extension Calculation Linkbase	X			
101.DEF	XBRL Taxonomy Extension Definition Linkbase	X			
101.LAB	XBRL Taxonomy Extension Labels Linkbase	X			
101.PRE	XBRL Taxonomy Extension Presentation Linkbase	X			

* Management contract or compensatory plan, contract or arrangement.

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Exhibit 4.2

DESCRIPTION OF SECURITIES

The following description is based upon our second amended and restated certificate of incorporation, our fifth amended and restated by-laws and applicable provisions of law. We have summarized certain portions of the second amended and restated certificate of incorporation and third amended and restated by-laws below. The summary is not complete. The second amended and restated certificate of incorporation and fifth amended and restated by-laws are provided as exhibits to our Annual Report on Form 10-K. You should read the second amended and restated certificate of incorporation and fifth amended and restated by-laws for the provisions that are important to you.

Charles River's authorized capital stock consists of 120,000,000 shares of common stock and 20,000,000 shares of preferred stock.

Common Stock

The issued and outstanding shares of common stock are validly issued, fully paid and non-assessable. Holders of our common stock are entitled to share equally, share for share, if dividends are declared on our common stock, whether payable in cash, property or our securities. The shares of common stock are not convertible and the holders thereof have no preemptive or subscription rights to purchase any of our securities. Upon liquidation, dissolution or winding up of our company, the holders of common stock are entitled to share equally, share for share, in our assets which are legally available for distribution, after payment of all debts and other liabilities and subject to the prior rights of any holders of any series of preferred stock then outstanding. Each outstanding share of common stock is entitled to one vote on all matters submitted to a vote of stockholders. There is no cumulative voting. Except as otherwise required by law or the restated certificate, the holders of common stock vote together as a single class on all matters submitted to a vote of stockholders.

Our common stock is listed on the New York Stock Exchange under the symbol "CRL."

Preferred Stock

We may issue shares of preferred stock in series and may, at the time of issuance, determine the rights, preferences and limitations of each series. Satisfaction of any dividend preferences of outstanding shares of preferred stock would reduce the amount of funds available for the payment of dividends on shares of common stock. Holders of shares of preferred stock may be entitled to receive a preference payment in the event of any liquidation, dissolution or winding-up of our company before any payment is made to the holders of shares of common stock. In some circumstances, the issuance of shares of preferred stock may render more difficult or tend to discourage a merger, tender offer or proxy contest, the assumption of control by a holder of a large block of our securities or the removal of incumbent management. Upon the affirmative vote of a majority of the total number of directors then in office, our board of directors, without stockholder approval, may issue shares of preferred stock with voting and conversion rights which could adversely affect the holders of shares of common stock.

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EX-21.1 3 crl1228201910-kxex211.htm EXHIBIT 21.1

Exhibit 21.1

SUBSIDIARIES

	Subsidiary	**Jurisdiction of Organization**
1	Charles River Laboratories, Inc.	Delaware
2	Charles River UK Limited	United Kingdom (England)
3	Charles River Laboratories Saint-Constant S.A.	Quebec, Canada
4	Charles River Holdings LLC	Delaware
5	Ballardvale C.V.	Netherlands
6	Charles River Nederland B.V.	Netherlands
7	Charles River Laboratories Holding SAS	France
8	Charles River Laboratories France-C.R.L.F. SAS	France
9	Charles River Laboratories Belgium SPRL	Belgium
10	Charles River Laboratories España SA	Spain
11	Charles River Laboratories Japan, Inc.	Japan
12	Charles River Germany Verwaltungs GmbH	Germany
13	Charles River Laboratories Italia Srl	Italy
14	Charles River Germany GmbH & Co. KG	Germany
15	Charles River Laboratories Poland Sp. Z.o.o.	Poland
16	Charles River Laboratories Ireland Limited	Ireland
17	Saothorlanna Bitheolaiocha Idirnaisiunta Teoranta	Ireland
18	Charles River Laboratories, Research Models and Services, Germany GmbH	Germany
19	Charles River Laboratories Luxembourg S.a.r.l.	Luxembourg
20	Charles River Laboratories Group	United Kingdom (Scotland)
21	Charles River Laboratories Edinburgh Ltd.	United Kingdom (Scotland)
22	Sunrise Farms, Inc.	New York
23	Charles River ULC	Nova Scotia, Canada
24	Charles River Laboratories Montreal, ULC	Nova Scotia, Canada
25	Charles River Laboratories Australia Pty. Ltd.	Australia
26	Zhanjiang A&C Biological Ltd.	China
27	Charles River Laboratories Korea	Korea
28	Charles River Laboratories Asia Holdings Limited	Hong Kong
29	Charles River Laboratories Germany GmbH	Germany
30	Charles River Discovery Research Services International, Inc.	Michigan
31	Charles River Discovery Research Services, Inc.	Michigan
32	Charles River Laboratories India Private Limited	India
33	Charles River Discovery Research Services Finland	Finland
34	Systems Pathology Company, LLC	Delaware
35	Accugenix Inc.	Delaware
36	Beijing Vital River Laboratory Animal Technology Co. Ltd.	China
37	Charles River Detecção Microbiana e de Endotoxina Participações	Brazil

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	Ltda	
38	Charles River Endotoxin and Microbial Detection Singapore Pte. Ltd.	Singapore
39	Charles River Endotoxin Microbial Detection Europe SAS	France
40	Charles River Laboratories Holdings Limited	United Kingdom (England)
41	BioFocus DPI (Holdings) Ltd.	United Kingdom (England)
42	Charles River Discovery Research Services UK Limited	United Kingdom (England)
43	Argenta Discovery 2009 Limited	United Kingdom (England)

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44	Charles River Laboratories Cleveland, Inc.	Delaware
45	Charles River Endotoxin and Microbial Detection Israel	Israel
46	Charles River Discovery Research Services Germany GmbH	Germany
47	CRL Holding Germany GmbH	Germany
48	Celsis Group Limited	United Kingdom (England)
49	Nastor Investments	United Kingdom (England)
50	Celsis International Limited	United Kingdom (England)
51	Celsis Limited	United Kingdom (England)
52	Celsis International B.V.	Netherlands
53	Celsis International GmbH	Germany
54	Charles River Laboratories SA France Acquisition SAS	France
55	Charles River Laboratories SA France Holdings SAS	France
56	Charles River Laboratories France Safety Assessment SAS	France
57	Charles River Laboratories Holding Europe SAS	France
58	CRL Safety Assessment, Inc.	Delaware
59	Charles River Laboratories SA USA, Inc.	Delaware
60	Charles River Laboratories SA Japan KK	Japan
61	Charles River Laboratories Ashland,LLC	Delaware
62	Charles River Laboratories SA Netherlands Holdings B.V.	Netherlands
63	Charles River Laboratories I Delaware Holdings, Inc.	Delaware
64	Charles River Laboratories II Delaware Holdings, Inc.	Delaware
65	CRL Dutch Holding Company B.V.	Netherlands
66	Charles River Laboratories Den Bosch B.V.	Netherlands
67	Charles River Laboratories Ireland Holding Unlimited Company	Ireland
68	3313290 Nova Scotia Company	Nova Scotia
69	Zhejiang Vital River Laboratory Animal Technology Co. Ltd.	China
70	Charles River Microbial Solutions International Limited	Ireland
71	CRL Holding Netherlands B.V.	Netherlands
72	KWS BioTest Limited	United Kingdom (England)
73	9904140 Canada Inc.	Canada
74	Charles River Microbial Solutions Company (Shanghai) Limited	China
75	Charles River Laboratories Copenhagen	Denmark
76	CRL Group International France	France
77	CRL Group France	France
78	Charles River Laboratories Evreux	France
79	Charles River Laboratories Saint Nazaire	France
80	Charles River Laboratories Hungary	Hungary
81	Solvo Biotechnológiai Zrt	Hungary
82	Solvo Biotechnology USA, Inc.	Delaware
83	Citoxlab USA, LLC	Kansas
84	Citox, Inc.	Delaware

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EX-23.1 4 crl1228201910-kxex231.htm EXHIBIT 23.1

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-3 (No. 333-224756) and Form S-8 (No. 333-225046, No. 333-212507, No. 333-190292, No. 333-174971, No. 333-161024, No. 333-144177) of Charles River Laboratories International, Inc. of our report dated February 11, 2020 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts
February 11, 2020

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Exhibit 31.1

CERTIFICATION PURSUANT TO
SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002
AND RULE 13a-14(a)/15d-14(a) OF THE EXCHANGE ACT OF 1934

I, James C. Foster, Chairman, President and Chief Executive Officer of Charles River Laboratories International, Inc. (the Company) certify that:

1. I have reviewed this annual report on Form 10-K for the year ended December 28, 2019 of the Company;

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

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

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

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

   b. designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

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

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

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

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

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

Dated: February 11, 2020

/s/ JAMES C. FOSTER

James C. Foster
Chairman, President and Chief Executive Officer
Charles River Laboratories International, Inc.

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Exhibit 31.2

CERTIFICATION PURSUANT TO
SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002
AND RULE 13a-14(a)/15d-14(a) OF THE EXCHANGE ACT OF 1934

I, David R. Smith, Corporate Executive Vice President and Chief Financial Officer of Charles River Laboratories International, Inc. (the Company) certify that:

1. I have reviewed this annual report on Form 10-K for the year ended December 28, 2019 of the Company;

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

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

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

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

   b. designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

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

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

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

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

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

Dated: February 11, 2020

/s/ DAVID R. SMITH

David R. Smith
Corporate Executive Vice President and Chief Financial Officer
Charles River Laboratories International, Inc.

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Exhibit 32.1

**CERTIFICATION PURSUANT TO 18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

In connection with the annual report on Form 10-K for the year ended December 28, 2019 of Charles River Laboratories International, Inc. (the "Company") as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, James C. Foster, Chairman, President and Chief Executive Officer of the Company, and David R. Smith, Corporate Executive Vice President and Chief Financial Officer of the Company, each hereby certifies, to the best of his knowledge and pursuant to 18 U.S.C. Section 1350, that:

(1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 (the "Exchange Act"); and

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

Dated: February 11, 2020

/s/ JAMES C. FOSTER

Chairman, President and Chief Executive Officer
Charles River Laboratories International, Inc.

Dated: February 11, 2020

/s/ DAVID R. SMITH

Corporate Executive Vice President and Chief Financial Officer
Charles River Laboratories International, Inc.

This certification shall not be deemed "filed" for any purpose, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Exchange Act.

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