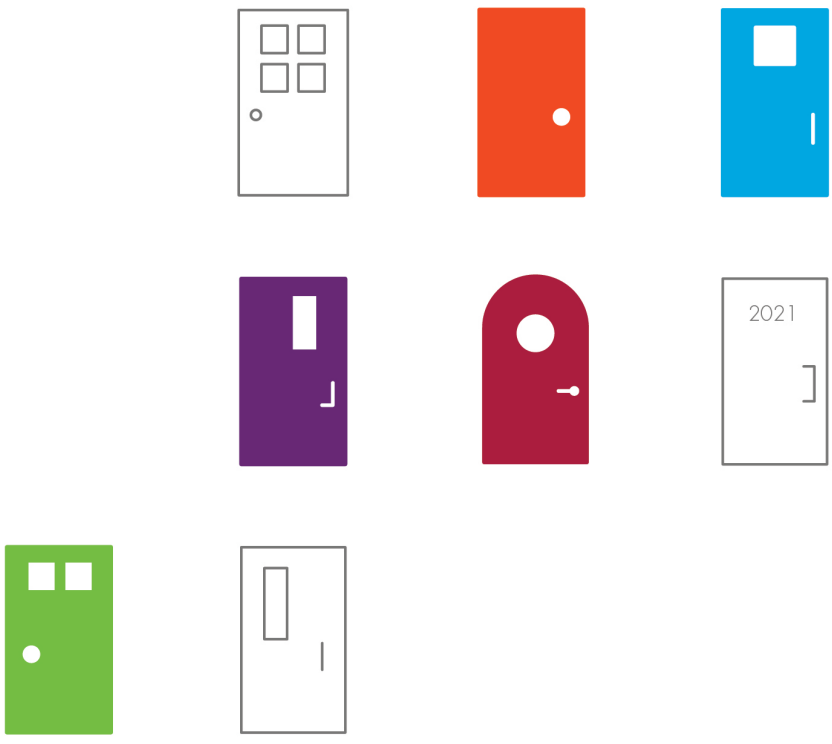
OPENING DOORS TO NEW OPPORTUNITIES

2021 ANNUAL REPORT



REPLIGEN

INSPIRING ADVANCES IN BIOPROCESSING

Opening Doors...

...to New Opportunities

On the cover of our 2021 Annual Report we feature six colorful doors that represent our success entering into new areas and opportunities for growth. This year's shareholder letter from our CEO speaks to each of these six – acquisitions, new markets and drug modalities, new products, increased capacity, new employees and sustainability programs. We invite you to read about our accomplishments in the year 2021, and our goals for 2022.

$671M
Reported Revenue

83% Reported Revenue Growth

$70M CapEx Investment

$190M Revenue from COVID-19 Related Programs

$76M Revenue from Cell & Gene Therapy Accounts

85% Increase in Adjusted Fully Diluted EPS

3 Acquisitions Supporting Filtration, Proteins and Fluid Management

12 New Product Launches

Inaugural Sustainability Report

2021 Key Highlights

Dear Shareholders

Welcome to Repligen's 2021 Annual Report. Our theme — *Opening Doors to New Opportunities* — represents the doors we have opened to achieve success in 2021 and build on new areas of opportunity for future growth.

Our "customer first" approach resulted in Repligen's strongest year to date, with 2021 year-over-year revenue growth of 83%, and **record annual revenue** of approximately $671 million.

We could not have achieved this without the dedication of more than 1,800 employees around the globe. In 2021 alone, we welcomed 724 **new employees** around the world. This includes those who joined Repligen through three **strategic acquisitions** completed in 2021 that expanded our portfolio and reinforced our position as the innovation leader in bioprocessing. **Product innovation** during 2021 enabled our entry into **new markets**, adding new customers and strengthening our position in **emerging drug modalities**, including cell and gene therapy. Finally, we added significantly to our production **capacity**, enabling us to keep pace with accelerated demand as we continue to deliver on both base business revenue growth, which increased by 38% year-over-year, while continuing to serve the critical needs of COVID-19 vaccine and therapeutic customers.

We are also proud of the diversity and differentiation that Repligen represents through our innovative products, talented people and steadfast principles. Our inaugural **Sustainability** report, *Committed to Making a Difference*, was published in November 2021; an important step toward our goal of becoming a best-in-class corporate citizen and create value for all stakeholders.

Strong Financial Performance

Record revenue and growth. Indicative of our strong financial performance in 2021, we reported 71% organic revenue growth for the full year and overall growth of 83%, to reach nearly $671 million in revenue. On the bottom line, our adjusted earnings per share grew by 85%, to $3.06.

Excellence at the core. While COVID-related tailwinds continued to propel overall growth, contributing approximately $190 million in revenue in 2021 (28% of total revenue), we were very encouraged by the momentum of our base, non-COVID business, which grew 38% for the year to reach $443 million, with incremental M&A revenue adding another $38 million. Our base business continues to deliver above-market growth, reflecting accelerated demand for our highly differentiated products that enable more efficient bioprocessing workflows.

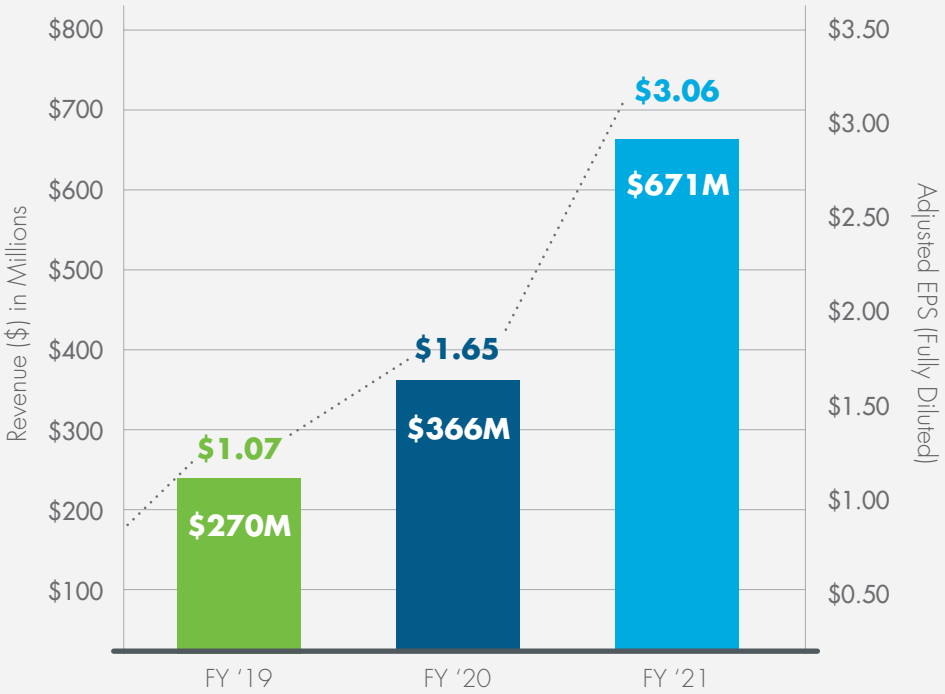
Significant growth across all franchises. Each of our four product franchises — Filtration, Proteins, Chromatography, and Process Analytics — experienced double- or triple-digit growth in 2021. Filtration sales were up over 130% to reach $404 million. Proteins grew 48% to approach $124 million. Chromatography revenue of $91 million represented 29% growth and Process Analytics grew 44% to reach $48 million in revenue. Below we highlight some of the main drivers of growth by franchise.

Franchise Level Growth Drivers

Filtration growth drivers: We experienced momentum in sales of flat sheet and hollow fiber membranes, modules and systems — which were major drivers of franchise growth. We saw an increase in demand from cell and gene therapy customers, and from COVID-related programs, which comprised about 40% of overall Filtration revenue, primarily due to commercial vaccine manufacturing needs. In addition, our top filtration product lines drove our capacity expansion plans, both in the U.S. and in Europe, through our acquisition of French hollow fiber manufacturer Polymem S.A. ("Polymem"). We expect continued momentum in Filtration in 2022 as we continue to build out capacity and bring new products to market.

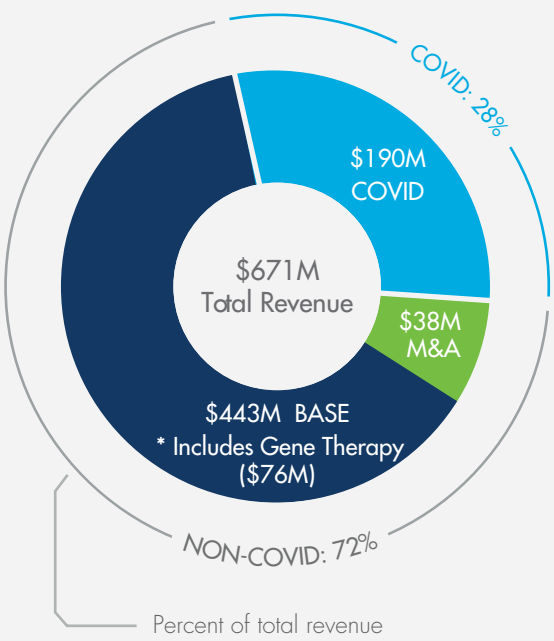
Delivering Revenue and Earnings Growth

We delivered 83% overall and 71% organic revenue growth in 2021, and an 85% increase in adjusted earnings per share with 3-year revenue CAGR of 51%.*



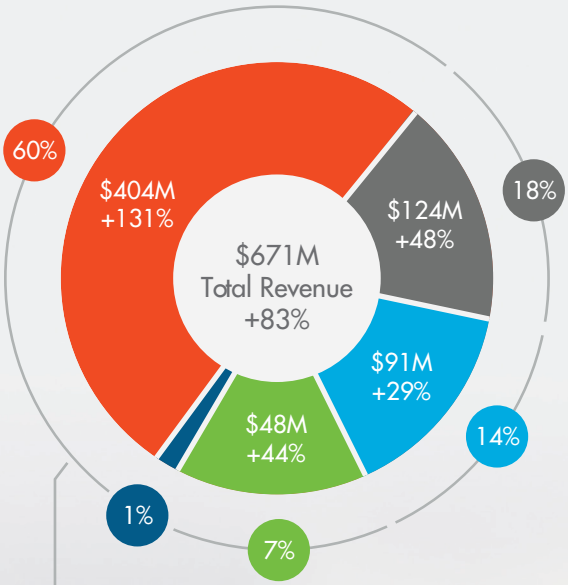
*CAGR includes FY '18 revenue of $194 million

Strong Base & New Markets



In 2021, revenue related to non-COVID programs grew 38% and represented 72% of total revenue, while COVID programs accounted for approximately 28% of total revenue.

Revenue and Growth by Franchise



Percent of total revenue by franchise

In 2021, all franchises delivered exceptional growth, led by Filtration at 131%. The increases were driven by a combination of increased adoption and scaling of our products into new markets, and continued COVID-19 tailwinds.

- Filtration
- Proteins
- Chromatography
- Process Analytics
- Other

Proteins growth drivers: We successfully renewed our Protein A ligand supply agreements with Cytiva and introduced new Repligen products, including NGL-Impact A® Hi pH, a ligand that overcomes challenges associated with purifying pH sensitive monoclonal antibodies (mAbs). In addition, our acquisition of Avitide increases our affinity content with a state-of-the-art ligand discovery and resin development platform — directly addressing the growing need for affinity solutions in gene therapy and other emerging modalities. 2022 will be focused on new product introductions and supporting our key Protein A ligand partners.

Chromatography growth drivers: Our market-leading OPUS® pre-packed chromatography columns (PPCs) were in strong demand, with acceleration in orders across the full portfolio highlighted by increased demand for our largest OPUS 80 PPCs for late-stage clinical and commercial processes, including COVID-19 vaccine workflows. While extended lead times on resin availability from top suppliers presented challenges, we expect these supply constraints to substantially improve as we move through 2022. Our affinity resins, historically captured in Chromatography, are now included in our Proteins franchise to better align with our overall strategy. Our Chromatography portfolio is now led by OPUS pre-packed columns and ARTeSYN® systems.

Process Analytics growth drivers: Our expanded commercial team and their focus on new account development and new application areas such as cell & gene therapy had a positive impact on our Process Analytics franchise. New accounts represented 54% of 2021 revenue, as we saw greater penetration of Slope Spectroscopy® technology, with encouraging early adoption rates for our next-generation FlowVPX™ System for in-line, real-time drug concentration measurements in clinical applications. 2022 will focus on expansion of FlowVPX in the marketplace and increased adoption of the broader portfolio of products at cell and gene therapy accounts.

Fluid Management: Welcome to our new franchise! In December 2021, we announced and completed our acquisition of BioFlex Solutions, Inc. Combined with our 2020 acquisitions of Engineered Molding Technology ("EMT"), Non-Metallic Solutions ("NMS") and ARTeSYN Biosolutions ("ARTeSYN"), we have assembled a diverse portfolio of single-use fluid management assemblies and components for easy plug-and-play integration into our filtration and chromatography skids. We are therefore creating a fifth franchise, here in 2022, to capture sales of Fluid Management consumables, with direct ties to our Systems strategy.

M&A Activity

2021 Acquisitions

Integrations of 2020 Acquisitions

STRATEGIC ACQUISITIONS

Opening doors through new acquisitions in 2021. On the M&A front, in 2021 we strengthened our market position in Filtration with the acquisition of Polymem, in Proteins with the acquisition of Avitide and in Fluid Management with the acquisition of BioFlex Solutions. These deals help us strengthen and expand our market presence and position us well to take additional market share with strong brand recognition, a reputation in our industry as the innovation leader in bioprocessing and a growing portfolio of new products.

- **Polymem.** Located near Toulouse, France, Polymem is a leading industrial expert in the development of hollow fiber membranes and modules. This acquisition strengthens our Filtration franchise and significantly expanded our hollow fiber membrane and module production capacity while providing core membrane technology expertise which will accelerate our R&D programs.

- **Avitide.** Based in Lebanon, New Hampshire, Avitide is an affinity ligand technology leader that advances and expands our Proteins franchise to address the unique purification needs of gene therapies and other emerging modalities.

- **BioFlex Solutions.** Located in Newton, New Jersey, BioFlex Solutions brings high precision injection molding and design capabilities to our single-use portfolio of flow paths and assemblies. This acquisition further integrates related components and supports our fluid management and systems strategy.

Expanding opportunities through our 2020 acquisitions. We successfully completed the integrations of companies acquired in 2020; EMT, NMS and ARTeSYN. Combined, these three deals address the growing need for single-use flow paths in our industry and bring best-in-class filtration and chromatography systems and associated consumables to our portfolio. The combined businesses were up approximately 26% on a *pro forma* basis, while also contributing to the manufacture of internal Repligen products.

With the addition of BioFlex Solutions in late 2021, we have now established a diverse portfolio of single-use flow path products that provide new opportunities to drive accelerated growth for the company.

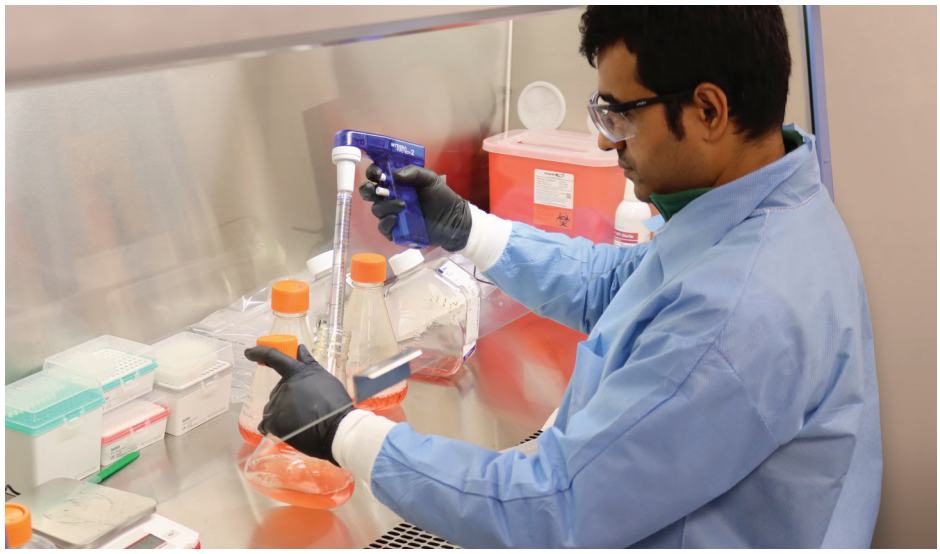
NEW MARKETS AND MODALITIES

Cell and Gene therapy. Cell and gene therapy ("C&GT") revenue increased by 40% in 2021 to approximately $76 million, reinforcing our market position in viral vector and plasmid manufacturing and demonstrating accelerated traction for our products. Our growth in C&GT was largely driven by our Filtration and Process Analytics franchises, as well as increased traction in Asia.

We successfully focused our efforts on acquiring new gene therapy customers, adding about 70 new accounts during the year. We finished 2021 with approximately 100 significant accounts, up from 70 in 2020.

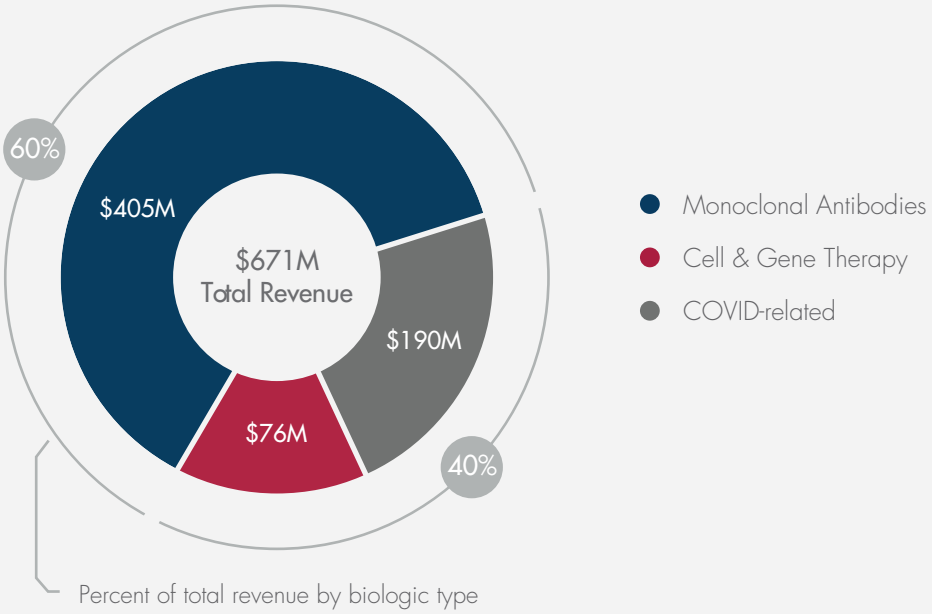
New applications center. With our new gene therapy applications center up and running and a focus in the industry on scale-up, we expect another strong year of growth from this market segment in 2022.

COVID-19 impact. In 2021, we generated nearly $190 million in revenue related to COVID-19 programs, up from $46 million in 2020. The expansion was driven predominantly by our Filtration franchise, where COVID vaccine revenues comprised about 40% of the franchise total. Our presence in the leading COVID vaccine programs represents an entry point to a relatively new modality for Repligen — mRNA and more broadly, nucleic acid based vaccines and therapeutics — a segment where we are seeing heightened industry investment.



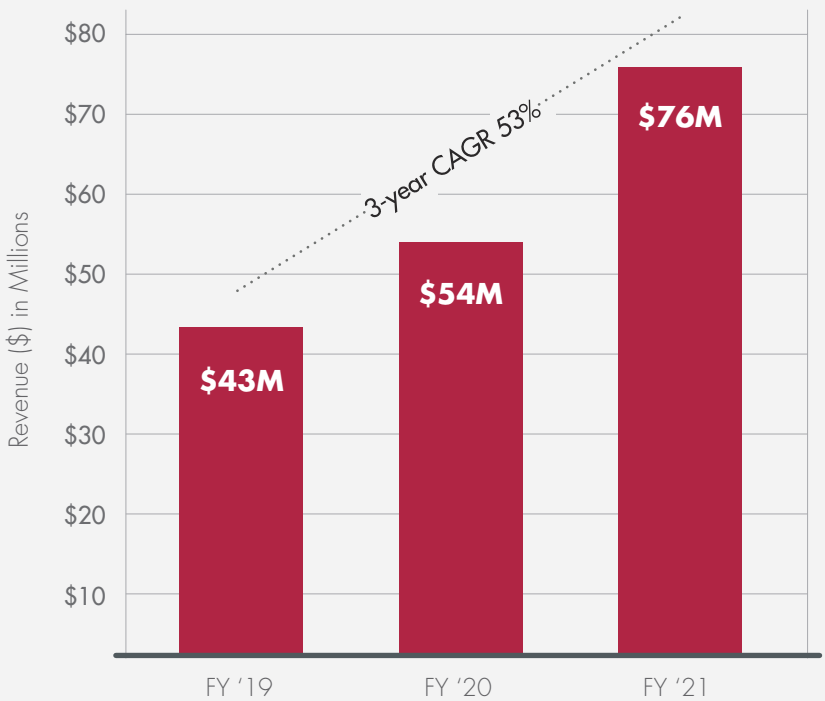
Revenue by Biologic Type

In 2021, COVID-19 and C&GT related revenue grew to represent 40% of total revenue.



Cell & Gene Therapy

In 2021, we opened 70 new cell & gene therapy accounts, and reported C&GT revenue growth of 40%.



*CAGR includes FY '18 C&GT revenue of $21 million

NEW PRODUCTS

"Inspiring advances in bioprocessing." As implied by our company tagline, innovation is at the core of Repligen culture and new product development and launches continue to be a main pillar in our overall strategy of winning market share through technology leadership.

Our commitment to innovation allowed our team to deliver on several key programs in 2021. We launched a total of **12 new products** during the year, including the **five highlighted below**:

1. We launched our FlowVPX system with ViPer software. This GMP-compliant, in-line analytics system, has been quickly adopted by our customer base, especially in downstream mAb processes;
2. We launched new KrosFlo® FS Systems to fully automate flat sheet tangential flow filtration (TFF) processes with integrated and configurable hardware components for simplicity and compliance;
3. We optimized ARTeSYN technology through our R&D team, to deliver on a portfolio of standardized ARTeSYN chromatography systems;
4. We launched our new XCell™ ATF Lab Controllers, enabling further scalability of our XCell ATF® systems from pre-clinical through commercial needs; and,
5. We partnered in the launch of the industry's first Protein A resin to effectively purify pH sensitive monoclonal antibodies, overcoming aggregation challenges through the development of NGL-Impact A Hi pH ligand.

As we enter 2022, we anticipate another strong year for R&D as we expand both our Avitide and ARTeSYN family of products.

"Our growth is grounded in insights that come from listening carefully to our customers' needs and pain points, and designing and supplying quality solutions that help our customers succeed."

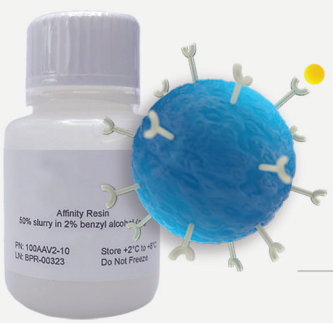
Christine Gebski | Senior Vice President, Filtration & Chromatography

1 *FlowVPX System with ViPer Software*

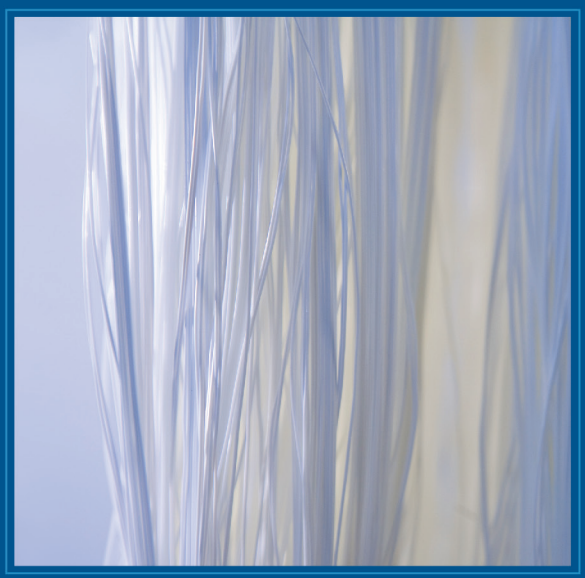
2 *KrosFlo FS Systems*

3 *ARTeSYN Chromatography Systems*

4 *XCell ATF Lab Controllers*



5 *NGL-Impact A Hi pH*



9x

increase in hollow fiber capacity

4

new OPUS suites operating in Breda

NEW CAPACITY

Significant increases in production capacity. One of our stated goals for the year, was to rapidly expand capacity across our product lines. Operationally, we increased our production capacity by three- to nine-fold allowing us to support, in a very meaningful way, the ongoing fight against the pandemic while continuing to supply product to our expanding customer base.

A highlight of our investment in capacity of approximately $70 million in 2020 and 2021, was in the area of Filtration, where the combination of the Polymem acquisition and expansion programs at our Rancho Dominguez, CA site increased our hollow fiber capacity over nine-fold. Also in Chromatography, we brought our European OPUS manufacturing facility on line. By the end of 2021, approximately 90% of our European customers had qualified in our Breda facility in The Netherlands for production of pre-packed columns.

We continue to invest in additional capacity in 2022 to complete the majority of our site expansion plans and drive down lead times for our customers. This includes adding even more filtration manufacturing space in Rancho Dominguez, CA and Marlboro, MA sites, and opening our first assembly center for Fluid Management in Hopkinton, MA.

NEW EMPLOYEES

Welcoming new hires, expanding our manufacturing teams. In 2021, we added 724 new employees, bringing our total employee base to 1,852 individuals located in 12 countries. We could not have managed the demands of 2021 without the commitment of this exceptional team of employees who pushed to ensure critical products were delivered to customers in a timely manner.

Providing opportunities for individual growth. In 2021, our Diversity, Equity and Inclusion (DEI) program was formalized, including Leadership Development initiatives. This has been integral to how we think about and act on our hiring needs and employee support, at both labor and professional levels.

COMMITTED TO CORPORATE RESPONSIBILITY

Inaugural Sustainability report. In 2021, the Corporate Responsibility Team (CRT) that we established early in 2020 produced the company's first Sustainability report – opening the door to embracing sustainability as a mindset that encompasses and provides opportunity to enhance our Environmental, Social and Governance ("ESG") profile. This ambitious report (accessible on our website; www.repligen.com) is aligned to key reporting frameworks - Sustainability Accounting Standards Board (SASB) and Global Reporting Initiative (GRI). The report reinforces our commitment to embed the UN Global Compact (UNGC) Ten Principles into our core business strategies and operations to advance the Sustainable Development Goals (SDGs).

Four pillars. The report is built on four pillars: Principles, People, Product and Planet. Our "4Ps" embody the belief shared by our Board and the executive leadership team that corporate responsibility is essential to sustaining business and economic growth in a manner that can also deliver positive environmental and social impact.

724

talented individuals joined our diverse team, ending the year with a total employee base of 1,852 across 12 countries.

Good to Great

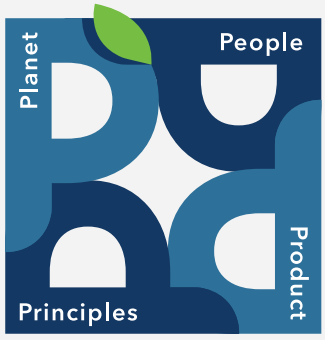
"I regularly share with employees that taking 'good' and upshifting to 'great' defines our success as an innovation-focused company. While we may be at the initial stages of documenting our ESG journey, I believe you will find that we are well on our way in many respects. A strong culture of responsibility and caring will continue to drive and define Repligen."

In our Sustainability report:

- We identify areas of risk management focus, and report on the refreshment of our Corporate Governance Guidelines and Codes of Conduct to better reflect our commitment to ethical and fair business practices and compliance (Principles)
- We discuss new leadership development programs and initiatives to support diversity, equity and inclusion both inside and outside of the organization (People)
- We showcase examples of lower-impact packaging and shipping solutions for key products (Product)
- We highlight the achievement by Repligen Sweden of carbon neutrality in manufacturing, where along with three additional sites, we have transitioned to 100% renewable energy across operations (Planet)
- We report a reduction in carbon emissions by 12% in 2020 versus our baseline year 2019, on a normalized to revenue basis (Planet)

"The response across stakeholder groups to our first report on sustainability is inspiring. It is also reaffirms that we are focused on the right things and moving in a positive direction. I'm proud to be leading our expanded sustainability efforts in 2022, along with a broader ESG team and full support of our Board and management, who are committed to operating responsibly."

Dianne Heiler | Senior Director, Packaging & Sustainability



12%

GHG emissions reduction

in 2020 as compared to 2019 (normalized to revenue)

10%

Scope 1 & Scope 2

reductions, a challenge set in 2021 to galvanize global sites to embrace our ESG strategy and take action

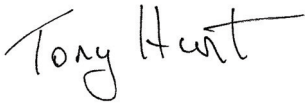
OUR FOCUS IN 2022

As we move through the year 2022, our strategic priorities will center on the following:

1. Building out additional capacity to support accelerating growth in our businesses;
2. Supporting and successfully integrating our 2021 acquisitions - Polymem, Avitide and Bioflex Solutions;
3. Launching and seeding new products including AAV resins for gene therapy, and ARTeSYN TFF filtration systems;
4. Continuing to make traction at cell and gene therapy accounts; and
5. Increasing our emphasis on ESG and Sustainability practices, with a focus in 2022 on DE&I, moving to 100% renewable energy at additional sites, and exploring a single-use recycling pilot program.

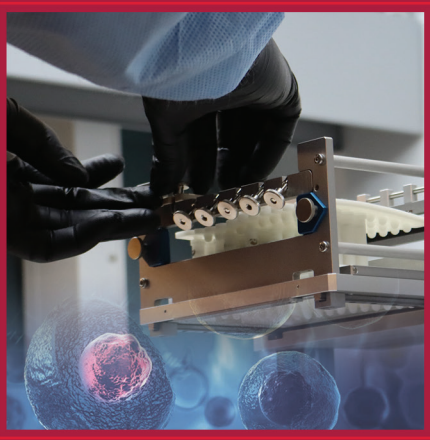
We believe we are well positioned to gain further market share in bioprocessing over the next 3-5 years and we are confident about hitting our goal of $1 billion by 2024.

In closing, 2021 was a fantastic year for Repligen, during which new employees, new acquisitions, new market and modality opportunities and new capacity came together to deliver a very strong growth year for the company. I want to welcome our many new employees and our colleagues joining Repligen through our 2021 acquisitions. Also I want to thank all of our stakeholders — including our shareholders, customers and suppliers — for your part in our success in 2021 and as we advance here in 2022.



Tony J. Hunt
President and CEO


ARTeSYN
A REPLIGEN COMPANY



2021
REPLIGEN CORPORATION
FORM 10-K

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

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

For the fiscal year ended December 31, 2021

OR

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

For the transition period from to

Commission File Number 000-14656

REPLIGEN CORPORATION

(Exact name of registrant as specified in its charter)

Delaware	**04-2729386**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
41 Seyon Street, Bldg. 1, Suite 100	
Waltham, MA	**02453**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (781) 250-0111

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value $0.01 per share	RGEN	The Nasdaq Global Select Market

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

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ 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 checkmark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐.

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

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

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

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. Yes ☐ No ☐.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐

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

The aggregate market value of the voting and non-voting common equity held by non-affiliates as of June 30, 2021, the last business day of the registrant's most recently completed second fiscal quarter, was $10,858,031,196.

The number of shares of the registrant's common stock outstanding as of February 14, 2022 was 55,327,475.

Documents Incorporated By Reference

The registrant intends to file a proxy statement pursuant to Regulation 14A within 120 days of the end of the fiscal year ended December 31, 2021. Portions of such proxy statement are incorporated by reference into Part III of this Annual Report on Form 10-K.

Auditor Firm Id	Auditor Name	Auditor Location
42	Ernst & Young LLP	Boston, Massachusetts, United States

Table of Contents

Summary of the Material Risks Associated with Our Business

Our business is subject to numerous risks and uncertainties that you should be aware of in evaluating our business. These risks include, but are not limited to, the following:

- Our product revenue may be negatively impacted by a number of factors, including without limitation, competition in the bioprocessing market, our historical reliance on a limited number of large customers, our ability to develop or acquire additional bioprocessing products in the future, our ability to manufacture our bioprocessing products sufficiently and timely, supply chain issues and/or disruption, and our ability to effectively penetrate the bioprocessing products market.
- We rely on a limited number of suppliers or, for certain of our products, one supplier, and we may not be able to find replacements or immediately transition to alternative suppliers, which could have a material adverse effect on our financial condition, results of operations and reputation.
- We may not be able to achieve sufficient market acceptance for our bioprocessing products, and our results of operations and competitive position could suffer.
- If our products do not perform as expected or the reliability of the technology on which our products are based is questioned, we could experience lost revenue, delayed or reduced market acceptance, increased cost and damage to our reputation.
- If we are unable to manufacture our products in sufficient quantities and in a timely manner, our operating results will be harmed, our ability to generate revenue could be diminished and our gross margin may be negatively impacted.
- Acquisitions we have completed, including our recent acquisitions of Polymem S.A., Avitide, Inc., BioFlex Solutions LLC and Newton T&M Corp., or may complete in the future, may expose us to risks that could adversely affect our business, and we may not achieve the anticipated benefits of acquisitions of businesses or technologies.
- Our results of operations could be negatively affected by potential fluctuations in foreign currency exchange rates.
- If we are unable to hire and retain skilled personnel, including technical, sales and marketing personnel, then we will have trouble developing and marketing our products.
- If we are unable to obtain, maintain and protect our intellectual property rights related to our products, we may not be able to compete effectively or succeed commercially.
- The business interruptions resulting from the COVID-19 outbreak or similar public health crises may disrupt the development, manufacturing and commercial sales of our products and adversely impact our business.

FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K ("Form 10-K") contains forward-looking statements which are made pursuant to the safe harbor provisions of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). The forward-looking statements in this Form 10-K do not constitute guarantees of future performance. Investors are cautioned that express or implied statements in this Form 10-K that are not strictly historical statements, including, without limitation, statements regarding current or future financial performance, potential impairment of future earnings, management's strategy, plans and objectives for future operations or acquisitions, product development and sales, research and development, selling, general and administrative expenditures, intellectual property and adequacy of capital resources and financing plans constitute forward-looking statements. Such forward-looking statements are subject to a number of risks and uncertainties that could cause actual results to differ materially from those anticipated, including, without limitation, the risks identified under the caption "Risk Factors" and other risks detailed in this Form 10-K and our other filings with the Securities and Exchange Commission. We assume no obligation to update any forward-looking information contained in this Form 10-K, except as required by law.

PART I

ITEM 1. BUSINESS

The following discussion of our business contains forward-looking statements that involve risks and uncertainties. When used in this report, the words "intend," "anticipate," "believe," "estimate," "plan" and "expect" and similar expressions as they relate to us are included to identify forward-looking statements. Our actual results could differ materially from those anticipated in these forward-looking statements and are a result of certain factors, including those set forth under "Risk Factors" and elsewhere in this Annual Report on Form 10-K ("Form 10-K").

References throughout this Form 10-K to "Repligen Corporation", "Repligen", "we", "us", "our", or the "Company" refer to Repligen Corporation and its subsidiaries, taken as a whole, unless the context otherwise indicates.

Overview

Repligen Corporation is a global life sciences company that develops and commercializes highly innovative bioprocessing technologies and systems that increase efficiencies and flexibility in the process of manufacturing biological drugs.

As the overall market for biologics continues to grow and expand, our primary customers – global biopharmaceutical companies and contract development and manufacturing organizations – face critical production cost, capacity, quality and time pressures. Built to address these concerns, our products help set new standards for the way biologics are manufactured. We are committed to inspiring advances in bioprocessing as a trusted partner in the production of critical biologic drugs – including monoclonal antibodies ("mAbs"), recombinant proteins, vaccines and cell and gene therapies ("C&GT") – that are improving human health worldwide.

We currently operate as one bioprocessing business, with a comprehensive suite of products to serve both upstream and downstream processes in biological drug manufacturing. Building on over 40 years of industry expertise, we have developed a broad and diversified product portfolio that reflects our passion for innovation and the customer-first culture that drives our entire organization. We continue to capitalize on opportunities to maximize the value of our product platform through both organic growth initiatives (internal innovation and commercial leverage) and targeted acquisitions.

Our corporate headquarters are located in Waltham, Massachusetts, with additional administrative and manufacturing operations worldwide. The majority of our 16 key manufacturing sites are located in the United States (California, Massachusetts, New Jersey and New York). Outside the United States, we have sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden.

COVID-19 Considerations and Responses

In March 2020, the World Health Organization declared the COVID-19 outbreak, including all ensuing variants thereto, to be a pandemic ("COVID-19"). COVID-19 has resulted in government authorities around the world implementing numerous unprecedented measures such as travel restrictions, quarantines, shelter in place orders, factory shutdowns and vaccine mandates. During 2021 and 2020, our revenues were positively affected by COVID-19. However, the extent to which COVID-19 will continue to affect our future financial results and operations will depend on future developments, which are highly uncertain and cannot be predicted, including the recurrence, severity and/or duration of COVID-19, and current or future domestic and international actions to contain and treat COVID-19.

With the health and safety of our employees as a top priority, we promptly created a COVID-19 task force in March 2020 focused on the Company's response to COVID-19, which quickly established on-site COVID-19 testing, on-site restrictions and protocols, employee communications, vaccine awareness and education and remote workforce management; in addition, many of our employees continued working remotely for extended periods of time during 2021 and 2020. We are following public and private sector policies and initiatives to reduce the transmission of COVID-19, such as the imposition of travel restrictions and the promotion of social distancing and continuing our work-from-home arrangements. We are taking a variety of measures to ensure the availability and functioning of our critical infrastructure, to promote the safety and security of our employees and to support the communities in which we operate. These measures include increasing our inventory, requiring remote working arrangements for employees who are not integral to physically making and shipping our products or who do not need specialized equipment to perform their work, restricting on-site visits by non-employees and investing in personal protective equipment. During 2021 and 2020, on-site testing was conducted at all U.S. sites and offered as an option at sites outside the United States. Daily temperature screenings were available at most U.S. and non-U.S. sites and all employees were encouraged to receive the COVID-19 vaccinations and COVID-19 booster shots as they became available. As COVID-19 conditions improved, we began implementing a phased

reopening process which we have since reversed in response to the identification of COVID-19 variants. We will continue to prioritize the health and safety of our employees until COVID-19 is contained. We may take further actions and adjust our reopening process as government authorities require or recommend or as we determine to be in the best interests of our employees, customers, partners and suppliers.

For further discussion of the risks relating to COVID-19, see *"The COVID-19 pandemic, or similar public health crises, could have a material adverse impact on our business, financial condition and results of operations, including our product sales, and our stock price"* in Item 1A. "Risk Factors," below.

Our Products

Our bioprocessing business is comprised of four main franchises: filtration; chromatography; process analytics; and proteins.

Since 2012, we have purposely built a highly diversified portfolio of products offered under these franchises, developing technological solutions that enable more efficient drug manufacturing processes for our customers, through internal research and development ("R&D") and strategic acquisitions. We are committed to sustainable innovation and have introduced disruptive new products in response to our customers' bioprocessing challenges. Our growth strategy continues to expand our geographic scope, our customer base and applications of our technologies.

To support our sales growth goals for these products, we make ongoing investments in our commercial organization, our R&D team and our manufacturing capacity. We regularly evaluate and invest in these areas as needed to ensure timely deliveries and to stay ahead of increased customer demand for our products.

A majority of our revenue is derived from consumable and/or single-campaign ("single-use") product sales, as compared to associated equipment. The customization, scalability and plug-and-play convenience of these products, and in many cases the closed nature of our technologies, make them ideal for use in biologics manufacturing processes where contamination risk is a critical concern of our customers.

Filtration

Filtration is our largest franchise with the broadest product offering covering upstream and downstream technologies. Below is a description of some of our key products:

XCell ATF® Cell Retention Systems

Our filtration products offer a number of advantages to manufacturers of biologic drugs and are used in process development and process scale (clinical and commercial) production. Our XCell Alternating Tangential Flow ("ATF") systems are used in upstream perfusion (continuous) and N-1 (intensified fed-batch or hybrid perfusion) cell culture processing.

XCell ATF is a cell retention technology. The system is comprised of an advanced hollow fiber ("HF") filtration device, a low shear pump and a controller. The XCell ATF system is connected to a bioreactor and enables the cell culture to be run continuously, with cells being retained in the bioreactor, fresh nutrients (cell culture media) being fed into the reactor continuously and clarified biological product and cell waste being removed (harvested) continuously. The cells are maintained in a consistent nutrient-rich environment and can reach cell densities two- and three-times higher than those achieved by standard fed-batch culture. As a result, product yield is increased, which improves facility utilization and can reduce the size of a bioreactor required to manufacture a given volume of biologic drug product. XCell ATF systems are available in a wide range of sizes that can easily scale from laboratory use through full production with bioreactors as large as 5,000 liters.

Through internal innovation, we developed and launched single-use formats of the original stainless steel XCell ATF devices to address increasing industry demand for single-use sterile systems with "plug-and-play" technology. The XCell ATF device is now available to customers in both its original configuration (steel housing and single-use filters) in all sizes (2, 4, 6 and 10), and/or as a single-use device (disposable housing/filter combination) in most sizes (2, 6, and 10). The availability of XCell ATF technology in a single-use format reduces implementation time by eliminating the time intensive workflow associated with autoclaving and enables our customers to accelerate evaluations of the product with a lower initial overall cost of ownership.

TangenX® Flat Sheet Cassettes

Our TangenX product line ("TangenX") balances our upstream XCell ATF systems (HF) with a portfolio of flat-sheet tangential flow filtration ("TFF") cassettes used in downstream biologic drug concentration and formulation processes. The TangenX product portfolio includes our single-use SIUS® brand, providing customers with a high-performance, cost saving alternative to reusable TFF cassettes.

TFF is a rapid and efficient method for the concentration and formulation of biomolecules that is widely used in many applications in biopharmaceutical development and manufacturing. SIUS cassettes feature a high performing membrane and unique cartridge construction that enables a lower price point. Each disposable cassette is delivered pre-sanitized and ready to be equilibrated and used for tangential flow, ultrafiltration and diafiltration applications. Use of SIUS TFF cassettes eliminates non-value-added steps (cleaning, testing between uses, storage and flushing) that are required with reusable TFF products, providing cost and time savings. The cassettes are interchangeable with filter hardware from multiple manufacturers, simplifying customer trial and adoption of SIUS products.

In 2020, we introduced SIUS Gamma, which we engineered to harness the performance and efficiencies of TangenX® SIUS® membranes and cassettes, while also providing the convenience of a fully assembled, closed and irradiated system. The device is delivered as a package including the cassette, manifold, clamps, tubing and connectors. The customizable SIUS Gamma device is ideal for adenovirus cell and gene therapy ("C&GT") processes where large volumes need to be concentrated prior to chromatography.

Spectrum® Hollow Fibers

Our filtration business is strengthened by a leading portfolio of Spectrum HF filtration solutions, including fully integrated KrosFlo® TFF® systems with Konduit sensing and ProConnex® Flow Path single-use assemblies. The KrosFlo family of TFF systems for product concentration is fully scalable from 2 milliliters to 5,000 liters – from lab-scale to commercial manufacturing. Designed for purification and formulation applications, KrosFlo systems enable robust downstream ultrafiltration and microfiltration.

We also gained the Spectra/Por® portfolio of laboratory and process dialysis products and in 2019, we launched the SpectraFlo™ Dynamic Dialysis Systems. Also, in 2019 we introduced the KrosFlo® TFDF® (Tangential Flow Depth Filtration) systems, which we believe have the potential to disrupt and displace traditional harvest clarification operations. The KrosFlo TFDF system includes control hardware, novel high throughput tubular depth filters and ProConnex® TFDF® flow paths. When used for cell culture clarification, single-use KrosFlo TFDF technology delivers unprecedented high flux (>1,000 LMH), high capacity, low turbidity, and minimal dilution, making the technology a high-performance alternative to traditional centrifugation and depth filtration approaches to harvest clarification. TFDF technology also provides benefits such as low hold-up volume, high recovery, small footprint, simple set up and disposal, scalability and reduced process time.

The Spectrum product line of HF filters is used in bench-tops through commercial-scale processes, primarily for the filtration, purification and concentration of biologics and diagnostic products. Our KrosFlo filtration systems and equipment offer both standard and customized solutions to bioprocessing customers, with particular strength in consumable and single-use offerings.

With our acquisition of Polymem S.A. ("Polymem") on July 1, 2021, we further expanded our HF membrane and module production capabilities and added core R&D, engineering and production expertise in HF technology for both industrial and bioprocessing markets. The Polymem business complements our Spectrum HF product line, which includes KrosFlo TFF systems and ProConnex fluid management. The acquisition of Polymem accelerates our HF manufacturing buildout and adds a Europe-based HF manufacturing center of excellence.

The growth of our filtration business has allowed us to substantially increase our direct sales presence in Europe and Asia and diversify our end markets to include all biologic classes, including mAb, vaccines, recombinant proteins and C&GT.

Other Filtration

Over time, we have broadened the application of our Konduit monitor, which automates concentration and buffer exchange, to include use with both HF TFF systems. We also self-manufacture HF filters that are used in our XCell ATF, KrosFlo TFF and KrosFlo TFDF systems.

With our acquisition of Engineered Molding Technology LLC (“EMT”) on July 13, 2020, we added EMT’s silicone-based, single-use components and manifolds to our filtration franchise. These fluid management products are key components in single-use filtration and chromatography systems and will help expand our line of single-use ProConnex flow paths, streamline our supply chain for ATF and provide more flexibility as we scale and expand our single-use and systems portfolios.

With our acquisition of Non-Metallic Solutions, Inc., a Massachusetts corporation ("NMS") on October 20, 2020, we expanded our line of single-use systems and associated integrated flow path assemblies, streamlining our supply chain for current products, and giving us more flexibility to scale and expand single-use and systems portfolios.

With our acquisition of the ARTeSYN Biosolutions Holdings Ireland Limited (“ARTeSYN”) business on December 3, 2020, we expanded our filtration offering, and added additional single-use components and flow path assemblies for fluid management, providing greater flexibility and market opportunity as we scale and expand our systems portfolio.

With our acquisition of BioFlex Solutions LLC (“BioFlex”) and Newton T&M Corp. (“NTM”) on December 16, 2021, we complemented and expanded our filtration franchise, as both BioFlex and NTM focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. These products are essential components in our upstream and downstream product offerings – especially our systems with line-sets and flow paths. These acquisitions streamline and increase our control over many components in our single-use supply chain, which ultimately should drive reduced lead-times for our customers in the coming years.

Chromatography

Our chromatography franchise includes a number of products used in downstream purification, development, manufacturing and quality control of biological drugs. The main driver of growth in this portfolio is our OPUS® pre-packed column (“PPC”) product line.

In addition to OPUS, with our acquisition of ARTeSYN in 2020, we added chromatography systems to our offerings, as well as single-use components and flow path assemblies for fluid management, providing greater flexibility and market opportunity as we scale and expand our systems portfolio.

Additional chromatography products include our affinity capture resins, such as CaptivA® Protein A resins, that are used in a small number of commercial drug processes and our ELISA test kits, used by quality control departments to detect and measure the presence of leached Protein A and/or growth factor in the final product.

OPUS Pre-Packed Columns

Our chromatography franchise features a wide range of OPUS columns, which we deliver to our customers sealed and pre-packed with their choice of resin. These are single-use or campaign-use disposable columns that replace the use of customer-packed glass columns for downstream purification. By designing OPUS columns to be a technologically advanced and flexible option for the purification of biologics from process development through clinical and commercial-scale manufacturing, Repligen has become a leader in the PPC market. Our biomanufacturing customers value the significant cost savings that OPUS columns can deliver by reducing set up time, labor, equipment and facility costs – in addition to delivering product consistency and “plug-and-play” convenience.

We launched our first production scale OPUS columns in 2012 and have since added larger diameter options that scale up to use with 2,000 liter bioreactors. Our OPUS 80R column is the largest available PPC on the market for use in late-stage clinical or commercial purification processes. We offer unique features such as a resin recovery port on our larger columns, which allows our customers to remove and reuse the recovered resin in other applications. We believe the OPUS 5-80R product line is the most flexible product line available in the market, serving the purification needs of customers manufacturing mAbs and other biologics such as vaccines and C&GT.

In addition to our larger scale OPUS columns, our portfolio includes our smaller-scale OPUS columns, including our RoboColumn®, MiniChrom® and ValiChrom® columns used for process development (“PD”) and validation. These columns are used in high-throughput PD screening, viral clearance validation studies and scale down validation of chromatography processes.

We maintain customer-facing centers in both the United States and Europe for our OPUS column customers, and offer a premier ability to pack any of hundreds of chromatography capture resins available, as per our customers’ choice.

Process Analytics

Our process analytics products complement and support our filtration, chromatography and proteins franchises as they allow end-users to make at-line or in-line absorbance measurements allowing for the determination of protein concentration in filtration, chromatography formulation and fill-finish applications.

SoloVPE® Device

Our SoloVPE slope spectroscopy system is the industry standard for offline and at-line absorbance measurements for protein concentration determination in process development, manufacturing and quality control settings.

FlowVPE® Device

Our FlowVPE slope spectroscopy system enhances the power of slope spectroscopy and provides in-line protein concentration measurement for filtration, chromatography and fill-finish applications. A key benefit of this in-line solution is the ability to monitor a manufacturing process in real time.

FlowVPX® System

FlowVPX® slope spectroscopy system is our next-generation FlowVPE launched at the beginning of 2021 and designed to meet the rigors of regulatory GMP requirements. FlowVPX offers reliable real-time results with integrated ease for concentration measurements during every stage of the downstream GMP-compliant production-scale biologics manufacturing.

Use of slope spectroscopy systems delivers multiple process benefits for our biopharmaceutical manufacturing customers, compared to traditional UV-Vis approaches. Key benefits include: the elimination of manual dilutions and sample transfers from process development/manufacturing to labs, rapid time to results (minutes versus hours), improved precision, built-in data quality for improved reporting and validation, and ease of use.

Proteins

Our proteins franchise is represented by our Protein A affinity ligands, which are a critical component of Protein A chromatography resins used in downstream purification of virtually all mAb-based drugs on the market or in development, and cell culture growth factor products, which are a key component of cell culture media used in upstream bioprocessing to increase cell density and improve product yield.

Affinity Ligands

We are a leading provider of Protein A affinity ligands to life sciences companies. Protein A ligands are an essential “binding” component of Protein A affinity chromatography resins used in the purification of virtually all mAb-based drugs on the market or in development. We manufacture multiple forms of Protein A ligands under long-term supply agreements with major life sciences companies including Cytiva, MilliporeSigma and Purolite, an Ecolab Inc. company ("Purolite"), who in turn sell their Protein A chromatography resins to end users (mAb manufacturers). We have two manufacturing sites supporting overall global demand for our Protein A ligands: one in Lund, Sweden and another in Waltham, Massachusetts.

Protein A chromatography resins are considered the industry standard for purification of antibody-based therapeutics due to the ability of the Protein A ligand to very selectively bind to or “capture” antibodies from crude protein mixtures. Protein A resins are packed into the first chromatography column of typically three columns used in a mAb purification process. As a result of Protein A’s high affinity for antibodies, the mAb product is highly purified and concentrated within this first capture step before moving to polishing steps.

In June 2018, we entered into an agreement with Navigo Proteins GmbH (“Navigo”) for the exclusive co-development of multiple affinity ligands for which Repligen holds commercialization rights. We manufacture and exclusively supply the first of these ligands, NGL-Impact® A, to Purolite, for use in their Jetted A50 Protein A resin product. We have a long-term supply agreement with Purolite for NGL-Impact and potential additional affinity ligands that may advance from our Navigo collaboration.

In October 2020, we announced the successful development (with Navigo) of a spike protein ligand, and our plans to manufacture and commercialize the associated chromatography resin as a Repligen branded and marketed product. We subsequently announced the launch of our NGL COVID-19 Spike Protein affinity resin in February 2021. The resin, which targets the SARS-CoV-2 spike protein, can be utilized in the purification of certain COVID-19 vaccines. The spike protein is a characterizing feature of SARS-CoV-2, the virus

that causes COVID-19; it is the primary antigen being evaluated in clinical trials to induce an immune response as a COVID-19 vaccine.

In September 2021, the Company and Navigo successfully completed co-development of a novel affinity ligand that addresses aggregation issues associated with pH sensitive antibodies and Fc-fusion proteins. We are manufacturing and supplying this ligand, NGL-Impact® Hi pH, to Purolite.

Also, in September 2021, we completed our strategic acquisition of Avitide, Inc. ("Avitide"), a market leader in affinity ligand discovery and development. This acquisition is a major step forward in building our proteins franchise, and moves Repligen into affinity resin solutions for C&GT and other emerging modalities. This acquisition builds off the excellent partnership with Navigo mentioned above, and strengthens and expands our ligand discovery platform.

Growth Factors

Most biopharmaceuticals are produced through an upstream mammalian cell culture process. In order to stimulate increased cell growth and maximize overall yield from a bioreactor, manufacturers often add growth factors, such as insulin, to their cell culture media. Our cell culture growth factor additives include LONG® R^3 IGF 1, our insulin-like growth factor that has been shown to be up to 100 times more biologically potent than insulin (the industry standard), thereby increasing recombinant protein production in cell culture fermentation applications.

Corporate Information

We are a Delaware corporation with our global headquarters in Waltham, Massachusetts. We were incorporated in 1981 and became a publicly traded company in 1986. Our common stock is listed on the Nasdaq Global Market under the symbol "RGEN". We have over 1,800 employees and operate globally with offices and manufacturing sites located at multiple locations in the United States, Europe and Asia. Our principal executive offices are located at 41 Seyon Street, Waltham, Massachusetts 02453, our website is www.repligen.com and our telephone number is (781) 250-0111.

2021 Acquisitions

BioFlex Solutions LLC and Newton T&M Corp.

On November 29, 2021, the Company entered into an Equity Purchase Agreement with BioFlex, NTM and each of Ralph Meola and Jason Nisler, to acquire 100% of the outstanding securities of BioFlex and NTM (collectively, the "NTM Acquisition"). The NTM acquisition closed on December 16, 2021.

NTM, which is headquartered in Newton, New Jersey, is the parent company of BioFlex and focuses on manufacturing of products, while BioFlex, also headquartered in Newton, New Jersey, commercializes branded products to biotechnology companies. The NTM Acquisition is a strong fit with the Company's fluid management portfolio of products as the industry migrates to single-use flow paths solutions for mAb, vaccine and C&GT applications, with a focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. The NTM Acquisition streamlines and increases our control over many components in our single-use supply chain which ultimately should drive reduced lead-times for Repligen customers in the coming years.

Avitide, Inc.

On September 16, 2021, the Company entered into an Agreement and Plan of Merger and Reorganization ("Avitide Merger Agreement") with Avalon Merger Sub, Inc., a Delaware corporation and a wholly owned direct subsidiary of the Company, Avalon Merger Sub LLC, a Delaware limited liability company and a wholly owned direct subsidiary of the Company, Avitide, and Shareholder Representative Services LLC, a Colorado limited liability company, solely in its capacity as the representative, agent and attorney-in-fact of Avitide's securityholders to purchase Avitide for $150.0 million in upfront consideration, comprised of cash and our common stock, and up to an additional $125.0 million (undiscounted) in contingent consideration for performance-based earnout payments over the next three years. The transaction closed on September 20, 2021.

Avitide, which is headquartered in Lebanon, New Hampshire, offers diverse libraries and leading technology in affinity ligand discovery and development resulting in best-in-class ligand discovery and development lead-times. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company's proteins and chromatography franchise to address the unique purification needs of gene therapies and other emerging modalities.

Polymem S.A.

On June 22, 2021, the Company entered into a Stock Purchase Agreement with Polymem, a company organized under the laws of France, and Jean-Michel Espenan and Franc Saux, acting together jointly and severally as the representatives of the sellers pursuant to which we acquired all of the outstanding common stock of Polymem for approximately $47 million in cash. The transaction closed on July 1, 2021.

Polymem, which is headquartered outside of Toulouse, France, is a manufacturer of HF membranes, membrane modules and systems for industrial and bioprocessing applications. Polymem products will complement and expand the Company's portfolio of HF systems and consumables. This acquisition substantially also increases the Company's membrane and module manufacturing capacity and establishes a world-class center of excellence in Europe to address the accelerating global demand for these innovative products.

2020 Acquisitions

ARTeSYN Biosolutions Holdings Ireland Limited

On October 27, 2020, we entered into an Equity and Asset Purchase Agreement with ARTeSYN, a company organized under the laws of Ireland, Third Creek Holdings, LLC, a Nevada limited liability company, Alphinity, LLC, a Nevada limited liability company ("Alphinity", and together with Third Creek Holdings, LLC the "ARTeSYN Sellers"), and Michael Gagne, solely in his capacity as the representative of the ARTeSYN Sellers, pursuant to which we acquired (i) all of the outstanding equity securities of ARTeSYN and (ii) certain assets from Alphinity related to the business of ARTeSYN (collectively, the "ARTeSYN Acquisition") for approximately $200 million in cash and the Company's common stock. The transaction closed on December 3, 2020.

ARTeSYN, which is headquartered in Waterford, Ireland, conducts its operations in Ireland, the United States and Estonia. Its suite of single-use solutions has been developed with the goal of enabling "abundance in medicine" by allowing greater efficiency in biologics manufacturing. The ARTeSYN team has created a number of solutions targeting the single-use space from single-use valves with fully disposable valve liners, XO® skeletal supports, a hybrid small parts offering for de-bottlenecking traditional facilities, to fully automated SU process systems that have quickly become leading solutions in the bioprocessing industry. ARTeSYN has established downstream processing leadership with its portfolio of state of the art single-use systems for chromatography, filtration, continuous manufacturing and media/buffer prep workflows. In addition, the Company has integrated unique flow path assemblies utilizing the Company's silicone extrusion and molding technology, to deliver highly differentiated, low hold-up volume systems that minimize product loss during processing. The ARTeSYN portfolio expands on the market success of the Company's HF systems and complements its chromatography and TFF filtration product lines.

Non-Metallic Solutions, Inc.

On October 15, 2020, we entered into a Stock Purchase Agreement with NMS, and each of William Malloneé and Derek Masser, the legal and beneficial owners of NMS, to purchase NMS, which transaction subsequently closed on October 20, 2020.

NMS, which is headquartered in Auburn, Massachusetts, is a manufacturer of fabricated plastics, custom containers, and related assemblies and components used in the manufacturing of biologic drugs. NMS's fluid management products complement and expand Repligen's single-use product offerings. Effective December 31, 2021, NMS was absorbed into the Company by way of "short-form" merger pursuant to Massachusetts and Delaware law, which did not require a vote of the Company's shareholders.

Engineered Molding Technology LLC

On June 26, 2020, we entered into a Membership Interest Purchase Agreement with EMT and each of Michael Pandori and Todd Etesse, the legal and beneficial owners of EMT to purchase EMT, which transaction subsequently closed on July 13, 2020.

EMT, which is headquartered in Clifton Park, New York, is an innovator and manufacturer of single-use silicone assemblies and components used in the manufacturing of biologic drugs. EMT's standard and custom molded and over-molded connectors and silicone tubing products are key fluid management components in single-use filtration and chromatography systems. EMT's products complement and expand our single-use product offerings. Effective July 11, 2021, EMT was absorbed into the Company by way of "short-form" merger pursuant to New York and Delaware law, which did not require a vote of the Company's shareholders .

2019 Acquisition

C Technologies, Inc.

On May 31, 2019, we acquired C Technologies Inc. ("C Technologies"), pursuant to the terms of a Stock Purchase Agreement, by and among Repligen, C Technologies and Craig Harrison, an individual and sole stockholder of C Technologies (such acquisition, the "C Technologies Acquisition").

C Technologies sells instruments, consumables and accessories that are designed to allow bioprocessing technicians to measure the protein concentration of a liquid sample using C Technologies' slope spectroscopy method, which eliminates the need for manual sample dilution.

The previous C Technologies Acquisition, combined with the 2021 acquisitions of Polymem, Avitide, BioFlex and NTM and the 2020 acquisitions of ARTeSYN, NMS and EMT, further establishes us as a key player in bioprocessing systems and associated integrated single-use systems and associated integrated flow path assemblies. For more information on these acquisitions, see Note 4, *"Acquisitions,"* to our consolidated financial statements included in Part II, Item 8 of this report.

Our Market Opportunity

Bioprocessing Addressable Market

The global addressable market for bioprocessing products is estimated to be over $22 billion of which we estimate Repligen's addressable market to be approximately $8.1 billion at year end 2021. This market includes products used to manufacture therapeutic antibodies, recombinant proteins and vaccines, as well as C&GT.

Monoclonal Antibody Market

Antibody-based biologics alone accounted for over $130 billion of global biopharma revenue in 2020. Industry sources project the mAbs market to grow in the range of approximately 10% to 12% annually through 2025, driven by new approvals and expanded clinical uses for marketed antibodies, as well as the emergence of biosimilar versions of originator mAbs. As of December 31, 2021, over 120 mAbs were approved by the U.S. Food and Drug Administration ("FDA") to treat a diverse range of diseases. R&D remains robust, with more than 800 mAb clinical trials ongoing to address a wide range of medical conditions.

In addition to investments in the discovery and development of novel biologic drugs, there has been substantial investment in follow-on products (biosimilars) by generic and specialty pharmaceutical as well as large biopharmaceutical companies. Development of follow-on products accelerated as the first major mAbs came off patent in the European Union and United States. Due to the high cost of biologic drugs, many countries in developing and emerging markets have been aggressively investing in biomanufacturing capabilities to supply lower cost biosimilars for the local markets. For both originator and follow-on biologics manufacturing, Repligen products are well-positioned to enable greater manufacturing flexibility, production yields and lower costs through improved process efficiencies.

Cell and Gene Therapy Market

C&GT has emerged in the past few years to become a rapidly growing area of biological drug development, with over 1,200 clinical trials underway at year-end 2020 according to industry sources. Statements by the FDA are supported by industry reports that estimate annual revenue growth of over 25% for the C&GT market through 2025. This scientifically advanced therapeutic approach has unique manufacturing challenges that many of our products can help address. We believe we are well positioned to participate in C&GT production, particularly in the manufacture of plasmids and viral vectors.

Our Strategy

We are focused on the development, production and commercialization of highly differentiated, technology-leading systems and solutions that address specific pressure points in the biologics manufacturing process and deliver substantial value to our customers. Our products are designed to optimize our customers' workflow to maximize productivity and we are committed to supporting our customers with strong customer service and applications expertise.

We intend to build on our recent history of developing market-leading solutions and delivering strong financial performance through the following strategies:

- *Continued innovation*. We plan to capitalize on our internal technological expertise to develop products that address unmet needs in upstream and downstream bioprocessing. We intend to invest further in our proteins franchise while developing platform and derivative products to support our filtration, chromatography and process analytics franchises. We plan to strengthen our existing product lines with complementary products and technologies that are designed to allow us to provide customers with a more efficient manufacturing process on one or more measures including flexibility, convenience, time savings, cost reduction and product yield.
- *Platforming our products.* A key strategy for accelerating market adoption of our products is delivery of enabling technologies that become the standard, or "platform," technology in markets where we compete. We focus our efforts on winning early-stage technology evaluations through direct interaction with the key biomanufacturing decision makers in process development labs. This strategy is designed to establish early adoption of our enabling technologies at key accounts, with opportunity for customers to scale up as the molecule advances to later stages of development and potential commercialization. We believe this approach can accelerate the implementation of our products as platform products, thereby strengthening our competitive advantage and contributing to long-term growth.
- *Targeted acquisitions*. We intend to continue to selectively pursue acquisitions of innovative technologies and products. We intend to leverage our balance sheet to acquire technologies and products that improve our overall financial performance by improving our competitiveness in filtration, chromatography or process analytics or by moving us into adjacent markets with common commercial call points.
- *Geographical expansion*. We intend to expand our global commercial presence by continuing to selectively build out our global sales, marketing, field applications and services infrastructure.
- *Operational efficiency*. We seek to expand operating margins through capacity utilization and process optimization strategies designed to increase our manufacturing yields. We plan to invest in systems to support our global operations, optimizing resources across our global footprint to maximize productivity.
-

Research and Development

Our research activities are focused on developing new high-value bioprocessing products across all of our franchises. We strive to continue to introduce truly differentiated products that address specific pain points in the biologics manufacturing process. Our commitment to innovation is core to the Repligen culture and our success as a company.

Sales and Marketing

Our sales and marketing strategy supports our objective of strengthening our position as a leading provider of products and services, addressing upstream, downstream and quality control needs of bioprocessing customers in the biopharmaceutical industry.

Our Commercial Team

To support our sales goals for our direct-to-consumer products, we have invested in our commercial organization. Since 2014, we have significantly expanded our global commercial organization from less than 10, to a commercial team of 309 employees as of December 31, 2021. This includes 211 people in field positions (sales, field applications and field service), and 98 people in internal positions (marketing, customer service and product management). Geographically, 182 members of our commercial team are located in North America, 65 in Europe and 62 in Asia-Pacific ("APAC") regions.

Our bioprocess account managers are supported in each region by bioprocess sales specialists with expertise in filtration, chromatography or process analytics, and by technically trained field applications specialists and field service providers, who can work closely with customers on product demonstrations, implementation and support. We believe that this model helps drive further adoption at our key accounts and also open up new sales opportunities within each region.

Ligand Supply Agreements

For our proteins franchise, we are committed to be a partner of choice for our customers with distributor and supply agreements in place with large life sciences companies such as Cytiva, MilliporeSigma and Purolite. The Cytiva Protein A supply agreement relating to our Waltham, Massachusetts facility was amended in September 2021 and pursuant to its amended terms, runs through 2025.

Cytiva moved a portion of its ligand manufacturing in-house in 2020 and under the terms of our existing long-term supply agreements, Cytiva has the ability to move additional manufacturing in house in 2022. Our Protein A supply agreement with MilliporeSigma runs, pursuant to its terms, through 2023, and in 2018 we amended our Protein A supply agreement with Purolite that runs, pursuant to its amended terms, to August 2026 with an option for renewal through 2028. Our dual manufacturing capability provides strong business continuity and reduces overall supply risk for our ligand customers.

Significant Customers and Geographic Reporting

Customers for our bioprocessing products include major life sciences companies, contract manufacturing organizations, biopharmaceutical companies, diagnostics companies and laboratory researchers.

The following table represents the Company's total revenue by geographic area (based on the location of the customer):

	For the Years Ended December 31,		
	2021	2020	2019
Revenue by customers' geographic locations:			
North America	41%	48%	51%
Europe	40%	38%	37%
APAC/Other	19%	14%	12%
Total revenue	100%	100%	100%

Revenue from Pfizer Inc. accounted for 10% of total revenue for the year ended December 31, 2021 and they were the only customer accounting for 10% or more of our 2021 total revenue. MilliporeSigma accounted for 11% and 13% of total revenues in the years ended December 31, 2020 and 2019, respectively. Another customer, Cytiva, accounted for 12% of total revenues in the year ended December 31, 2019.

Human Capital

Employees

Repligen performs in a highly competitive industry and recognizes that our continued success hinges upon our ability to attract, develop and retain a diverse team of talented individuals. We place high value on the satisfaction and well-being of our employees, and operate with fair labor standards and industry-competitive compensation and benefits globally. As of December 31, 2021, we employed 1,852 full-time and part-time employees, an increase of 724 since December 31, 2020. This total includes 309 employees in our commercial organization (211 field and 98 internal), 169 in engineering and R&D, 874 in manufacturing, 179 in quality, 110 in supply chain roles and 211 in administrative functions. Each of our employees has signed a confidentiality agreement. None of our U.S. employees are covered by collective bargaining agreements. We have one collective bargaining agreement with two unions that covers our 102 employees in Sweden, comprising approximately 6% of our total workforce. We renewed this collective bargaining agreement in November 2020, and it expires at the end of March 2023. In France, 81 employees are under the relevant national and local collective bargaining agreements for metallurgy, comprising approximately 4% of our total workforce.

Code of Business Conduct and Ethics

Repligen is committed to conducting business in accordance with the highest ethical standards. This means how we conduct ourselves and our global work is more than just a matter of policy and law; it's a reflection of our core principles. Our Second Amended and Restated Code of Business Conduct and Ethics reflects Repligen's five core principles – (1) trustworthiness, (2) respectfulness, (3) responsibility, (4) fairness and (5) corporate citizenship. Our Second Amended and Restated Code of Business Conduct and Ethics applies to all Repligen employees, including those who are integrated into the Company through acquisitions.

Diversity, Equity and Inclusion

Repligen supports the values of diversity, equity and inclusion ("DE&I"), reflecting our resolute commitment to a diverse, equitable and inclusive workplace. We have established talent acquisition processes, as well as training and employee engagement resources, including the formation of a DE&I council, to drive the promotion of diversity and inclusion at all levels of our organization.

Employee Engagement

We regularly conduct engagement surveys to gain insight on employee perspectives. Additional channels for employee engagement include CEO-led town halls and Company-wide all-hands meetings.

Health, Safety and Well-Being

We actively promote the safety, health and well-being of our employees and end users of our products. Our environmental health and safety policy advances our vision of zero workplace incidents and our efforts to reduce our environmental impacts.

Repligen has continued to focus on employee safety throughout COVID-19 by implementing extensive safety measures, including without limitation on-site COVID-19 testing protocols, detailed contact-tracing if COVID-19 positive cases are detected and flexible remote working options for many of our employees. See the section entitled, *"COVID-19 Considerations and Responses"* above for more information on the Company's response to COVID-19.

Intellectual Property

We are committed to protecting our intellectual property through a combination of patents, trade secrets and trademarks, as well as confidentiality and material transfer agreements. As further described below, we own or have exclusive rights to 203 issued patents and 289 pending patent applications in the United States and other foreign jurisdictions including Australia, Canada, China, France, Germany, India, Japan, South Korea, Sweden and the United Kingdom.

Our policy is to require each of our employees, consultants, business partners, potential collaborators and major customers to execute confidentiality agreements upon the commencement of an employment, consulting, business relationship, or product related audit or research evaluation. These agreements provide that all confidential information developed or made known to the other party during the course of the relationship with us is to be kept confidential and not disclosed to third parties except in specific circumstances. In the case of employees and consultants, the agreements generally provide that all inventions conceived by the individual in the course of rendering services to Repligen shall be our exclusive property and must be assigned to Repligen.

Filtration

For our filtration franchise, we are focusing on ATF, TFDF and TFF HF and flat sheet systems, membranes, filters, flow paths and single-use technologies. We continually seek to improve upon these technologies and have multiple new patent filings including patents covering next generation TFDF filters and ATF technology.

Chromatography

Our issued patents cover certain unique methods and features of our OPUS PPC, including methods of manufacturing column components, as well as packing and testing chromatography columns. We strive to improve upon this technology, including developing potentially disruptive technology related to gamma irradiated columns, resin packing methods, and methods of removing air using specialized tubing and valve systems.

Through the ARTeSYN Acquisition, our patent portfolio includes Exo-Technology, valves, integrated sensors and integrated flow path systems. We also have protection on our single-use replacement valves and liners used in combination with our modular configurable encapsulated flow systems to provide sterilized flow paths for various bioprocessing applications.

Process Analytics

Through our 2019 acquisition of C Technologies, we hold issued patents to various slope spectroscopy instruments, including an interactive variable pathlength device and related methods of use. C Technologies' scientists are continually developing new analytical tools using its state of the art slope spectroscopy technology.

Proteins

We currently hold a patent for "Nucleic Acids Encoding Recombinant Protein A," which claims sequences that encode a truncated recombinant Protein A but are otherwise identical to the natural Protein A, which is used for bioprocessing applications.

Pursuant to our collaboration with Navigo, we also have multiple patents and multiple pending patent applications globally covering Protein A-based affinity ligands through our collaboration with Navigo. These include ligands for antibody purification, as well as ligands for purifying COVID-19 vaccines.

In addition, with the acquisition of Avitide in September 2021, we have added multiple pending patent applications globally covering affinity ligands to our portfolio.

Trademarks

We procure and maintain trademark registrations globally for the Repligen trademark and our various product brands. We prioritize our "housemarks", (e.g., Repligen, the stylized "R" logo, Spectrum, TangenX, C Technologies, ARTeSYN, Polymem, Avitide, etc), and ensure continued protection globally. We also have trademark registrations for various product lines, including OPUS, XCell ATF, TFDF, KrosFlo, SIUS, ProConnex, Spectra/Por, NGL-Impact, SoloVPE, FlowVPE, XO and AVIPure, that provide valuable company recognition and goodwill with our customers.

We have a comprehensive branding policy that includes trademark usage guidelines to ensure Repligen trademarks are used in accordance with our worldwide registrations and we actively police any unauthorized trademark usage as well as enforce the rights we have under our trademarks.

Licensing Agreements

We have entered into multiple licensing and collaboration relationships with third-party business partners in an effort to fully exploit our technology and advance our bioprocessing business strategy.

Competition

Our bioprocessing products compete on the basis of value proposition, performance, quality, cost effectiveness, and application suitability with numerous established technologies. Additional products using new technologies that may be competitive with our products may also be introduced. Many of the companies selling or developing competitive products, which in some cases include Cytiva and MilliporeSigma (the life sciences business of Merck KGaA), two of our largest customers, have greater financial and human resources, R&D, manufacturing and marketing experience than we do. They may undertake their own development of products that are substantially similar to or compete with our products and they may succeed in developing products that are more effective or less costly than any that we may develop. These competitors may also prove to be more successful in their production, marketing and commercialization activities. We cannot be certain that the research, development and commercialization efforts of our competitors will not render any of our existing or potential products obsolete.

Manufacturing

A majority of our 16 key manufacturing sites are located in the United States (California, Massachusetts, New Jersey and New York). Outside the United States, we have manufacturing sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden.

The proteins products we provide are manufactured at our sites in Waltham, Massachusetts and Lund, Sweden. Native Protein A ligands and our growth factor products are manufactured in Lund, while recombinant Protein A ligands are manufactured in both Waltham and Lund. Our primary chromatography assembly and manufacturing sites are located in Waltham and Ravensburg, Germany, with additional chromatography manufacturing suites being added in Breda, the Netherlands in 2021. Our primary filtration manufacturing sites are located in Marlborough, Massachusetts and Rancho Dominguez, California. In Marlborough, the focus is on XCell ATF and flat sheet TFF products, while in Rancho Dominguez the focus is on Spectrum HF, TFDF and ProConnex products. Our process analytics products are manufactured in Bridgewater, New Jersey. Our operating room products are manufactured in Irving, Texas. With our three acquisitions in 2021, we gained manufacturing sites in Toulouse, France (Polymem), Newton, New Jersey (NTM) and with our three acquisitions in 2020, we gained manufacturing sites in Clifton Park, New York (EMT) and Auburn, Massachusetts (NMS) for fluid management consumables. ARTeSYN's primary manufacturing sites for fluid management products and systems are located in Waterford, Ireland and Tallinn, Estonia, with additional sites in California.

We utilize our own facilities in Waltham, Massachusetts and Lund, Sweden as well as third-party contract manufacturing organizations to carry out certain fermentation and recovery operations, while the purification, immobilization, packaging and quality control testing of our bioprocessing products are conducted at our facilities. Our facilities located in Waltham, Massachusetts; Lund, Sweden; Ravensburg, Germany; Bridgewater, New Jersey; Clifton Park, New York; and Rancho Dominguez, California are ISO 9001:2015 certified and maintain formal quality systems to maintain process control, traceability, and product conformance. Additionally, our facility in Irving, Texas is ISO 13485:2012 certified. We practice continuous improvement initiatives based on routine internal audits as well as external feedback and audits performed by our partners and customers. In addition, we maintain a business continuity management system that focuses on key areas such as contingency planning, security stocks and off-site storage of raw materials and finished goods to ensure continuous supply of our products.

Available Information

We maintain a website with the address www.repligen.com. We are not including the information contained on our website as a part of, or incorporating it by reference into, this Form 10-K. We make available free of charge through our website our Form 10-Ks, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K, and amendments to these reports, as soon as reasonably practicable after we electronically file such materials with, or furnish such materials to, the Securities and Exchange Commission ("SEC"). Our Second Amended and Restated Code of Business Conduct and Ethics is also available free of charge through our website.

Our filings with the SEC may be accessed through the SEC's Electronic Data Gathering, Analysis and Retrieval ("EDGAR") system at www.sec.gov.

ITEM 1A. RISK FACTORS

Investors should carefully consider the risk factors described below before making an investment decision.

If any of the events described in the following risk factors occur, our business, financial condition or results of operations could be materially harmed. In that case, the trading price of our common stock could decline and investors may lose all or part of their investment. Additional risks and uncertainties that we are unaware of or that we currently deem immaterial may also become important factors that affect Repligen.

This Annual Report on Form 10-K ("Form 10-K") contains forward looking statements that involve risks and uncertainties. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including the risks faced by us described below and elsewhere in this Form 10-K.

Risks Related to Our Business

Risks Related to Competition, Sales and Marketing

We compete with life sciences, pharmaceutical and biotechnology companies who are capable of developing new approaches that could make our products and technology obsolete.

The bioprocessing market is intensely competitive, subject to rapid change and significantly affected by new product introductions and other market activities of industry participants.

We compete with several medium and small companies in each of our product categories as well as several large companies, including Danaher Corporation (Pall Corporation and Cytiva), Thermo Fisher Scientific Inc., MilliporeSigma and Sartorius. Many of our competitors are large, well-capitalized companies that may have greater financial, manufacturing, marketing, research and development resources than we have, as well as stronger name recognition, longer operating histories and benefits derived from greater economies of scale. As a consequence, they are able to spend more aggressively on product development, marketing, sales and other product initiatives than we can. Many of these competitors have:

- significantly greater name recognition;
- larger and more established distribution networks;
- additional lines of products and the ability to bundle products to offer higher discounts or other incentives to gain a competitive advantage;
- greater experience in conducting research and development, manufacturing, clinical trials, marketing, obtaining regulatory approval and entering into collaborations or other strategic partnership arrangements; and
- greater financial and human resources for product development, sales and marketing and patent litigation.

These factors, among others, may enable our competitors to market their products at lower prices or on terms more advantageous to customers than what we can offer. Competition may result in price reduction, reduced gross margins and loss of market share, any of which could have a material adverse effect on our business, financial condition and results of operations.

Our current and future competitors, including certain of our customers, may at any time develop additional products that compete with our products. If any company develops products that compete with or are superior to our products, our revenue may decline. Additionally, new approaches by these competitors may make our products and technologies obsolete or noncompetitive.

As we evolve from a company dependent on others to commercialize our products to a company selling directly to end users, we may encounter difficulties in expanding our product portfolio and our commercial marketing capabilities.

Prior to 2016, we generated most of our revenues through sales of bioprocessing products to a limited number of life sciences companies, such as Cytiva, MilliporeSigma and other individual distributors. However, due in part to our recent strategic acquisitions, an increasing amount of our revenue is attributable to our commercialization of bioprocessing products that we sell directly to end-users, including biopharmaceutical companies and contract manufacturing organizations. This has required and will continue to require us to invest additional resources in our sales and marketing capabilities. We may not be able to attract and retain additional sales and marketing professionals, and the cost of building the sales and marketing function may not generate our anticipated revenue growth. In addition, our sales and marketing efforts may be unsuccessful. Our failure to manage these risks may have a negative impact on our financial condition, or results of operations and may cause our stock price to decline.

If we are unable to continue to hire and retain skilled personnel, then we will have trouble developing and marketing our products.

Our success depends largely upon the continued service of our management and scientific staff and our ability to attract, retain and motivate highly skilled technical, scientific, management and marketing personnel. We also face significant competition in the hiring and retention of such personnel from other companies, research and academic institutions, government and other organizations who have superior funding and resources. The loss of key personnel or our inability to hire and retain skilled personnel could materially adversely affect our product development efforts and our business.

Despite our increasingly diversified client base, we have historically depended on a limited number of customers for a high percentage of our revenues.

The loss of, or a significant reduction in orders from, any of our large customers, including following any termination or failure to renew a long-term supply contract, would significantly reduce our revenues and harm our results of operations. If a large customer purchases fewer of our products, defers orders or fails to place additional orders with us for any reason, including for business continuity purposes, our revenue could decline, and our operating results may not meet market expectations.

In addition, if our customers order our products, but fail to pay on time or at all, our liquidity and operating results could be materially and adversely affected. Furthermore, if any of our current or future products compete with those of any of our largest customers, these customers may place fewer orders with us or cease placing orders with us, which would negatively affect our revenues and operating results.

Certain of our products are used by customers in the production of gene therapies, which represent a relatively new and still-developing mode of treatment. Unforeseen adverse events, negative clinical outcomes, or increased regulatory scrutiny of cell and gene therapy ("C&GT") and its financial cost may damage public perception of the safety, utility, or efficacy of gene therapies and may harm our customers' ability to conduct their business. Such events may negatively impact our revenues and have an adverse effect on our performance.

C&GT remains a relatively new and developing treatment method, with only a few gene therapies approved to date by regulatory authorities. Public perception may be influenced by claims that C&GT is unsafe or ineffective, and C&GT may not gain the acceptance of the public or the medical community. In addition, ethical, social, legal, and financial concerns about C&GT and genetic testing could result in additional regulations, limitations or even prohibitions on certain cell and gene therapies or cell and gene-therapy-related products. More restrictive regulations or negative public perception could reduce certain of our customers' use of our products, which could negatively affect our revenue and performance.

In response to the ongoing COVID-19 pandemic, certain of our products are used by customers in the development or manufacture of COVID-19 vaccines and therapeutics, some of which have not yet received regulatory approval or authorization. Unforeseen adverse events, regulatory interventions, the emergence of new variants of the virus rendering current vaccines and therapeutics ineffective and the development of next generation vaccines and therapeutics that do not incorporate our products may negatively impact our revenues and have an adverse effect on our performance.

Certain of our products are being used by our customers in the development or manufacture of COVID-19 vaccines and therapies. Certain of these therapies continue to be under development, while others have received approval or authorization in the applicable jurisdictions for sale and distribution. Negative outcomes in clinical trials, unforeseen adverse events in patients and decreased effectiveness in new and emerging COVID-19 variants may result in increased regulatory scrutiny, reduced public trust or withdrawals, pauses or restrictions on approvals or authorizations of vaccines and therapies that use our products and could reduce certain of our customers' use of such products. Such events would have a negative impact on our revenues. In addition, if failure to obtain certain regulatory approvals or authorization or increased competition in the production of COVID-19 vaccines and therapies causes our customers to discontinue the use of our products in the development or manufacture of such therapies, our product revenues may decline, which would negatively impact our financial performance.

Risks Related to the COVID-19 Pandemic

The COVID-19 pandemic, or similar public health crises, could have a material adverse impact on our business, financial condition and results of operations, including our product sales and our stock price.

Since December 2019, an outbreak of a novel strain of a virus named SARS-CoV-2, or coronavirus, which causes COVID-19, has since spread to countries in which we or our customers and suppliers operate, including the United States. COVID-19 is evolving, and to date, has led to the implementation of various responses, including government-imposed quarantines, extended business closures,

travel restrictions and other public health safety measures, as well as reported adverse impacts on healthcare resources, facilities and providers, in Massachusetts, across the United States and in other countries. The COVID-19 outbreak continues to rapidly evolve, including the spread of the Delta and Omicron variants.

In response to COVID-19, and in accordance with direction from state and local government authorities, we have restricted and may continue to restrict access to our facilities mostly to personnel and third parties who must perform critical activities that must be completed on-site, limited the number of such personnel that can be present at our facilities at any one time, and requested that most of our personnel work remotely. In the event that governmental authorities were to further modify current restrictions, our employees conducting research and development or manufacturing activities may not be able to access our manufacturing space. Certain of our third-party suppliers have experienced labor shortage due to the spread of COVID-19. Such shortages may lead to interruptions in our manufacturing activities and our product supply and could have a material adverse effect on our business and our results of operation and financial condition. Our revenues and other operating results depend in large part on our ability to manufacture and assemble our products in sufficient quantities and in a timely manner.

In addition, the trading prices for our common stock and other biopharmaceutical companies have been highly volatile as a result of COVID-19. As a result, we may face difficulties raising capital through sales of our common stock or such sales may be on unfavorable terms.

We operate on a global basis with offices or activities in Japan, South Korea, China, India, Europe and North America, and global health crises, such as COVID-19, could result in a widespread economic downturn in the industries in which we and our customers operate. The extent to which the outbreak impacts our business and the businesses of our customers will depend on future developments, which remain highly uncertain and cannot be predicted with confidence, such as the continued geographic spread of the disease, the duration of the outbreak, and actions taken in the United States and elsewhere to contain the outbreak and treat the disease, such as social distancing and quarantines, business closures or business disruptions. Some factors from COVID-19 that could delay or otherwise adversely affect the completion of our customers' preclinical activities and clinical trials, as well as the healthcare industry generally, include:

- the potential diversion of resources in the healthcare system away from routine patient treatment, drug development and clinical trials to focus on pandemic concerns, which could result in reduced demand for our products or our customer's products and could significantly impact our operating results;
- limitations on travel that could interrupt our customers' key preclinical activities and trial activities, such as clinical trial site initiations and monitoring, domestic and international travel by customer employees, contractors or patients to clinical trial sites, including any government-imposed travel restrictions or quarantines that will impact the ability or willingness of patients, employees or contractors to travel to a customer's research, manufacturing and clinical trial sites or secure visas or entry permissions, any of which could delay or adversely impact the conduct or progress of such customer's prospective clinical trials;
- interruption or delays in the operations of the FDA and comparable foreign regulatory agencies, which may impact review, inspection, clearance and approval timelines;
- interruption in global shipping affecting the transport of our products and other supplies used in our customers' prospective clinical trials due to staffing shortages, production slowdowns or stoppages and disruptions in delivery systems;
- limitations on business operations by local, state, or the federal government that could impact our customers' ability to conduct preclinical or clinical activities;
- business disruptions caused by potential workplace, laboratory and office closures and an increased reliance on employees working from home, disruptions to or delays in ongoing laboratory experiments and operations, staffing shortages, travel limitations, or communication or mass transit disruptions, any of which could adversely impact our business operations or delay necessary interactions with local regulators, ethics committees, manufacturing sites and other important agencies and contractors;
- business disruptions or cybersecurity risks associated with a substantial portion of our workforce working from home for extended periods of time; and
- the impact on the valuation of our marketable securities and other financial assets due to market volatility.

Risks Related to Product Development and Acquisitions

If we are unable to expand our product portfolio, our ability to generate revenue could be adversely affected.

We are increasingly seeking to develop and commercialize our portfolio of products. Our future financial performance will depend, in part, on our ability to successfully develop and acquire additional bioprocessing products. There is no guarantee that we will be able to successfully acquire or develop additional bioprocessing products, and the Company's financial performance will likely suffer if we are unable to do so.

Our acquisitions expose us to risks that could adversely affect our business, and we may not achieve the anticipated benefits of acquisitions of businesses or technologies.

As a part of our growth strategy, we may make selected acquisitions of complementary products and/or businesses, such as our recent acquisitions of Polymem, Avitide, BioFlex and NTM. Any acquisition involves numerous risks and operational, financial, and managerial challenges, including the following, any of which could adversely affect our business, financial condition, or results of operations:

- difficulties in integrating new operations, technologies, products, and personnel;
- problems maintaining uniform procedures, controls and policies with respect to our financial accounting systems;
- lack of synergies or the inability to realize expected synergies and cost-savings;
- difficulties in managing geographically dispersed operations, including risks associated with entering foreign markets in which we have no or limited prior experience;
- underperformance of any acquired technology, product, or business relative to our expectations and the price we paid;
- negative near-term impacts on financial results after an acquisition, including acquisition-related earnings charges;
- the potential loss of key employees, customers, and strategic partners of acquired companies;
- claims by terminated employees and shareholders of acquired companies or other third parties related to the transaction;
- the assumption or incurrence of additional debt obligations or expenses, or use of substantial portions of our cash;
- the issuance of equity securities to finance or as consideration for any acquisitions that dilute the ownership of our stockholders;
- the issuance of equity securities to finance or as consideration for any acquisitions may not be an option if the price of our common stock is low or volatile which could preclude us from completing any such acquisitions;
- any collaboration, strategic alliance and licensing arrangement may require us to relinquish valuable rights to our technologies or product candidates, or grant licenses on terms that are not favorable to us;
- diversion of management's attention and company resources from existing operations of the business;
- inconsistencies in standards, controls, procedures, and policies;
- the impairment of intangible assets as a result of technological advancements, or worse-than-expected performance of acquired companies;
- assumption of, or exposure to, historical liabilities of the acquired business, including unknown contingent or similar liabilities that are difficult to identify or accurately quantify; and
- risks associated with acquiring intellectual property, including potential disputes regarding acquired companies' intellectual property.

In addition, the successful integration of acquired businesses requires significant efforts and expense across all operational areas, including sales and marketing, research and development, manufacturing, finance, legal, and information technologies. There can be no assurance that any of the acquisitions we may make will be successful or will be, or will remain, profitable. Our failure to successfully address the foregoing risks may prevent us from achieving the anticipated benefits from any acquisition in a reasonable time frame, or at all.

If intangible assets and goodwill that we recorded in connection with our acquisitions become impaired, we may have to take significant charges against earnings.

In connection with the accounting for our completed acquisitions, we recorded a significant amount of intangible assets, including developed technology and customer relationships relating to the acquired product lines, and goodwill. Under accounting principles generally accepted in the United States ("GAAP"), we must assess, at least annually and potentially more frequently, whether the value of intangible assets and goodwill has been impaired. Intangible assets and goodwill will be assessed for impairment in the event of an impairment indicator. Any reduction or impairment of the value of intangible assets and goodwill will result in a charge against earnings, which could materially adversely affect our results of operations and shareholders' equity in future periods.

Risks Related to Manufacturing and Supply

If we are unable to manufacture our products in sufficient quantities and in a timely manner, our operating results will be harmed, our ability to generate revenue could be diminished and our gross margin may be negatively impacted.

Our revenues and other operating results will depend in large part on our ability to manufacture and assemble our products in sufficient quantities and in a timely manner. Any interruptions we experience in the manufacturing or shipping of our products could delay our ability to recognize revenues in a particular quarter. Manufacturing problems can and do arise, and as demand for our products increases, any such problems could have an increasingly significant impact on our operating results. While we have not generally experienced problems with, or delays in, our production capabilities that resulted in delays in our ability to ship finished products, there can be no assurance that we will not encounter such problems in the future. We may not be able to quickly ship products and recognize anticipated revenues for a given period if we experience significant delays in the manufacturing process. In addition, we must maintain sufficient production capacity in order to meet anticipated customer demand, which carries fixed costs that we may not be able to offset if orders slow, which would adversely affect our operating margins. If we are unable to manufacture our products consistently, in sufficient quantities, and on a timely basis, our bioprocessing revenue, gross margins and our other operating results will be materially and adversely affected.

We rely on a limited number of suppliers or, for certain of our products, one supplier, and we may not be able to find replacements or immediately transition to alternative suppliers, which could have a material adverse effect on our financial condition, results of operations and reputation.

There are only a limited number of suppliers of materials for certain of our products. An interruption in operations of the business related to these products could occur if we encounter delays or difficulties in securing the required materials, or if we cannot then obtain an acceptable substitute. Any such interruption could significantly affect the business related to these products and our financial condition, results of operations and reputation. For example, we believe that only a small number of suppliers are currently qualified to supply materials for the XCell ATF® systems. The use of materials furnished by these replacement suppliers would require us to alter our operations related to the XCell ATF systems. Transitioning to a new supplier for our products would be time-consuming and expensive, may result in interruptions in our operations, could affect the performance specifications of our product lines or could require that we revalidate the materials.

There can be no assurance that we will be able to secure alternative materials and bring such materials online and revalidate them without experiencing interruptions in our workflow. If we should encounter delays or difficulties in securing, reconfiguring or revalidating the materials required for our products, our business related to these products and our financial condition, results of operations and reputation could be adversely affected.

Risks Related to Our Financial Position and Need for Additional Capital

Servicing our debt will require a significant amount of cash, and we may not have sufficient cash flow from our business to make payments on our debt.

In 2019, we incurred significant indebtedness in the amount of $287.5 million in aggregate principal with additional accrued interest under our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"). Our ability to make scheduled payments of the principal of, to pay interest on, or to refinance our indebtedness, including the 2019 Notes, depends on our future performance, which is subject to economic, financial, competitive and other factors that may be beyond our control. Our business may not generate cash flow from operations in the future sufficient to service our debt and make necessary capital expenditures. If we are unable to generate such cash flow, we may be required to adopt one or more alternatives, such as selling assets, restructuring debt or obtaining additional equity capital on terms that may be onerous or highly dilutive. Our ability to refinance our indebtedness will depend on the capital markets and our financial condition at such time. In addition, in the event of a fundamental change or a default under the 2019 Notes, the holders and/or the trustee under the indentures governing the 2019 Notes may accelerate the

payment obligations or trigger the holders' repurchase rights under the 2019 Notes. We may not be able to engage in any of these activities or engage in these activities on desirable terms, which could result in a default on our debt obligations, including the 2019 Notes.

If a make-whole fundamental change, such as an acquisition of our company, occurs prior to the maturity of the 2019 Notes, under certain circumstances, the conversion rate for the 2019 Notes will increase such that additional shares of our common stock will be issued upon conversion of the 2019 Notes in connection with such make-whole fundamental change. The increase in the conversion rate will be determined based on the date on which the make-whole fundamental change occurs or becomes effective and the price paid (or deemed paid) per share of our common stock in such transaction. Upon conversion of the 2019 Notes, unless we elect to deliver solely shares of our common stock to settle such conversion (other than paying cash in lieu of delivering any fractional share), we will be required to make cash payments in respect of the 2019 Notes being converted. We may not have enough available cash or be able to obtain financing at the time we are required to make repurchases of 2019 Notes surrendered therefor or notes being converted. Our failure to repurchase 2019 Notes at a time when the repurchase is required by the indenture or to pay any cash payable on future conversions of the 2019 Notes as required by the indenture would constitute a default under the indenture. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay the indebtedness and repurchase the 2019 Notes or make cash payments upon conversions thereof.

In addition, our significant indebtedness, combined with our other financial obligations and contractual commitments, could have other important consequences. For example, it could:

- make us more vulnerable to adverse changes in general U.S. and worldwide economic, industry and competitive conditions and adverse changes in government regulation;
- limit our flexibility in planning for, or reacting to, changes in our business and our industry;
- place us at a disadvantage compared to our competitors who have less debt; and
- limit our ability to borrow additional amounts for working capital and other general corporate purposes, including to fund possible acquisitions of, or investments in, complementary businesses, products, services and technologies.

Any of these factors could materially and adversely affect our business, financial condition and results of operations. In addition, if we incur additional indebtedness, the risks related to our business and our ability to service or repay our indebtedness would increase.

Future strategic transactions or acquisitions may require us to seek additional financing, which we may not be able to secure on favorable terms, if at all.

We plan to continue a strategy of growth and development for our bioprocessing business, and we actively evaluate various strategic transactions on an ongoing basis, including licensing or acquiring complementary products, technologies or businesses that would complement our existing portfolio of development programs. In order to complete such strategic transactions, we may need to seek additional financing to fund these investments and acquisitions. Should we need to do so, we may not be able to secure such financing, or obtain such financing on favorable terms because of the volatile nature of the biotechnology marketplace. In addition, future acquisitions may require the issuance or sale of additional equity or debt securities, which may result in additional dilution to our stockholders.

Our exposure to political, economic and other risks that arise from operating a multinational business has and may continue to increase.

We operate on a global basis with offices or activities in Japan, South Korea, China, India, Europe and North America. Our operations and sales outside of the United States have increased as a result of our strategic acquisitions and the continued expansion of our commercial organization. Risks related to these increased foreign operations include:

- fluctuations in foreign currency exchange rates, which may affect the costs incurred in international operations and could harm our results of operations and financial condition;
- changes in general economic and political conditions in countries where we operate, particularly as a result of ongoing economic instability within foreign jurisdictions;
- the occurrence of a trade war, or other governmental action related to tariffs or trade agreements;

- being subject to complex and restrictive employment and labor laws and regulations, as well as union and works council restrictions;
- changes in tax laws or rulings in the United States or other foreign jurisdictions that may have an adverse impact on our effective tax rate;
- being subject to burdensome foreign laws and regulations, including regulations that may place an increased tax burden on our operations;
- being subject to longer payment cycles from customers and experiencing greater difficulties in timely accounts receivable collections; and
- required compliance with a variety of foreign laws and regulations, such as data privacy requirements, real estate and property laws, anti-competition regulations, import and trade restrictions, export requirements, U.S. laws such as the Foreign Corrupt Practices Act of 1977 and the U.S. Department of Commerce's Export Administration Regulations, and other U.S. federal laws and regulations established by the Office of Foreign Assets Control, local laws such as the U.K. Bribery Act of 2010 or other local laws that prohibit corrupt payments to governmental officials or certain payments or remunerations to customers.

Our business success depends in part on our ability to anticipate and effectively manage these and other related factors. We cannot assure you that these and other related factors will not materially adversely affect our international operations or business as a whole.

In addition, a deterioration in diplomatic relations between the United States and any country where we conduct business could adversely affect our future operations and lead to a decline in profitability. In 2018 and 2019, the United States imposed tariffs on goods imported from China and certain other countries, which has resulted in retaliatory tariffs by China and other countries. Additional tariffs or further retaliatory trade measures taken by China or other countries in response, could affect the demand for our products and services, impact the competitive position of our products, prevent us from being able to sell products in certain countries or otherwise adversely impact our results of operations.

We may be unable to efficiently manage our growth as a larger and more geographically diverse organization.

Our strategic acquisitions, the continued expansion of our commercial sales operations, and our organic growth have increased the scope and complexity of our business. As a result, we will face challenges inherent in efficiently managing a more complex business with an increased number of employees over large geographic distances, including the need to implement appropriate systems, policies, benefits and compliance programs. Our inability to manage successfully the geographically and culturally diverse, and substantially larger combined organization could materially adversely affect our operating results and, as a result, the market price of our common stock.

Our results of operations could be negatively affected by potential fluctuations in foreign currency exchange rates.

We conduct a large portion of our business in international markets. For the fiscal year ended December 31, 2021, 37.5% of our revenues and 27.1% of our costs and expenses were denominated in foreign currencies, primarily the Swedish krona, the British pound sterling, and the Euro. We are exposed to the risk of an increase or decrease in the value of the foreign currencies relative to the U.S. Dollar, which could increase the value of our expenses and decrease the value of our revenue when measured in U.S. Dollars. As a result, our results of operation may be influenced by the effects of future exchange rate fluctuations and such effects may have an adverse impact on our common stock price.

Natural disasters, geopolitical unrest, war, terrorism, public health issues or other catastrophic events could disrupt the supply, delivery or demand of products, which could negatively affect our operations and performance.

We are subject to the risk of disruption by earthquakes, floods and other natural disasters, fire, power shortages, geopolitical unrest, war, terrorist attacks and other hostile acts, public health issues, epidemics or pandemics and other events beyond our control and the control of the third parties on which we depend. Any of these catastrophic events, whether in the United States or abroad, may have a strong negative impact on the global economy, our employees, facilities, partners, suppliers, distributors or customers, and could decrease demand for our products, create delays and inefficiencies in our supply chain and make it difficult or impossible for us to deliver products to our customers.

For example, COVID-19 has affected countries in which we or our suppliers operate, including the United States. This outbreak has resulted in the extended shutdown of certain businesses, which may in turn result in disruptions to our and our customer's supply chain and business operations. These could include disruptions from the temporary closure of third-party supplier and manufacturer facilities, interruptions in product supply, or restrictions on the export or shipment of our products. Global health concerns, such as COVID-19, could also continue to result in social, economic, and labor instability in the countries in which we or our customers and suppliers operate. These uncertainties could have a material adverse effect on our business and our results of operation and financial condition.

In addition, a catastrophic event that results in the destruction or disruption of our data centers or our critical business or information technology systems would severely affect our ability to conduct normal business operations and, as a result, our operating results would be adversely affected.

Legal, political and economic uncertainty surrounding the withdrawal of the United Kingdom from the European Union is a source of instability and uncertainty.

On June 23, 2016, the United Kingdom ("U.K.") held a referendum in which a majority of voters approved an exit from the European Union ("EU"). The U.K. formally left the EU on January 31, 2020, in a process commonly referred to as "Brexit". Under a withdrawal agreement (the "Withdrawal Agreement") between the EU and the U.K., the United Kingdom was subject to a transition period until December 31, 2020, during which EU rules continued to apply.

The U.K. and EU have signed an EU-UK Trade and Cooperation Agreement, which became provisionally applicable on January 1, 2021, and has been formally applicable since May 1, 2021. Under the terms of the deal, the EU and U.K. have separate regulatory regimes for medicinal products, although there are some provisions for mutual recognition of standards, for example with regards to good manufacturing practices. Many of the regulations that now apply in the U.K. following the transition period (including financial laws and regulations, tax, intellectual property rights, data protection laws, supply chain logistics, environmental, health and safety laws and regulations, medicine approval and regulations, immigration laws and employment laws), could be amended in future as the U.K. determines its new approach, which may result in significant divergence from EU regulations. This lack of clarity on future U.K. laws and regulations and their interaction with the EU laws and regulations increases our regulatory burden of operating in and doing business with both the U.K. and the EU.

In addition, as a result of Brexit, EU countries may seek to conduct referenda with respect to their continuing membership with the EU. If other EU Member States pursue withdrawal, barrier-free access between the U.K. and other EU Member States or among the European Economic Area ("E.E.A.") overall could be diminished or eliminated. The long-term effects of Brexit will also depend on any further agreements (or lack thereof) between the U.K. and the EU. Such a withdrawal from the EU is unprecedented, and it is unclear how the restrictions on the U.K.'s access to the European single market for goods, capital, services and labor within the EU, or single market, and the wider commercial, legal and regulatory environment, could impact our U.K. operations.

We may also face new regulatory costs and challenges that could have an adverse effect on our operations and development programs. For example, the U.K. will lose the benefits of global trade agreements negotiated by the EU on behalf of its members, which may result in increased trade barriers that could make our doing business in the EU and the E.E.A. more difficult. There may continue to be economic uncertainty surrounding the consequences of Brexit, which could adversely affect our financial condition, results of operations, cash flows and market price of our common stock.

Risks Related to Ownership of Our Common Stock

Risks Related to Investment in Our Securities

Our operating results may fluctuate significantly, our customers' future purchases are difficult to predict and any failure to meet financial expectations may result in a decline in our stock price.

Our quarterly operating results may fluctuate in the future as a result of many factors such as the impact of seasonal spending patterns, changes in overall spending levels in the life sciences industry, the inability of some of our customers to consummate anticipated purchases of our products due to changes in end-user demand, and other unpredictable factors that may affect ordering patterns. Because our revenue and operating results are difficult to predict, we believe that our past results of operations are not necessarily a good indicator of our future performance. Additionally, if revenue declines in a quarter, whether due to a delay in recognizing expected revenue, adverse economic conditions or otherwise, our results of operations will be harmed because many of our expenses are relatively fixed. In particular, a large portion of our manufacturing costs, our research and development, sales and marketing and general and administrative expenses are not significantly affected by variations in revenue. Further, our gross

margins are dependent on product mix. A shift in sales mix away from our higher-margin products to lower margin products will adversely affect our gross margins. If our quarterly operating results fail to meet investor expectations, the price of our common stock may decline.

Securities or industry analysts may not publish favorable research or reports about our business or may publish no information, which could cause our stock price or trading volume to decline.

The trading market for our common stock is influenced by the research and reports that industry or securities analysts publish about us and our business. We do not have any control over these analysts and we cannot provide any assurance that analysts will cover us or provide favorable coverage. If any of the analysts who cover us issue an adverse opinion regarding our stock price, our business or stock price would likely decline. If one or more of these analysts cease coverage of our company or fail to regularly publish reports covering us, we could lose visibility in the market, which in turn could cause our stock price or trading volume to decline.

Our stock price could be volatile, which could cause shareholders to lose part or all of their investment.

The market price of our common stock, like that of the common stock of many other companies with similar market capitalizations, is highly volatile. In addition, the stock market has experienced extreme price and volume fluctuations. This volatility has significantly affected the market prices of securities of many life sciences, biotechnology and pharmaceutical companies for reasons frequently unrelated to or disproportionate to the operating performance of the specific companies. These broad market fluctuations may adversely affect the market price of our common stock.

If we fail to maintain an effective system of internal controls, we may not be able to accurately report financial results or prevent fraud. If we identify a material weakness in our internal control over financial reporting, our ability to meet our reporting obligations and the trading price of our stock could be negatively affected.

Effective internal controls are necessary to provide reliable financial reports and to assist in the effective prevention of fraud. Any inability to provide reliable financial reports or prevent fraud could harm our business. We regularly review and update our internal controls, disclosure controls and procedures, and corporate governance policies. In addition, we are required under the Sarbanes-Oxley Act of 2002 to report annually on our internal control over financial reporting. Any system of internal controls, however well designed and operated, is based in part on certain assumptions and can provide only reasonable, not absolute, assurances that the objectives of the system are met. If we, or our independent registered public accounting firm, determine that our internal controls over financial reporting are not effective, discover areas that need improvement in the future or discover a material weakness, these shortcomings could have an adverse effect on our business and financial results, and the price of our common stock could be negatively affected. A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis. Accordingly, a material weakness increases the risk that the financial information we report contains material errors.

If we cannot conclude that we have effective internal control over our financial reporting, or if our independent registered public accounting firm is unable to provide an unqualified opinion regarding the effectiveness of our internal control over financial reporting, investors could lose confidence in the reliability of our financial statements, which could lead to a decline in our stock price. Failure to comply with reporting requirements could also subject us to sanctions and/or investigations by the SEC, the Nasdaq Global Select Market or other regulatory authorities. We have previously implemented several significant ERP modules and expect to implement additional ERP modules in the future. The implementation of the ERP system represents a change in our internal control over financial reporting. Although we continue to monitor and assess our internal controls in the new ERP system environment as changes are made and new modules are implemented, and we have taken additional steps to modify and enhance the design and effectiveness of our internal control over financial reporting, there is a risk that deficiencies may occur that could aggregate to a material weakness.

If we fail to remedy any deficiencies or maintain the adequacy of our internal controls, we could be subject to regulatory scrutiny, civil or criminal penalties or shareholder litigation. In addition, failure to maintain adequate internal controls could result in financial statements that do not accurately reflect our operating results or financial condition.

Risks Related to Our Charter and Bylaws

Anti-takeover provisions in our charter documents, certain of our contracts with third parties, and under Delaware law could make an acquisition of us, even one that may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our certificate of incorporation and by-laws may delay or prevent an acquisition of us or a change in our management. These provisions include the ability of our board of directors to issue preferred stock without stockholder approval. In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us. Although we believe these provisions collectively provide for an opportunity to obtain greater value for stockholders by requiring potential acquirers to negotiate with our board of directors, they would apply even if an offer rejected by our board was considered beneficial by some stockholders. Additionally, certain of our contracts with third parties allow for termination upon specified change of control transactions. Anti-takeover provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors, which is responsible for appointing the members of our management, and anti-takeover or change of control contract termination rights may frustrate or prevent any attempts by a third-party to acquire or attempt to acquire the Company.

Risks Related to Tax Matters

The enactment of legislation implementing changes in taxation of international business activities, the adoption of other corporate tax reform policies, or changes in tax legislation or policies, or interpretations thereof, could materially impact our financial position and results of operations.

Corporate tax reform, base-erosion efforts and tax transparency continue to be high priorities in many tax jurisdictions where we have business operations. As a result, policies regarding corporate income and other taxes in numerous jurisdictions are under heightened scrutiny and tax reform legislation is being proposed or enacted in a number of jurisdictions. There is no assurance that our actual income tax liability will not be materially different than what is reflected in our income tax provisions and accruals as a result of changes in tax laws.

In addition, many countries are beginning to implement legislation and other guidance to align their international tax rules with the Organisation for Economic Co-operation and Development's Base Erosion and Profit Shifting recommendations and action plan that aim to standardize and modernize global corporate tax policy, including changes to cross-border tax, transfer pricing documentation rules, and nexus-based tax incentive practices. Because of the heightened scrutiny of corporate taxation policies, prior decisions by tax authorities regarding treatments and positions of corporate income taxes could be subject to enforcement activities, and legislative investigation and inquiry, which could also result in changes in tax policies or prior tax rulings. Any such changes in policies or rulings may also result in the taxes we previously paid being subject to change.

Due to the large scale of our international business activities, any substantial changes in international corporate tax policies, enforcement activities or legislative initiatives may materially adversely affect our business, the amount of taxes we are required to pay and our financial condition and results of operations generally.

Our ability to use net operating loss and tax credit carryforwards and certain built-in losses to reduce future tax payments is limited by provisions of the Internal Revenue Code, and it is possible that certain transactions or a combination of certain transactions may result in material additional limitations on our ability to use our net operating loss and tax credit carryforwards.

Section 382 and 383 of the Internal Revenue Code of 1986, as amended, contain rules that limit the ability of a company that undergoes an ownership change, which is generally any change in ownership of more than 50 percentage points of its stock over a three-year period, to utilize its net operating loss and tax credit carryforwards and certain built-in losses recognized in years after the ownership change. These rules generally operate by focusing on ownership changes involving stockholders owning directly or indirectly 5% or more of the stock of a company and any change in ownership arising from a new issuance of stock by the company. Generally, if an ownership change occurs, the yearly taxable income limitation on the use of net operating loss and tax credit carryforwards and certain built-in losses is equal to the product of the applicable long-term, tax-exempt rate and the value of the company's stock immediately before the ownership change. We may be unable to offset our taxable income with losses, or our tax liability with credits, before such losses and credits expire and therefore would incur larger federal income tax liability. While our most recent Section 382 analysis did not show any current limitations, future transactions or combinations of future transactions may result in a change in control under Section 382 in the future. Federal net operating losses generated after December 31, 2017 are not subject to expiration and generally may not be carried back to prior taxable years except that, under the Coronavirus Aid,

Relief, and Economic Security Act, net operating losses generated in 2018, 2019 and 2020 may be carried back five taxable years. Additionally, for taxable years beginning after December 31, 2020, the deductibility of such deferral net operating losses is limited to 80% of our taxable income in any future taxable year.

Risks Related to Government Regulation

Risks Related to Regulations and Compliance

We are subject to export and import control laws and regulations that could impair our ability to compete in international markets or subject us to liability if we violate such laws and regulations.

We are subject to U.S. export controls and sanctions regulations that restrict the shipment or provision of certain products and services to certain countries, governments, and persons. While we take precautions to prevent our products and services from being exported in violation of these laws, we cannot guarantee that the precautions we take will prevent violations of export control and sanctions laws. We believe that, in the past, we and our subsidiaries may have exported certain products without a required export license in apparent violation of U.S. export control laws. As a result, we have submitted to the U.S. Department of Commerce's Bureau of Industry and Security various notices of voluntary self-disclosure concerning potential violations. If we are found to be in violation of U.S. sanctions or export control laws, it could result in substantial fines and penalties for us and for the individuals working for us. We may also be adversely affected through other penalties, reputational harm, loss of access to certain markets, or otherwise.

Complying with export control and sanctions regulations may be time-consuming and may result in the delay or loss of sales opportunities or impose other costs. Any change in export or import regulations, economic sanctions or related legislation, or change in the countries, governments, persons or technologies targeted by such regulations, could result in our decreased ability to export or sell certain products to existing or potential customers in affected jurisdictions.

Our business is subject to a number of environmental risks.

Our manufacturing business involves the controlled use of hazardous materials and chemicals and is therefore subject to numerous environmental and safety laws and regulations and periodic inspections for possible violations of these laws and regulations. In addition to these hazardous materials and chemicals, our facility in Sweden also uses Staphylococcus aureus and toxins produced by Staphylococcus aureus in some of its manufacturing processes. Staphylococcus aureus and the toxins it produces, particularly enterotoxins, can cause severe illness in humans. The costs of compliance with environmental and safety laws and regulations are significant. Any violations, even if inadvertent or accidental, of current or future environmental and safety laws or regulations and the cost of compliance with any resulting order or fine could adversely affect our operations.

Health care reform measures could adversely affect our business.

The efforts of governmental and third-party payors to contain or reduce the costs of health care may adversely affect the business and financial condition of pharmaceutical and biotechnology companies, including ours. Specifically, in both the United States and some foreign jurisdictions, there have been a number of legislative and regulatory proposals to change the health care system in ways that could affect our ability to sell our products profitably. For example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010 (together, the "ACA"), was passed, which substantially changes the way health care is financed by both governmental and private insurers and significantly impacts the U.S. life sciences industry. The ACA and other federal and state proposals and health care reforms could limit the prices that can be charged for the products we develop and may limit our commercial opportunity.

The ACA subjected biologic products to potential competition by lower-cost biosimilars; addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected; increased the minimum Medicaid rebates owed by most manufacturers under the Medicaid Drug Rebate Program; extended the Medicaid Drug Rebate program to utilization of prescriptions of individuals enrolled in Medicaid-managed care organizations; subjected manufacturers to new annual fees and taxes for certain branded prescription drugs; created a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% (increased to 70% pursuant to the Bipartisan Budget Act of 2018, effective as of January 1, 2019) point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D; and provided incentives to programs that increase the federal government's comparative effectiveness research.

Recent federal government efforts have been aimed at amending or repealing all or portions of existing health care reform legislation, including the ACA. Changes in existing health care reform measures may result in uncertainty with respect to legislation, regulation and government policy that could significantly impact our business and the life sciences industry. Since its enactment, there have been numerous judicial, administrative, executive, and legislative challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. Since its enactment, there have been judicial, U.S. Congressional and executive challenges to certain aspects of the ACA. On June 17, 2021, the United States Supreme Court dismissed the most recent judicial challenge to the ACA brought by several states without specifically ruling on the constitutionality of the ACA. Prior to the United States Supreme Court's decision, President Biden issued an executive order to initiate a special enrollment period from February 15, 2021 through August 15, 2021 for purposes of obtaining health insurance coverage through the ACA marketplace. The executive order also instructed certain governmental agencies to review and reconsider their existing policies and rules that limit access to healthcare, including among others, reexamining Medicaid demonstration projects and waiver programs that include work requirements, and policies that create unnecessary barriers to obtaining access to health insurance coverage through Medicaid or the ACA. It is unclear how other healthcare reform measures of the Biden Administration or other efforts, if any, to challenge, repeal or replace the ACA will impact our business.

Various portions of the ACA are currently undergoing legal and constitutional challenges in the United States Supreme Court; the former Trump Administration issued various executive orders that eliminated cost sharing subsidies and various provisions that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices; and Congress has introduced several pieces of legislation aimed at significantly revising or repealing the ACA. Also, in December 2018, the Centers for Medicare & Medicaid Services ("CMS") issued a final rule permitting further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA risk adjustment program. Since then, the ACA risk adjustment program payment parameters have been updated annually. On December 20, 2019, former President Trump signed into law the Further Consolidated Appropriations Act (H.R. 1865), which repeals the Cadillac tax, the health insurance provider tax, and the medical device excise tax. It is impossible to determine whether similar taxes could be instated in the future. It is unclear whether the ACA will be overturned, repealed, replaced, or further amended. We cannot predict what effect further changes to the ACA would have on our business.

In addition, other legislative and regulatory changes have been proposed and adopted in the United States since the ACA was enacted:

- On August 2, 2011, the U.S. Budget Control Act of 2011, among other things, included aggregate reductions of Medicare payments to providers of 2% per fiscal year. These reductions went into effect on April 1, 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2030, with the exception of a temporary suspension from May 1, 2020 through December 31, 2021, unless additional U.S. Congressional action is taken.
- On January 2, 2013, the U.S. American Taxpayer Relief Act of 2012 was signed into law, which, among other things, further reduced Medicare payments to several types of providers.
- On April 13, 2017, CMS published a final rule that gives states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces.
- On May 30, 2018, the Right to Try Act was signed into law. The law, among other things, provides a federal framework for certain patients to access certain investigational new drug products that have completed a Phase 1 clinical trial and that are undergoing investigation for FDA approval. Under certain circumstances, eligible patients can seek treatment without enrolling in clinical trials and without obtaining FDA permission under the FDA expanded access program. There is no obligation for a pharmaceutical manufacturer to make its drug products available to eligible patients as a result of the Right to Try Act.
- On May 23, 2019, CMS published a final rule to allow Medicare Advantage Plans the option of using step therapy for Part B drugs beginning January 1, 2020.
- On December 20, 2019, former President Trump signed into law the Further Consolidated Appropriations Act (H.R. 1865), which repealed the Cadillac tax, the health insurance provider tax, and the medical device excise tax. It is impossible to determine whether similar taxes could be instated in the future.

Additionally, there has been increasing legislative and enforcement interest in the United States with respect to drug pricing practices. Specifically, there has been heightened governmental scrutiny over the manner in which manufacturers set prices for

their marketed products, which has resulted in several U.S. Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to drug pricing, reduce the cost of prescription drugs under Medicare, and review the relationship between pricing and manufacturer patient programs. At a federal level, President Biden signed an executive order on July 9, 2021 affirming the administration's policy to (i) support legislative reforms that would lower the prices of prescription drug and biologics, including by allowing Medicare to negotiate drug prices, by imposing inflation caps, and, by supporting the development and market entry of lower-cost generic drugs and biosimilars; and (ii) support the enactment of a public health insurance option. Among other things, the executive order also directs the U.S. Department of Health and Human Services ("HHS") to provide a report on actions to combat excessive pricing of prescription drugs, enhance the domestic drug supply chain, reduce the price that the federal government pays for drugs, and address price gouging in the industry; and directs the FDA to work with states and Indian Tribes that propose to develop section 804 Importation Programs in accordance with the Medicare Prescription Drug, Improvement, and Modernization Act of 2003, and the FDA's implementing regulations. FDA released such implementing regulations on September 24, 2020, which went into effect on November 30, 2020, providing guidance for states to build and submit importation plans for drugs from Canada. On September 25, 2020, CMS stated drugs imported by states under this rule will not be eligible for federal rebates under Section 1927 of the Social Security Act and manufacturers would not report these drugs for "best price" or "average manufacturer price" purposes. Since these drugs are not considered covered outpatient drugs, CMS further stated it will not publish a national average drug acquisition cost for these drugs. If implemented, importation of drugs from Canada may materially and adversely affect the price we receive for any of our product candidates. Further, on November 20, 2020 CMS issued an interim final rule implementing the most favored nation ("MFN") model under which Medicare Part B reimbursement rates would have been be calculated for certain drugs and biologicals based on the lowest price drug manufacturers receive in Organisation for Economic Co-operation and Development countries with a similar gross domestic product per capita. However, on August 6, 2021 CMS announced a proposed rule to rescind the MFN model rule. Additionally, on November 30, 2020, HHS published a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Medicare Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a safe harbor for certain fixed fee arrangements between pharmacy benefit managers and manufacturers. Pursuant to court order, the removal and addition of the aforementioned safe harbors were delayed and recent legislation imposed a moratorium on implementation of the rule until January 1, 2026. Although a number of these and other proposed measures may require authorization through additional legislation to become effective, and the Biden Administration may reverse or otherwise change these measures, both the Biden Administration and Congress have indicated that they will continue to seek new legislative measures to control drug costs. We expect that additional U.S. federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that the U.S. federal government will pay for healthcare drugs and services, which could result in reduced demand for our products or additional pricing pressures.

Additionally, the federal government and individual states in the United States have also become increasingly active in passing legislation and implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. Legally mandated price controls on payment amounts by third-party payors or other restrictions could harm our business, financial condition, results of operations and prospects. In addition, regional healthcare authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other healthcare programs. This could reduce the ultimate demand for our products or put pressure on drug pricing, which could negatively affect our business, financial condition, results of operations and prospects. We expect that additional state and federal healthcare reform measures will be adopted in the future.

We may be exposed to liabilities under the Foreign Corrupt Practices Act, and any determination that we violated the Foreign Corrupt Practices Act could have a material adverse effect on our business.

We are subject to the Foreign Corrupt Practice Act of 1977 (the "FCPA") and other laws that prohibit improper payments or offers of payments to foreign governments and their officials and political parties by U.S. persons and issuers as defined by the statute for the purpose of obtaining or retaining business. We have operations and agreements with third parties and make sales in jurisdictions outside of the United States, which may experience corruption. Our activities in jurisdictions outside of the United States create the risk of unauthorized payments or offers of payments by one of our employees, consultants, sales agents or distributors, because these parties are not always subject to our control. These risks have increased following our recent acquisitions of overseas operations and facilities. It is our policy to implement safeguards to discourage these practices by our employees. However, our existing safeguards and any future improvements may prove to be less than effective, and the employees, consultants, sales agents or distributors of Repligen may engage in conduct for which we might be held responsible. Violations of

the FCPA may result in severe criminal or civil sanctions, and we may be subject to other liabilities, which could negatively affect our business, operating results and financial condition. In addition, the government may seek to hold us liable for successor liability FCPA violations committed by any companies in which we invest or that we acquire.

Changes in accounting standards and subjective assumptions, estimates, and judgments by management related to complex accounting matters could significantly affect our financial results or financial condition.

Generally accepted accounting principles and related accounting pronouncements, implementation guidelines, and interpretations with regard to a wide range of matters that are relevant to our business, such as revenue recognition, asset impairment and fair value determinations, inventories, business combinations and intangible asset valuations, leases, and litigation, are highly complex and involve many subjective assumptions, estimates, and judgments. Changes in these rules or their interpretation or changes in underlying assumptions, estimates, or judgments could significantly change our reported or expected financial performance or financial condition.

Risks Related to Data and Privacy

Our internal computer systems, or those of our customers, collaborators or other contractors, may be subject to cyber-attacks or security breaches, which could result in a material disruption of our product development programs.

Despite the implementation of security measures, our internal computer systems and those of our customers, collaborators cloud-based platform service providers, and other contractors are vulnerable to damage from computer viruses and unauthorized access. Cyber-attacks are increasing in their frequency, sophistication and intensity, and have become increasingly difficult to detect. Cyber-attacks could include the deployment of harmful malware, ransomware, denial-of-service attacks, social engineering and other means to affect service reliability and threaten the confidentiality, integrity and availability of information. Cyber-attacks also could include phishing attempts or e-mail fraud to cause payments or information to be transmitted to an unintended recipient. A material cyber-attack or security breach could cause interruptions in our operations and could result in a material disruption of our business operations, damage to our reputation or a loss of revenues.

In the ordinary course of our business, we collect and store sensitive data, including, among other things, personally identifiable information about our employees, intellectual property, and proprietary business information. Any cyber-attack or security breach that leads to unauthorized access, use or disclosure of personal or proprietary information could harm our reputation, cause us not to comply with federal and/or state breach notification laws and foreign law equivalents and otherwise subject us to liability under laws and regulations that protect the privacy and security of personal information. In addition, we could be subject to risks caused by misappropriation, misuse, leakage, falsification or intentional or accidental release or loss of information maintained in the information systems and networks of our company and our vendors, including personal information of our employees, and company and vendor confidential data. In addition, outside parties may attempt to penetrate our systems or those of our vendors or fraudulently induce our personnel or the personnel of our vendors to disclose sensitive information in order to gain access to our data and/or systems. Like other companies, we have on occasion experienced, and will continue to experience, data security incidents involving access to company data threats to our data and systems, including malicious codes and viruses, phishing, business email compromise attacks, or other cyber-attacks. The number and complexity of these threats continue to increase over time. If a material breach of our information technology systems or those of our vendors occurs, the market perception of the effectiveness of our security measures could be harmed and our reputation and credibility could be damaged.

We could be required to expend significant amounts of money and other resources to respond to these threats or breaches, and to repair or replace information systems or networks and could suffer financial loss or the loss of valuable confidential information. In addition, we could be subject to regulatory actions and/or claims made by individuals and groups in private litigation involving privacy issues related to data collection and use practices and other data privacy laws and regulations, including claims for misuse or inappropriate disclosure of data, as well as unfair or deceptive practices. Although we procure, develop and maintain systems and controls designed to prevent these events from occurring, and we have a process to identify and mitigate threats, the procurement, development and maintenance of these systems, controls and processes is costly and requires ongoing monitoring and updating as technologies change and efforts to overcome security measures become increasingly sophisticated. Moreover, despite our efforts, the possibility of these events occurring cannot be eliminated entirely and there can be no assurance that any measures we take will prevent cyber-attacks or security breaches that could adversely affect our business.

Changes in laws and regulations governing the privacy and protection of data and personal information could adversely affect our business.

We are subject to data privacy and protection laws and regulations that apply to the collection, transmission, storage and use of proprietary information and personally-identifying information, which among other things, imposes certain requirements relating to the privacy, security and transmission of certain individually identifiable information. In addition, numerous other federal and state laws, including state security breach notification laws, state health information privacy laws and federal and state consumer protection laws, govern the collection, use, disclosure and security of personal information. These laws continue to change and evolve and are increasing in breadth and impact.

For example, California enacted the California Consumer Privacy Act ("CCPA"), which went into effect in January 2020 and became enforceable by the California Attorney General in July 2020, and which, among other things, requires companies covered by the legislation to provide new disclosures to California consumers and afford such consumers new rights with respect to their personal information, including the right to request deletion of their personal information, the right to receive the personal information on record for them, the right to know what categories of personal information generally are maintained about them, as well as the right to opt-out of certain sales of personal information. The CCPA provides civil penalties for violations, as well as a private right of action for certain data breaches that result in the loss of personal information. This private right of action may increase the likelihood of, and risks associated with, data breach litigation.

Additionally, a new California ballot initiative, the California Privacy Rights Act ("CPRA") was passed in November 2020. Effective January 1, 2023, the CPRA imposes additional obligations on companies covered by the legislation and will significantly modify the CCPA by expanding consumers' rights with respect to certain sensitive personal information, among other things. The CPRA also creates a new state agency that will be vested with authority to implement and enforce the CCPA and the CPRA. The effects of the CCPA and the CPRA are potentially significant and may require us to modify our data collection or processing practices and policies, incur substantial costs and expenses in an effort to comply and increase our potential exposure to regulatory enforcement and/or litigation.

Certain other state laws impose similar privacy obligations and we anticipate that more states may enact legislation similar to the CCPA, which provides consumers with new privacy rights and increases the privacy and security obligations of entities handling certain personal information of such consumers. The CCPA has prompted a number of proposals for new federal and state-level privacy legislation. Such proposed legislation, if enacted, may add additional complexity, variation in requirements, restrictions and potential legal risk, require additional investment of resources in compliance programs, impact strategies and the availability of previously useful data and could result in increased compliance costs and/or changes in business practices and policies.

The regulatory framework governing the collection, processing, storage, use and sharing of certain information is rapidly evolving and is likely to continue to be subject to uncertainty and varying interpretations. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our existing data management practices or the features of our services and platform capabilities. Any failure or perceived failure by us, or any third parties with which we do business, to comply with our posted privacy policies, changing consumer expectations, evolving laws, rules and regulations, industry standards, or contractual obligations to which we or such third parties are or may become subject, may result in actions or other claims against us by governmental entities or private actors, the expenditure of substantial costs, time and other resources or the incurrence of significant fines, penalties or other liabilities. In addition, any such action, particularly to the extent we were found to be guilty of violations or otherwise liable for damages, would damage our reputation and adversely affect our business, financial condition and results of operations.

We cannot yet fully determine the impact these or future laws, rules, regulations and industry standards may have on our business or operations. Any such laws, rules, regulations and industry standards may be inconsistent among different jurisdictions, subject to differing interpretations or may conflict with our current or future practices. Additionally, our customers may be subject to different privacy laws, rules and legislation, which may mean that they require us to be bound by varying contractual requirements applicable to certain other jurisdictions. Adherence to such contractual requirements may impact our collection, use, processing, storage, sharing and disclosure of various types of information including financial information and other personal information, and may mean we become bound by, or voluntarily comply with, self-regulatory or other industry standards relating to these matters that may further change as laws, rules and regulations evolve. Complying with these requirements and changing our policies and practices may be onerous and costly, and we may not be able to respond quickly or effectively to regulatory, legislative and other developments. These changes may in turn impair our ability to offer our existing or planned features, products and services and/or

increase our cost of doing business. As we expand our customer base, these requirements may vary from customer to customer, further increasing the cost of compliance and doing business.

Various foreign countries also have, or are developing, laws governing the collection, use, disclosure, security, and cross-border transmission of personal information. The legislative and regulatory landscape for privacy and data protection continues to evolve, and there has been an increasing amount of focus on privacy and data protection issues with the potential to affect our business. For example, privacy requirements in the EU govern the transfer of personal information from the European Economic Area to the United States. While we continue to address the implications of changes to the EU data privacy regulations, the area remains an evolving landscape with new regulations coming into effect and continued legal challenges and our efforts to comply with the evolving data protection rules may be unsuccessful. Failure to comply with laws regarding data protection would expose us to risk of enforcement actions taken by data protection authorities in the EU and the potential for significant penalties if we are found to be non-compliant. Similarly, failure to comply with federal and state laws in the United States regarding privacy and security of personal information could expose us to penalties under such laws. Even if we are not determined to have violated these laws, government investigations into these issues typically require the expenditure of significant resources and generate negative publicity, which could harm our business.

Risks Related to Our Products and Technology

Risks Related to Our Intellectual Property

If we are unable to obtain or maintain our intellectual property, we may not be able to succeed commercially.

We endeavor to obtain and maintain trade secrets and, to a lesser extent with respect to the products that currently account for a majority of our revenue, patent protection when available in order to protect our products and processes from unauthorized use and to produce a financial return consistent with the significant time and expense required to bring our products to market. Our success will depend, in part, on our ability to:

- preserve our trade secrets and know-how;
- operate without infringing the proprietary rights of third parties;
- obtain and maintain patent protection for our products and manufacturing processes; and
- secure any necessary licenses from others on acceptable terms.

We consider trade secrets, know-how and other forms of market protection to be among the most important elements of our proprietary position, in particular, as it relates to the products that currently account for a majority of our revenue. We also own or have exclusive rights to a number of U.S. patents and U.S. pending patent applications as well as corresponding foreign patents and patent applications. We continue to actively and selectively pursue patent protection and seek to expand our patent estate, particularly for our products currently in development, and we cannot be sure that any patent applications that we will file in the future or that any currently pending applications will be issued on a timely basis, if ever. We cannot be certain that we were the first to make the inventions covered by each of our pending patent applications or that we were the first to file patent applications for such inventions. Even if patents are issued, the degree of protection afforded by such patents will depend upon the:

- scope of the patent claims;
- validity and enforceability of the claims obtained in such patents; and
- our willingness and financial ability to enforce and/or defend them.

The patent position of life sciences companies is often highly uncertain and usually involves complex legal and scientific questions. Patents that may be granted to us in certain foreign countries may be subject to opposition proceedings brought by third parties or result in suits by us, which may be costly and result in adverse consequences for us.

In some cases, litigation or other proceedings may be necessary to assert claims of infringement, to enforce patents issued to us or our licensors, to protect trade secrets, know-how or other intellectual property rights we own or to determine the scope and validity of the proprietary rights of third parties. Such litigation could result in substantial costs to us and diversion of our resources. An adverse outcome in any such litigation or proceeding could have a material adverse effect on our business, financial condition and results of operations. If our competitors prepare and file patent applications in the United States that claim technology also claimed by us, we may be required to participate in interference proceedings declared by the U.S. Patent and Trademark Office to determine priority of invention, which would result in substantial costs to us.

While one of our U.S. patents covering recombinant Protein A had its term adjusted to expire in 2028, our other U.S. patents covering recombinant Protein A have expired, and as a result, we may face increased competition, which could harm our results of operations, financial condition, cash flow and future prospects.

Other companies could begin manufacturing and selling native or some of the commercial forms of recombinant Protein A in the United States and may directly compete with us on certain Protein A products. This may induce us to sell Protein A at lower prices and may erode our market share, which could adversely affect our results of operations, financial condition, cash flow and future prospects.

Our freedom to develop our products may be challenged by others, and we may have to engage in litigation to determine the scope and validity of competitors' patents and proprietary rights, which, if we do not prevail, could harm our business, results of operations, financial condition, cash flow and future prospects.

There has been substantial litigation and other proceedings regarding the complex patent and other intellectual property rights in the life sciences industry. We have been a party to, and in the future may become a party to, patent litigation or other proceedings regarding intellectual property rights.

We may become involved in patent litigation or other intellectual property proceedings, including the following situations:

We may initiate litigation or other proceedings against third parties to seek to invalidate the patents held by such third parties or to obtain a judgment that our products or services do not infringe on such third parties' patents.

- We may initiate litigation or other proceedings against third parties to seek to enforce our patents against infringement.
- If our competitors file patent applications that claim technology also claimed by us, we may participate in interference or opposition proceedings to determine the priority of invention.
- If third parties initiate litigation claiming that our processes or products infringe their patent or other intellectual property rights, we will need to defend against such claims.

The cost to us of any patent litigation or other proceeding, even if resolved in our favor, could be substantial. Some of our competitors may be able to sustain the cost of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. If a patent litigation or other intellectual property proceeding is resolved in a way that is unfavorable to us, we or our collaborative or strategic partners may be enjoined from manufacturing or selling our products and services without a license from the other party and be held liable for significant damages. The failure to obtain any required license on commercially acceptable terms or at all may harm our business, results of operations, financial condition, cash flow and future prospects.

Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace. Patent litigation and other proceedings may also absorb significant management time, attention and resources.

Risks Related to Our Products

The market may not be receptive to our new bioprocessing products upon their introduction.

We expect a portion of our future revenue growth to come from introducing new bioprocessing products, including line extensions and new features for our OPUS® disposable chromatography columns, our XCell ATF system, our SIUS® tangential flow filtration ("TFF") cassettes, our Spectrum® hollow fiber modules TFF line of cassettes and our growth factors. The commercial success of all of our products will depend upon their acceptance by the life science and biopharmaceutical industries. Many of the bioprocessing products that we are developing are based upon new technologies or approaches. As a result, there can be no assurance that these new products, even if successfully developed and introduced, will be accepted by customers. If customers do not adopt our new products and technologies, our results of operations may suffer and, as a result, the market price of our common stock may decline.

Our products are subject to quality control requirements.

Whether a product is produced by us or purchased from outside suppliers, it is subjected to quality control procedures, including the verification of porosity and with certain products, the complete validation for good manufacturing practices, U.S. Food and Drug Administration, CE and ISO 2001 compliance, prior to final packaging. Quality control is performed by a staff of technicians utilizing

calibrated equipment. In the event we, or our manufacturers, produce products that fail to comply with required quality standards, it may incur delays in fulfilling orders, write-downs, damage to our reputation and damages resulting from product liability claims.

If our products do not perform as expected or the reliability of the technology on which our products are based is questioned, we could experience lost revenue, delayed or reduced market acceptance of our products, increased costs and damage to our reputation.

Our success depends on the market's confidence that we can provide reliable, high-quality bioprocessing products. We believe that customers in our target markets are likely to be particularly sensitive to product defects and errors. Our reputation and the public image of our products and technologies may be impaired if our products fail to perform as expected. Although our products are tested prior to shipment, defects or errors could nonetheless occur in our products. Furthermore, the Protein A that we manufacture is subsequently incorporated into products that are sold by other life sciences companies and we have no control over the manufacture and production of those products. In the future, if our products experience, or are perceived to experience, a material defect or error, this could result in loss or delay of revenues, delayed market acceptance, damaged reputation, diversion of development resources, legal claims, increased insurance costs or increased service and warranty costs, any of which could harm our business. Such defects or errors could also narrow the scope of the use of our products, which could hinder our success in the market. Even after any underlying concerns or problems are resolved, any lingering concerns in our target market regarding our technology or any manufacturing defects or performance errors in our products could continue to result in lost revenue, delayed market acceptance, damaged reputation, increased service and warranty costs and claims against us.

Risks Related to Litigation

We may become involved in litigation or other proceedings with collaborative partners, which may be time consuming, costly and could result in delays in our development and commercialization efforts.

In connection with the Company's decision to focus its efforts on the growth of its core bioprocessing business, we sought development and commercialization partnerships for our remaining portfolio of clinical stage assets. Any disputes with such partners that lead to litigation or similar proceedings may result in us incurring legal expenses, as well as facing potential legal liability. Such disputes, litigation or other proceedings are also time-consuming and may cause delays in our development and commercialization efforts. If we fail to resolve these disputes quickly and with terms that are no less favorable to us than the current terms of the arrangements, our business, results of operations, financial condition, cash flow and future prospects may be harmed.

We may become subject to litigation, which could result in substantial costs and divert management's attention and resources from our business.

From time to time, we may become involved in litigation or other legal proceedings relating to claims arising from the ordinary course of business. Litigation is subject to inherent risks and uncertainties that may cause actual results to differ materially from our expectations. If we receive an adverse judgment in any litigation, we could be required to pay substantial damages. With or without merit, litigation can be complex, can extend for a protracted period of time, can be very expensive and the expense can be unpredictable. Litigation initiated by us could also result in counterclaims against us, which could increase the costs associated with the litigation and result in our payment of damages or other judgments against us. In addition, litigation, and any related publicity, may divert the efforts and attention of some of our management and key personnel, which could adversely affect our business.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our material office and manufacturing leases are detailed below:

Location	Square Feet	Principal Use	Lease Expiration
Waltham, Massachusetts	182,243 [1]	Corporate headquarters, manufacturing, research and development, marketing and administrative offices	July 31, 2030
Marlborough, Massachusetts	130,700 [2]	Manufacturing operations	November 30, 2028
Rancho Dominguez, California	68,908	Manufacturing, research and development, marketing and administrative operations	November 30, 2025 [3]
Hopkinton, Massachusetts	64,000 [4]	Manufacturing, assembly site	August 15, 2034
Toulouse, France [5]	62,980	Manufacturing and administrative operations	May 30, 2030
Lund, Sweden	58,405 [6]	Manufacturing and administrative operations	December 31, 2026
Compton, California [7]	54,060	Warehouse	May 31, 2026
Waterford, Ireland [8]	41,928	Manufacturing and administrative operations	April 1, 2034
Bridgewater, New Jersey [9]	33,669	Manufacturing and administrative operations	November 30, 2028
Lebanon, New Hampshire [10]	31,053	Research and development and administrative operations	July 31, 2026
Clifton Park, New York [11]	30,148	Manufacturing operations	December 31, 2024

(1) In September 2021, we signed the Sixth Amendment of Lease for our facility in Waltham, Massachusetts, which extended our lease term and expanded the facility by 74,108 square feet. Pursuant to the Sixth Amendment of Lease, effective November 1, 2021, we extended our lease term to July 31, 2030 and immediately expanded our facility by 21,244 square feet. The remaining 52,864 square feet will be available beginning in the second quarter of 2022. This expansion is needed to accommodate our need for additional office and manufacturing space.

(2) During 2020, the Company entered into a First Amendment to the lease agreement for the Marlborough facility, expanding the space by an additional 66,939 square feet. The effective date of this expansion was January 1, 2021.

(3) In 2018, we expanded our facility in Rancho Dominguez, California by approximately 15,000 square feet. The lease for the expanded portion of the facility expires on November 30, 2025.

(4) In May 2021, the Company entered into an agreement to lease the Hopkinton, Massachusetts facility. This space will be used as an assembly center for our ProConnex® single-use flow path products and proteins manufacturing.

(5) On July 1, 2021, we acquired Polymem, a manufacturer of hollow fiber membranes, membrane modules and systems for industrial and bioprocessing applications, which is located in Toulouse, France.

(6) In December 2020, the Company signed an extension of the existing lease at its Lund, Sweden facility, which included approximately 13,000 square feet of additional space. The lease commenced in April 2021.

(7) Effective April 1, 2021, the Company entered into a Multi-Tenant Industrial Lease for a warehouse in Compton, California to assist with capacity constraints.

(8) Includes two facilities in Waterford, Ireland. The lease for one facility was in effect upon the acquisition of ARTeSYN in December 2020. The second lease conveyed ownership of a 32,940 square foot facility to the Company in December 2021. This lease was signed with the Irish Development Authority.

(9) On May 31, 2019, we acquired C Technologies, a process analytics company located in Bridgewater, New Jersey.

(10) On September 20, 2021, we acquired Avitide, a company offering diverse libraries and leading technology in affinity ligand discovery and development, located in Lebanon, New Hampshire.

(11) On July 13, 2020, the Company acquired Engineered Molding Technology LLC, an innovator and manufacturer of single-use silicon assemblies and components used in the manufacturing of biologic drugs which is located in Clifton Park, New York.

During the year ended December 31, 2021, we incurred total rental costs for all facilities of $17.0 million.

ITEM 3. LEGAL PROCEEDINGS

From time to time, we may be subject to legal proceedings and claims in the ordinary course of business. We are not currently aware of any such proceedings or claims that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations.

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

Market Information for Common Stock

Our common stock is traded on the Nasdaq Global Select Market under the symbol "RGEN."

Stockholders and Dividends

As of February 14, 2022, there were 284 stockholders of record of our common stock. We have not paid any dividends since our inception and do not intend to pay any dividends on our common stock in the foreseeable future. We anticipate that we will retain all earnings, if any, to support our operations. Any future determination as to the payment of dividends will be at the sole discretion of our Board of Directors and will depend on our financial condition, results of operations, capital requirements and other factors our Board of Directors deems relevant.

Equity Compensation Plan Information

The following table sets forth information as of December 31, 2021 regarding shares of common stock that may be issued under the Company's equity compensation plans, consisting of the Second Amended and Restated 2001 Repligen Corporation Stock Plan, the Amended and Restated 2012 Stock Option and Incentive Plan and the 2018 Stock Option and Incentive Plan.

Plan Category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a))
	(a)	(b)	(c)
Equity compensation plans approved by security holders	1,231,792 [(1)]	$ 54.15 [(2)]	2,127,217

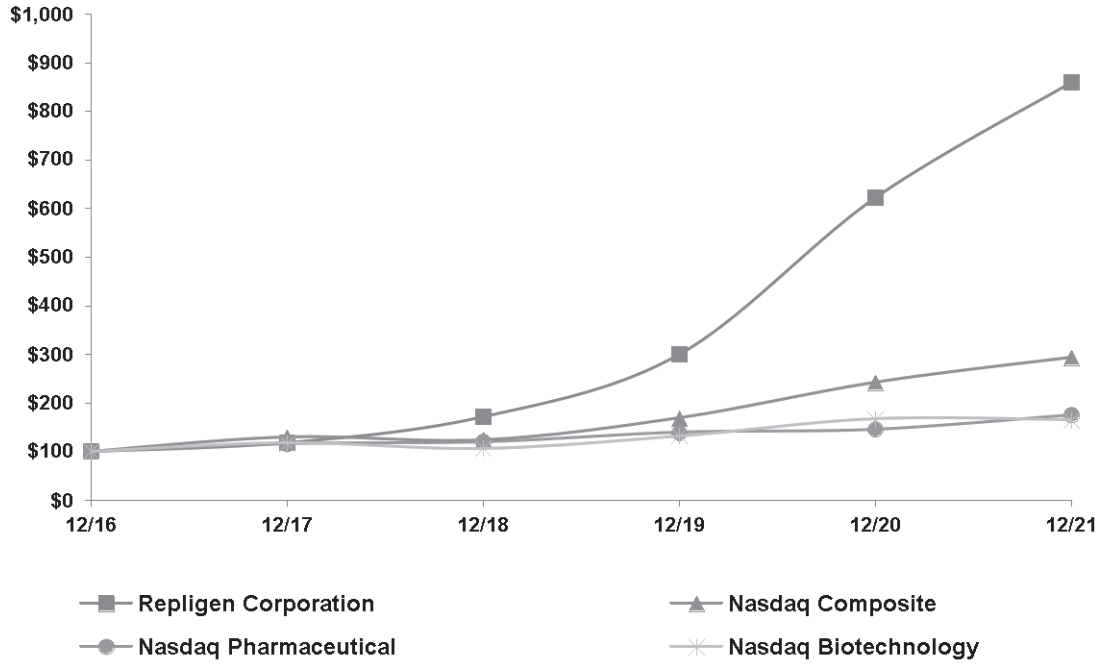
(1) Includes 625,107 shares of common stock issuable upon the exercise of outstanding options and 606,685 shares of common stock issuable upon the vesting of stock units, which include restricted stock units and performance stock units. No shares of restricted stock are outstanding.

(2) Since stock units do not have any exercise price, such units are not included in the weighted average exercise price calculation.

Stock Performance Graph

The graph below matches Repligen Corporation's cumulative 5-year total shareholder return on common stock with the cumulative total returns of the Nasdaq Composite index, the Nasdaq Pharmaceutical index, and the Nasdaq Biotechnology index. The graph tracks the performance of a $100 investment in our common stock and in each index (with the reinvestment of all dividends) from December 31, 2016 to December 31, 2021. The comparisons shown in the graph below are based upon historical data. We caution that the stock price performance shown in the graph below is not necessarily indicative of, nor is it intended to forecast, the potential future performance of our common stock.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
Among Repligen Corporation, the Nasdaq Composite Index,
the Nasdaq Pharmaceutical Index and the Nasdaq Biotechnology Index



*$100 invested on 12/31/16 in stock or index, including reinvestment of dividends. Fiscal year ending December 31.

The information contained in the performance graph shall not be deemed to be "soliciting material" or to be "filed" with the Securities and Exchange Commission, and such information shall not be incorporated by reference into any future filing under the Securities Act of 1933, as amended (the "Securities Act") or the Securities Exchange Act of 1934, as amended (the "Exchange Act"), except to the extent that Repligen specifically incorporates it by reference into such filing.

Issuer Purchases of Equity Securities

In June 2008, the Board of Directors authorized a program to repurchase up to 1.25 million shares of our common stock to be repurchased at the discretion of management from time to time in the open market or through privately negotiated transactions. The repurchase program has no set expiration date and may be suspended or discontinued at any time. We did not repurchase any shares of common stock during the year ended December 31, 2021. In prior years, we repurchased a total of 592,827 shares, leaving 657,173 shares remaining under this authorization.

ITEM 6. RESERVED

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

Information pertaining to fiscal year 2019 was included in the Company's Annual Report on Form 10-K ("Form 10-K") for the year ended December 31, 2020 on pages 39 through 57 under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," which was filed with the SEC on February 24, 2021.

Repligen and its subsidiaries, collectively doing business as Repligen Corporation ("Repligen", "we", "our", or "the Company") is a global life sciences company that develops and commercializes highly innovated bioprocessing technology and systems that increase efficiencies and flexibility in the process of manufacturing biological drugs.

As the overall market for biologics continues to grow and expand, our customers – primarily large biopharmaceutical companies and contract development and manufacturing organizations – face critical production cost, capacity, quality and time pressures. Built to address these concerns, our products help set new standards for the way biologics are manufactured. We are committed to inspiring advances in bioprocessing as a trusted partner in the production of critical biologic drugs – including monoclonal antibodies ("mAbs"), recombinant proteins, vaccines and cell and gene therapies ("C&GT") – that are improving human health worldwide. For more information regarding our business, products and acquisitions, see above sections in Part I entitled "Overview", "Our Products", "2021 Acquisitions", "2020 Acquisitions", "2019 Acquisition" and "Our Market Opportunity".

COVID-19 Pandemic

Our global operations have been and continue to be affected by the ongoing global pandemic of a novel strain of coronavirus ("COVID-19") and the resulting volatility and uncertainty it has caused in the United States and international markets. During the year ended December 31, 2021, many businesses and countries, including the United States, continued applying preventative and precautionary measures designed to mitigate the spread of the virus and its variants including government orders and other restrictions on the conduct of business operations.

In response to COVID-19, we enacted safety measures, including social distancing protocols, encouraging employees to work from home when possible, suspending non-essential work travel, frequently disinfecting our workspaces and providing appropriate personal protective equipment to employees who are physically present at our facilities. As COVID-19 conditions improved, we began implementing a phased reopening process (which we have since reversed in response to the identification of COVID-19 variants), encouraged our employees to receive COVID-19 vaccinations and COVID-19 booster shots as they become available. We will continue to implement appropriate safety measures until COVID-19 is contained. We may take further actions and adjust our reopening process as government authorities require or recommend or as we determine to be in the best interests of our employees, customers, partners and suppliers.

COVID-19 continues to be dynamic, and near-term challenges across the economy remain. The ongoing effects of COVID-19 remain difficult to predict due to numerous uncertainties, including the severity, duration and resurgence of the outbreak, new variants, the effectiveness of health and safety measures including vaccines, the pace and strength of the economic recovery, and supply chain pressures, among others. We will continue to actively monitor the effects of COVID-19 and will continue to take appropriate steps to mitigate the impacts to our employees and on our business results.

Critical Accounting Policies and Estimates

While our significant accounting policies are more fully described in the notes to our consolidated financial statements, we have identified the policies and estimates below as being critical to our business operations and the understanding of our results of operations. These policies require management's most difficult, subjective or complex judgements, often as a result of the need to make estimates about the effect of matters that are inherently uncertain. The impact of and any associated risks related to these policies on our business operations are discussed throughout "Management's Discussion and Analysis of Financial Condition and Results of Operations," specifically in the "Results of Operations" section, where such policies affect our reported and expected financial results. Although we believe that our estimates, assumptions, and judgements are reasonable, they are based upon information presently available. Actual results may differ significantly from these estimates under different assumptions, judgments, or conditions.

Revenue recognition

We generate revenue from the sale of bioprocessing products, equipment devices, and related consumables used with these equipment devices to customers in the life science and biopharmaceutical industries. Under Accounting Standards Codification No. ("ASC") 606, "*Revenue from Contracts with Customers,"* 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 expected value method or the most likely amount method, depending on the facts and circumstances relative to the contract. 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. Applying the practical expedient in paragraph 606-10-32-18, 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. None of the Company's contracts contained a significant financing component as of December 31, 2021.

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.

The Company recognizes product revenue under the terms of each customer agreement upon transfer of control to the customer, which occurs at a point in time.

Allowance for credit losses

We evaluate our global accounts receivable through a continuous process of assessing our portfolio on an individual customer and overall basis. This process consists of a thorough review of historical collection experience, current aging status of the customer accounts, financial condition of our customers, and whether the receivables involve retainages. We also consider the economic environment of our customers, both from a marketplace and geographic perspective, in evaluating the need for an allowance. Based on our review of these factors, we establish or adjust allowances for specific customers. Credit losses can vary substantially over time and the process involves judgment and estimation that require a number of assumptions about matters that are uncertain. Accordingly, our results of operations can be affected by adjustments to the allowance due to actual write-offs that differ from estimated amounts. See Note 7, *"Credit Losses,"* to our consolidated financial statements included in this report for more information.

Inventories

We value inventory at cost or, if lower, net realizable value, using the first-in, first-out method. We review our inventory at least quarterly and record a provision for excess and obsolete inventory based on our estimates of expected sales volume, production capacity and expiration dates of raw materials, work-in-process and finished products. We write down inventory that has become obsolete, inventory that has a cost basis in excess of its expected net realizable value, and inventory in excess of expected requirements to cost of product revenue. Manufacturing of bioprocessing finished goods is done to order and tested for quality specifications prior to shipment.

A change in the estimated timing or amount of demand for our products could result in additional provisions for excess inventory quantities on hand. Any significant unanticipated changes in demand or unexpected quality failures could have a significant impact on the value of inventory and reported operating results. During all periods presented in the accompanying consolidated financial statements, there have been no material adjustments related to a revised estimate of inventory valuations.

Business combinations

Total consideration transferred for acquisitions is allocated to the tangible and intangible assets acquired and liabilities assumed, if any, based on their fair values at the dates of acquisition. This purchase price allocation process requires management to make significant estimates and assumptions with respect to intangible assets and deferred revenue obligations. The fair value of

identifiable intangible assets is based on detailed valuations that use information and assumptions determined by management. Any excess of purchase price over the fair value of the net tangible and intangible assets acquired is allocated to goodwill. While we use our best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as any contingent consideration, where applicable, our estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, we record adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded to our consolidated statements of comprehensive income. The Company estimates the fair value of the contingent consideration earnouts using the Monte Carlo Simulation and updates the fair value of the contingent consideration at each reporting period based on the estimated probability of achieving the earnout targets and applying a discount rate that captures the risk associated with the expected contingent payments. To the extent that our estimates change in the future regarding the likelihood of achieving these targets, we may need to record material adjustments to our accrued contingent consideration. Such changes in the fair value of contingent consideration are recorded as contingent consideration expense in our consolidated statements of comprehensive income. For the year ended December 31, 2021, we recorded $5.9 million of contingent consideration expense related to the change in estimated contingent consideration obligations from the acquisition of Avitide, Inc. ("Avitide") in September 2021.

We use the income approach to determine the fair value of certain identifiable intangible assets including customer relationships and developed technology. This approach determines fair value by estimating after-tax cash flows attributable to these assets over their respective useful lives and then discounting these after-tax cash flows back to a present value. We base our assumptions on estimates of future cash flows, expected growth rates, expected trends in technology, etc. We base the discount rates used to arrive at a present value as of the date of acquisition on the time value of money and certain industry-specific risk factors. We believe the estimated purchased customer relationships, developed technologies, trademark/tradename, patents, non-competition agreements and in-process research and development amounts so determined represent the fair value at the date of acquisition and do not exceed the amount a third-party would pay for the assets.

Intangible assets and goodwill

Intangible assets

Intangible assets with a definite life are amortized over their useful lives using the straight-line method and the amortization expense is recorded within cost of product revenue, research and development and selling, general and administrative expense in the consolidated statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any adverse conditions exist, that would indicate the carrying value of these assets may not be recoverable. More frequent impairment assessments are conducted if certain conditions exist, including a change in the competitive landscape, any internal decisions to pursue new or different technology strategies, a loss of a significant customer, or a significant change in the marketplace, including changes in the prices paid for the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition of the asset. If the estimate of an intangible asset's remaining useful life is changed, the remaining carrying amount of the intangible asset is amortized prospectively over the revised remaining useful life. The Company continues to believe that its definite-lived intangible assets are recoverable at December 31, 2021.

Indefinite-lived intangible assets are tested for impairment at least annually. There has been no impairment of our intangible assets for the periods presented.

Goodwill

We test goodwill for impairment on an annual basis and between annual tests if events and circumstances indicate it is more likely than not that the fair value of a reporting unit is less than its carrying value. Events that would indicate impairment and trigger an interim impairment assessment include, but are not limited to, current economic and market conditions, including a decline in market capitalization, a significant adverse change in legal factors, business climate or operational performance of the business, and an adverse action or assessment by a regulator. Goodwill is tested for impairment as of December 31st of each year, or more frequently as warranted by events or changes in circumstances mentioned above. Accounting guidance also permits an optional qualitative assessment for goodwill to determine whether it is more likely than not that the carrying value of a reporting unit exceeds its fair value. If, after this qualitative assessment, we determine that it is not more likely than not that the fair value of a

reporting unit is less than its carrying amount, then no further quantitative testing would be necessary. A quantitative assessment is performed if the qualitative assessment results in a more likely than not determination or if a qualitative assessment is not performed. The quantitative assessment considers whether the carrying amount of a reporting unit exceeds its fair value, in which case an impairment charge is recorded to the extent the reporting unit's carrying value exceeds its fair value.

The Company operates as one reporting unit. The fair value of the reporting unit is determined using both an income approach and market approach. Our income approach model used for our reporting unit valuation is consistent with that used for our December 31, 2019 goodwill impairment valuation noted above, except that cash flows from the entire business enterprise were used for the reporting unit valuation. Our market approach model estimated the fair value of the reporting unit based on market prices paid in actual precedent transactions of similar businesses and market multiples of guideline public companies. As a result of our 2020 quantitative assessment, we concluded that goodwill was not impaired as of December 31, 2020. During the qualitative assessment of the Company's one reporting unit during the 2021 goodwill impairment testing, it was determined that it was not more likely than not that its fair value was less than its carrying amount. As such, a quantitative impairment assessment was not required as of December 31, 2021. If an event occurs or circumstances change that would more likely than not reduce the fair value of its reporting unit below its carrying value, the Company will evaluate its goodwill for impairment between annual tests.

Accrued liabilities

We estimate accrued liabilities by identifying services performed on our behalf, estimating the level of service performed and determining the associated cost incurred for such service as of each balance sheet date. For example, we would accrue for professional and consulting fees incurred with law firms, audit and accounting service providers and other third-party consultants. These expenses are determined by either requesting those service providers to estimate unbilled services at each reporting date for services incurred or tracking costs incurred by service providers under fixed fee arrangements.

We have processes in place to estimate the appropriate amounts to record for accrued liabilities, which principally involve the applicable personnel reviewing the services provided. In the event that we do not identify certain costs that have begun to be incurred or we under or over-estimate the level of services performed or the costs of such services, the reported expenses for that period may be too low or too high. The date on which certain services commence, the level of services performed on or before a given date, and the cost of such services often require the exercise of judgment. We make these judgments based upon the facts and circumstances known at the date of the financial statements.

A change in the estimated cost or volume of services provided could result in additional accrued liabilities. Any significant unanticipated changes in such estimates could have a significant impact on our accrued liabilities and reported operating results. There have been no material adjustments to our accrued liabilities in any of the periods presented in the accompanying consolidated financial statements.

Debt accounting

Our short-term debt balance is related to our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"), which were issued in July 2019, and are carried at their principal amount less unamortized debt discount. We account for our convertible notes as separate liability and equity components. We estimate the carrying amount of the liability component by estimating the fair value of a similar liability that does not have an associated conversion feature. The Company allocates transaction costs related to the issuance of convertible notes to the liability and equity components using the same proportions as the initial carrying value of the convertible notes. The carrying value of the equity component is calculated by deducting the carrying value of the liability component from the principal amount of the convertible notes as a whole. The difference represents a debt discount that is amortized to interest expense in our consolidated statement of comprehensive income over the term of the convertible notes using the effective interest rate method. We assess the equity classification of the cash conversion feature quarterly. We allocated transaction costs related to the issuance of the 2019 Notes to the liability and equity components using the same proportions as the initial carrying value of the 2019 Notes. In 2022, the Company will adopt Accounting Standards Update No. ("ASU") 2020-06, *"Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40)."* This standard eliminates the liability and equity separation model for convertible instruments with a cash conversion feature. As a result, after adoption, the Company will no longer separately present in equity an embedded conversion feature for the 2019 Notes. Additionally, the embedded conversion feature will no longer be amortized into income as interest expense over the life of the 2019 Notes. The Company is currently evaluating the impact of the adoption of ASU 2020-06 on the Company's consolidated financial statements.

During the fourth quarter of 2021, the closing price of the Company's common stock exceeded 130% of the conversion price of the 2019 Notes for more than 20 trading days of the last 30 consecutive trading days of the quarter. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2022, the quarter immediately following the quarter when the conditions are met, as stated in the terms of the 2019 Notes. Expecting to continue meeting these terms, the Company continues to classify the carrying value of the 2019 Notes as current liabilities on the Company's balance sheet as of December 31, 2021. This classification is reassessed each quarter.

Stock-based compensation

We use the Black-Scholes option pricing model to calculate the fair value of stock option awards on the grant date. The expected term of options granted represents the period of time for which the options are expected to be outstanding and is derived from our historical stock option exercise experience and option expiration data. For purposes of estimating the expected term, we have aggregated all individual option awards into one group, as we do not expect substantial differences in exercise behavior among our employees. The expected volatility is a measure of the amount by which our stock price is expected to fluctuate during the expected term of options granted. We determined the expected volatility based upon the historical volatility of our common stock over a period commensurate with the option's expected term. The risk-free interest rate is the implied yield available on U.S. Treasury zero-coupon issues with a remaining term equal to the option's expected term on the grant date. We have never declared or paid any cash dividends on any of our capital stock and do not expect to do so in the foreseeable future. Accordingly, we use an expected dividend yield of zero to calculate the grant-date fair value of a stock option.

The fair value for stock units, which include restricted stock units and performance stock units, is calculated using the closing price of the Company's common stock on the date of grant. We recognize compensation expense on awards that vest based on service conditions on a straight-line basis over the requisite service period based upon the number of options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted by an amount of estimated forfeitures. We recognize compensation expense on awards that vest based on performance conditions following our assessment of the probability that the performance condition will be achieved over the service period. Forfeitures represent only the unvested portion of a surrendered option. Forfeitures are estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. Based on an analysis of historical data, we have calculated an 8% annual forfeiture rate for non-executive level employees, a 3% annual forfeiture rate for executive level employees, and a 0% forfeiture rate for non-employee members of the Board of Directors, which we believe are reasonable assumptions to estimate forfeitures. However, the estimation of forfeitures requires significant judgment and, to the extent actual results or updated estimates differ from our current estimates, a cumulative adjustment to stock-based compensation expense will be recorded in the period estimates are revised.

For the years ended December 31, 2021, 2020 and 2019, we recorded stock-based compensation expense of $27.5 million, $17.0 million and $12.8 million, respectively, for share-based awards granted under all of the Company's stock plans.

As of December 31, 2021, there was $59.2 million of total unrecognized compensation cost related to unvested share-based awards. This cost is expected to be recognized over a weighted average remaining requisite service period of 3.16 years. We expect 1,953,733 unvested options and stock units to vest over the next five years.

Income taxes

Deferred taxes are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect in the years in which the differences are expected to reverse. Valuation allowances are provided, if, based upon the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized. We account for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The evaluation of uncertain tax positions is based on 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, new audit activity and changes in facts or circumstances related to a tax position. We evaluate our tax position on a quarterly basis. We also accrue for potential interest and penalties related to unrecognized tax benefits in income tax expense.

In addition, we are subject to the continual examination of our income tax returns by the U.S. Internal Revenue Service ("IRS") and other domestic and foreign tax authorities. We expect future examinations to focus on our intercompany transfer pricing practices as well as other matters. We regularly assess the likelihood of outcomes resulting from these examinations to determine the adequacy of our provision for income taxes and have reserved for potential adjustments that may result from such examinations. We believe such estimates to be reasonable; however, the final determination of any of these examinations could significantly impact the amounts provided for income taxes in our consolidated financial statements.

Recent accounting standards update

See Note 2, *"Summary of Significant Accounting Policies – Recent Accounting Standards Updates,"* to our consolidated financial statements included in this report for more information.

Results of Operations

The following discussion of the financial condition and results of operations should be read in conjunction with the accompanying consolidated financial statements and the related footnotes thereto.

Revenues

Total revenues for years ended December 31, 2021, 2020 and 2019 were comprised of the following:

	For the Years Ended December 31,			2021 vs. 2020		2020 vs. 2019	
	2021	2020	2019	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Revenue:							
Product	$ 670,319	$ 366,136	$ 270,097	$ 304,183	83.1%	$ 96,039	35.6%
Royalty and other	215	124	148	91	73.4%	(24)	(16.2)%
Total revenue	$ 670,534	$ 366,260	$ 270,245	$ 304,274	83.1%	$ 96,015	35.5%

Product revenues

Since 2016, we have been increasingly focused on selling our products directly to customers in the pharmaceutical industry and to our contract manufacturers. These direct sales have increased to 83.1% of our total product revenue during 2021 from 78.0% of our total product revenue in 2020. We expect that direct sales will continue to account for an increasing percentage of our product revenues, as the largest customer of our protein products diversified its supply chain in 2020. Sales of our bioprocessing products can be impacted by the timing of large-scale production orders and the regulatory approvals for such antibodies, which may result in significant quarterly fluctuations.

Product revenues were comprised of the following:

	For the Years Ended December 31,		
	2021[1]	2020[2]	2019[3]
	(Amounts in thousands)		
Filtration products	$ 403,505	$ 174,851	$ 119,464
Chromatography products[4]	91,037	70,677	60,662
Process analytics products	48,019	33,346	16,405
Proteins products[4]	123,707	83,317	69,004
Other	4,051	3,945	4,562
Total product revenue	$ 670,319	$ 366,136	$ 270,097

(1) 2021 revenue for filtration products includes revenue related to Polymem from July 1, 2021 as well as BioFlex Solutions LLC ("BioFlex") and Newton T&M Corp ("NTM") from December 16, 2021 through December 31, 2021. 2021 revenue for proteins products includes revenue related to Avitide from September 20, 2021 through December 31, 2021.

(2) 2020 revenue for filtration products includes revenue related to Engineered Molding Technology LLC ("EMT") from July 13, 2020, Non-Metallic Solutions, Inc. ("NMS") from October 20, 2020 and ARTeSYN from December 3, 2020 through December 31, 2020.

(3) 2019 revenue includes process analytics revenue related to C Technologies from June 1, 2019 through December 31, 2019.

(4) Revised 2020 and 2019 revenue in the table above reflects a shift in product revenue from chromatography products to proteins products of approximately $3 million and $4 million, respectively. These changes are consistent with the current year presentation of product revenue.

Revenue from our filtration products includes the sale of our XCell ATF® systems and consumables, KrosFlo® filtration products, SIUS® filtration products, the fluid management products offered by BioFlex, which we acquired on December 16, 2021, the hollow fiber ("HF") membrane technology offered by Polymem, which we acquired on July 1, 2021, the silicone-molded products offered by EMT, which we acquired on July 13, 2020 and the products offered by NMS and ARTeSYN, which were both acquired during the

fourth quarter of 2020. Revenue from our chromatography products includes the sale of our OPUS chromatography columns, chromatography resins and ELISA test kits as well as sales of products offered by Avitide, which we acquired on September 20, 2021. Revenue from protein products includes the sale of our Protein A ligands and cell culture growth factors. Revenue from our process analytics products includes the sale of our SoloVPE, FlowVPE and FlowVPX systems, consumables and service. Other revenue primarily consists of revenue from the sale of our operating room products to hospitals as well as freight revenue.

For 2021, product revenue increased by $304.2 million, or 83.1%, as compared to 2020 with exceptional robust demand for our filtration, chromatography, process analytics and proteins products. The increase is due to the continued adoption of our products by key bioprocessing customers across all our key product lines. Beginning in the second quarter of 2020, we experienced an increase in overall sales as a result of accelerated demand across all our franchises due to the critical needs of customers working on COVID-19 vaccines and therapeutics. In addition, during 2021 we saw an increase in demand for C&GT and monoclonal antibody manufacturing. Revenue for 2021 also increased due to revenue from Polymem, Avitide, BioFlex and NTM, which we acquired during the second half of 2021. During 2021, we also include twelve months of revenue from our acquisitions executed in the second half of 2020, EMT, NMS and ARTeSYN, for which there was only a partial year of revenue commencing from the respective acquisition dates in 2020, through December 31, 2020.

Sales of our bioprocessing products are impacted by the timing of orders, development efforts at our customers or end-users and regulatory approvals for biologics that incorporate our products, which may result in significant quarterly fluctuations. Such quarterly fluctuations are expected, but they may not be predictive of future revenue or otherwise indicate a trend.

For 2020, product revenue increased by $96.0 million, or 35.6%, as compared to 2019. The increase was due to the continued adoption of our products by key bioprocessing customers across all our key product lines mentioned above. Beginning in the second quarter of 2020, we experienced an increase in overall sales as a result of accelerated demand, which was from broad-based covering mAb, C&GT and COVID-19 customers working on vaccines and therapeutics. In 2020, we also had good performance from our acquisitions executed in 2019 and 2020. C Technologies revenue increased by $16.9 million in 2020, compared to 2019, as 2020 represented twelve months of ownership of C Technologies, which was acquired in May 2019, compared to only seven months of ownership in 2019. Finally, as a result of our acquisitions of EMT, NMS and ARTeSYN in the second half of 2020, revenue from our filtration products included $6.2 million of additional revenue.

Royalty revenues

Royalty revenues in 2021 and 2020 relate to royalties received from a third-party systems manufacturer associated with our OPUS chromatography columns. Royalty revenues are variable and are dependent on sales generated by our partner.

Costs and operating expenses

Total costs and operating expenses for the years ended December 31, 2021, 2020 and 2019 were comprised of the following:

	For the Years Ended December 31,			2021 vs. 2020		2020 vs. 2019	
	2021	2020	2019	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Cost of product revenue	$ 279,280	$ 156,634	$ 119,099	$ 122,646	78.3%	$ 37,535	31.5%
Research and development	34,274	20,182	19,450	14,092	69.8%	732	3.8%
Selling, general and administrative	183,866	119,621	95,613	64,245	53.7%	24,008	25.1%
Contingent consideration expense	5,865	—	—	5,865	100.0%	—	N/A
Total costs and operating expenses	$ 503,285	$ 296,437	$ 234,162	$ 206,848	69.8%	$ 62,275	26.6%

Cost of product revenue

Cost of product revenue increased $122.6 million, or 78.3%, in 2021, as compared to 2020, due primarily to the increase in product revenue and costs associated with higher product volume. In addition, to support our rapid growth and increased demand for our products, we continue to invest in our manufacturing infrastructure through increased manufacturing headcount and increased occupancy costs. There was an approximately 84% increase in manufacturing headcount from December 31, 2020 to December 31, 2021, which resulted in higher employee-related costs. Our depreciation expense increased as manufacturing equipment was placed in service during 2021. The impact on cost of product revenue from our three acquisitions in 2021 was $7.4 million, which has also contributed to the increase in cost of product revenue as there were no comparable costs for these acquisitions in 2020.

Gross margin was 58.3% in 2021, as compared to 57.2% in 2020. The gross margin in 2021 included $2.1 million of amortization of inventory step-up associated with the Polymem Acquisition and ARTeSYN Acquisition and 2020 included $0.7 million of amortization of inventory step-up associated with the ARTeSYN Acquisition and the acquisition of EMT. Excluding the step-up amortization, gross margin for 2021 and 2020 was 58.7% and 57.4%, respectively. The increase in gross margin, excluding the inventory step-up amortization, in 2021, as compared to 2020, was due primarily to the increase in revenue mentioned above, and favorable product mix, partially offset by an increase in employee costs related to an increase in manufacturing headcount subsequent to December 31, 2020, an increase in occupancy costs due to added capacity in 2021 and an increase in depreciation expense mentioned above. Gross margins may fluctuate in future quarters based on expected production volume and product mix.

For 2020, cost of product revenue increased $37.5 million, or 31.5%, as compared to 2019, due primarily to the increase in product revenue and costs associated with higher product volume. An increase in manufacturing headcount resulted in higher employee-related costs in 2020, compared to 2019. Additional facility costs, including personal protection equipment purchased for essential manufacturing personnel on site to protect against COVID-19, were also incurred during 2020 for which there were no comparable amounts in 2019.

Gross margin was 57.2% in 2020, compared to 55.9% in 2019. The gross margin in 2020 included $0.7 million of amortization of inventory step-up associated with the EMT and ARTeSYN Acquisitions and the gross margin for 2019 included $1.5 million of amortization of inventory step-up associated with the C Technologies Acquisition in May 2019. Excluding the step-up amortization, gross margins in 2020 and 2019 were 57.4% and 56.5%, respectively. The increase in gross margins, excluding the inventory step-up amortization, in 2020, as compared to 2019, was due primarily to the increase in revenue mentioned above, and favorable product mix, partially offset by an increase in manufacturing headcount subsequent to December 31, 2019.

Research and development expenses

Research and development (“R&D”) expenses are related to bioprocessing products, which include personnel, supplies and other research expenses. Due to the size of the Company and the fact that these various programs share personnel and fixed costs, we do not track all of our expenses or allocate any fixed costs by program, and therefore, have not provided historical costs incurred by project.

R&D expenses increased $14.1 million, or 69.8%, during 2021, as compared to 2020. The increase was due to the addition of R&D expenses related to operations of Avitide, Polymem and ARTeSYN, from their respective acquisition dates to December 31, 2021, including a full year of costs related to ARTeSYN programs for which there were costs from one month in 2020. Additionally, R&D costs increased, due to a rise in R&D headcount and the ramp up of project spending for new product development during 2021.

R&D expenses increased $0.7 million, or 3.8% in 2020, as compared to 2019. The increase was primarily due to a $1.1 million increase in C Technologies R&D expenses. C Technologies was acquired on May 31, 2019. Therefore, only seven months of expenses were recognized in 2019, compared to a full 12 months in 2020. The increase was partially offset by a decrease in R&D spending on external projects, as certain R&D process development laboratories were not fully functional for most of 2020 due to COVID-19.

R&D expense also includes investments made to expand our proteins product offering through our development agreement with Navigo Proteins GmbH (“Navigo”). The Company invested $2.3 million in 2021, $0.9 million in 2020 and $1.0 million in 2019 in the form of milestone payments to Navigo.

We expect our R&D expenses in 2022 to modestly increase to support new product development.

Selling, general and administrative expenses

Selling, general and administrative (“SG&A”) expenses include the costs associated with selling our commercial products and costs required to support our marketing efforts, including legal, accounting, patent, shareholder services, amortization of intangible assets and other administrative functions.

During 2021, SG&A costs increased by $64.2 million, or 53.7%, as compared to 2020. The increase is partially due to the continued expansion of our customer-facing activities to drive sales of our bioprocessing products, and the continued buildout of our administrative infrastructure, primarily through increased headcount and increased occupancy costs as well as an increase in depreciation related to assets placed in service during the year, all to support expected future growth. Employee-related costs during 2021, as compared to the same periods in 2020, resulted from the increase in headcount period over period. These costs include stock-based compensation expense, which increased $9.1 million in 2021, as compared to 2020. In addition, SG&A costs

increased in 2021, due to the addition of EMT, NMS and ARTeSYN in the second half of 2020 and the addition of Polymem, Avitide, BioFlex and NTM during the second half of 2021, for which there were no comparable costs in 2020.

For 2020, SG&A costs increased by $24.0 million, or 25.1%, as compared to 2019. The increase was partially due to the continued expansion of our customer-facing activities to drive sales of our bioprocessing products and the continued buildout of our administrative infrastructure, primarily through increased headcount, to support expected future growth. Stock-based compensation expense and other employee-related costs increased in 2020, as compared to 2019, resulting from an increase in headcount and higher share prices period over period. In addition, $4.2 million of the increase in SG&A costs for 2020 was related to the C Technologies operations, which was acquired in May 2019. C Technologies' SG&A costs for 2020 include a full year of costs, compared to only seven months in 2019. With the acquisitions of EMT, NMS and ARTeSYN in 2020, an additional $2.2 million of SG&A costs were included in the consolidated results.

Contingent consideration expense

Contingent consideration expense represents the change in fair value of the contingent consideration obligation included in noncurrent contingent consideration on the consolidated balance sheet as of the end of each period. Re-measurement of the contingent consideration obligation is done each quarter and the carrying value of the obligation is adjusted to the current fair value through our consolidated statement of comprehensive income. We recorded an adjustment to the fair value of the contingent consideration obligation for the year ended December 31, 2021 of $5.9 million.

Other expenses, net

The table below provides detail regarding our other expenses, net:

	For the Years Ended December 31,			2021 vs. 2020		2020 vs. 2019	
	2021	2020	2019	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Investment income	$ 176	$ 1,741	$ 5,324	$ (1,565)	(89.9)%	$ (3,583)	(67.3)%
Loss on conversion of debt	(13)	—	(5,650)	(13)	(100.0)%	5,650	(100.0)%
Interest expense	(12,714)	(12,133)	(9,292)	(581)	4.8%	(2,841)	30.6%
Other expenses	(1,155)	(214)	(314)	(941)	439.7%	100	(31.8)%
Total other expenses, net	$ (13,706)	$ (10,606)	$ (9,932)	$ (3,100)	29.2%	$ (674)	6.8%

Investment income

Investment income includes income earned on invested cash balances. The decrease of $1.6 million in 2021, as compared to 2020, is attributable to a decrease in interest rates on our invested cash balances and to a decrease in our average invested cash balances. In March 2020, in response to the outbreak of COVID-19 and to stay ahead of disruptions and economic slowdown, the Federal Reserve reduced federal funds rates to a range of 0.0% to 0.25%, which will continue to affect our investment income in future periods. We expect investment income to vary based on changes in the amount of funds invested and fluctuation of interest rates.

The decrease of $3.6 million in 2020, as compared to 2019, was also attributable to a decrease in interest rates on our invested cash balances. Higher average invested cash balances during 2020, as compared to 2019 due to the completion of a public offering and the issuance of our 2019 Notes during the third quarter of 2019, partially offset the decrease in interest rates mentioned above.

Loss on conversion of debt

The loss on conversion of debt in 2021 is a result of the settlement of the conversion of $11,000 aggregate principal of our 2019 Notes. We had no loss on conversion of debt in 2020.

The $5.7 million loss on conversion of debt for the year ended December 31, 2019 resulted from the settlement of our outstanding 2.125% Convertible Senior Notes due 2021 (the "2016 Notes") in the third quarter of 2019. The loss represents the difference between (i) the fair value of the liability component and (ii) the sum of the carrying value of the debt component and any unamortized debt issuance costs at the time of settlement.

Interest expense

Interest expense in 2021 and 2020 is primarily from our 2019 Notes. Interest expense, which includes the amortization of debt issuance costs and contractual coupon interest, increased $0.6 million in 2021, as compared to 2020. This is a result of the decrease in the balance of debt issuance costs that are being amortized. As these costs decrease, the carrying value of the debt increases and interest calculated based on the carrying value increases as well.

Interest expense in 2020 was primarily from our 2019 Notes. In 2019, interest expense was from a combination of our 2016 Notes, which were settled during the third quarter of 2019 and our 2019 Notes. Interest expense increased $2.8 million in 2020, as compared to 2019 based on the increase in debt issued from $115.0 million for the 2016 Notes to $287.5 million for the 2019 Notes.

The amortization of debt issuance costs on the 2019 Notes was $11.5 million and $11.0 million in 2021 and 2020, respectively. Amortization of debt issuance costs on the 2019 Notes was $4.7 million in 2019. The amortization of the debt issuance costs on the 2016 Notes was $2.8 million in 2019.

Contractual coupon interest incurred on the 2019 Notes in 2021 and 2020 was $1.1 million in each year. Interest calculated based on the carrying value related to the 2019 Notes for 2019 was $0.5 million. Contractual coupon interest incurred on the 2016 Notes was $1.3 million in 2019. Since the 2016 Notes were settled during July 2019, interest no longer accrued on the 2016 Notes subsequent to their settlement.

Other expenses, net

The change in other expenses, net in 2021, as compared to 2020, is primarily attributable to realized foreign currency losses related to amounts due from non-Swedish krona-based customers and vendors.

The change in other expenses during 2020, as compared to 2019, was primarily attributable to realized foreign currency losses related to amounts due from non-Swedish krona-based customers and vendors. In addition, $0.5 million was included in other expenses in 2019, which represents a bridge loan commitment fee incurred as part of the C Technologies Acquisition.

Income tax provision (benefit)

Income tax provision (benefit) for the years ended December 31, 2021, 2020 and 2019 was as follows:

	For the Years Ended December 31,			2021 vs. 2020		2020 vs. 2019	
	2021	2020	2019	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Income tax provision (benefit)	$ 25,252	$ (709)	$ 4,740	$ 25,961	(3,661.6)%	$ (5,449)	(115.0)%
Effective tax rate	16.4%	(1.2)%	18.1%				

For 2021, we recorded an income tax provision of $25.3 million. The effective tax rate in 2021 was 16.4% and is based upon the estimated income for the year ending December 31, 2021 and the composition of income in different jurisdictions. The increase in effective tax rates was primarily due to higher income before income taxes, lower windfall benefits recognized on stock option exercises and the vesting of stock units, partially offset by lower U.S. taxation of foreign earnings. Our effective tax rate for 2021 was lower than the U.S. statutory rate of 21% primarily due to business tax credits and windfall benefits on stock option exercises and the vesting of stock units.

In 2020, we recorded an income tax benefit of $0.7 million. Our effective tax rate in 2020 was (1.2%) and was based upon the estimated income for the year ending December 31, 2020 and the composition of income in different jurisdictions. Our effective tax rate in 2020 was lower than the U.S. statutory rate of 21% primarily due to windfall benefits on stock option exercises and the vesting of stock units.

For the year ended December 31, 2019, we recorded an income tax provision of approximately $4.7 million. Our effective tax rate was an income tax provision of 18.1% and was based upon the estimated taxable income for the year ending December 31, 2019 and the composition of the taxable income in different jurisdictions. Our effective tax rate was lower than the U.S. statutory rate of 21% due primarily to windfall benefits on stock option exercises and the vesting of restricted stock units and to deductions related to debt extinguishment.

Non-GAAP Financial Measures

We provide non-GAAP adjusted income from operations, non-GAAP adjusted net income and adjusted EBITDA as supplemental measures to GAAP measures regarding our operating performance. These financial measures exclude the impact of certain acquisition related items and, therefore, have not been calculated in accordance with GAAP. A detailed explanation and a reconciliation of each non-GAAP financial measures to its most comparable GAAP financial measures are described below.

We include this financial information because we believe these measures provide a more accurate comparison of our financial results between periods and more accurately reflect how management reviews its financial results. We excluded the impact of certain acquisition related items because we believe that the resulting charges do not accurately reflect the performance of our ongoing operations for the period in which such charges are incurred.

Non-GAAP adjusted income from operations

Non-GAAP adjusted income from operations is measured by taking income from operations as reported in accordance with GAAP and excluding acquisition and integration costs, inventory step-up charges, contingent consideration expense and intangible amortization booked through our consolidated statements of comprehensive income. The following is a reconciliation of income from operations in accordance with GAAP to non-GAAP adjusted income from operations for the years ended December 31, 2021 and 2020:

	For the Years Ended December 31,	
	2021	2020
	(Amounts in thousands)	
GAAP income from operations	$ 167,249	$ 69,823
Non-GAAP adjustments to income from operations:		
Inventory step-up charges	2,130	734
Acquisition and integration costs	18,001	11,465
Contingent consideration expense	5,865	—
Intangible amortization	21,941	16,032
Non-GAAP adjusted income from operations	$ 215,186	$ 98,054

Non-GAAP adjusted net income

Non-GAAP adjusted net income is measured by taking net income as reported in accordance with GAAP and excluding acquisition and integration costs and related tax effects, inventory step-up charges, contingent consideration, intangible amortization and related tax effects, loss on conversion of debt and non-cash interest expense booked through our consolidated statements of comprehensive income. The following is a reconciliation of net income in accordance with GAAP to non-GAAP adjusted net income for the years ended December 31, 2021 and 2020:

	For the Years Ended December 31,			
	2021		2020	
	Amount	Fully Diluted Earnings per Share*	Amount	Fully Diluted Earnings per Share*
	(Amounts in thousands, except per share data)			
GAAP net income	$ 128,291	$ 2.24	$ 59,926	$ 1.11
Non-GAAP adjustments to net income:				
Inventory step-up charges	2,130	0.04	734	0.01
Acquisition and integration costs	18,001	0.31	10,479	0.19
Contingent consideration expense	5,865	0.10	—	—
Intangible amortization	21,941	0.38	16,032	0.30
Loss on conversion of debt	13	0.00	—	—
Non-cash interest expense	11,530	0.20	10,970	0.20
Tax effect on non-GAAP charges	(12,515)	(0.22)	(9,050)	(0.17)
Non-GAAP adjusted net income	$ 175,256	$ 3.06	$ 89,091	$ 1.65

* Note that earnings per share amounts may not add due to rounding.

Adjusted EBITDA

Adjusted EBITDA is measured by taking net income as reported in accordance with GAAP, excluding investment income, interest expense, taxes, depreciation and intangible amortization, and excluding acquisition and integration costs, inventory step-up charges, contingent consideration and loss on conversion of debt booked through our consolidated statements of comprehensive income. The following is a reconciliation of net income in accordance with GAAP to adjusted EBITDA for years ended December 31, 2021 and 2020:

	For the Years Ended December 31,	
	2021	2020
	(Amounts in thousands)	
GAAP net income	$ 128,291	$ 59,926
Non-GAAP EBITDA adjustments to net income:		
Investment income	(176)	(1,741)
Interest expense	12,714	12,133
Income tax provision (benefit)	25,252	(709)
Depreciation	16,395	10,888
Amortization	22,052	16,143
EBITDA	204,528	96,640
Other non-GAAP adjustments:		
Inventory step-up charges	2,130	734
Acquisition and integration costs	18,001	10,479
Contingent consideration expense	5,865	—
Loss on conversion of debt	13	—
Adjusted EBITDA	$ 230,537	$ 107,853

Liquidity and Capital Resources

We have financed our operations primarily through revenues derived from product sales, the issuance of the 2016 Notes in May 2016 and our 2019 Notes in July 2019 and the issuance of common stock in our December 2020, July 2019 and May 2019 public offerings. Our revenue for the foreseeable future will primarily be limited to our bioprocessing product revenue.

At December 31, 2021, we had cash and cash equivalents of $603.8 million compared to cash and cash equivalents of $717.3 million at December 31, 2020. There were no restrictions on cash as of December 31, 2021.

On December 8, 2020, the Company completed a public offering in which 1,725,000 shares of its common stock, including the underwriters' full exercise of an option to purchase up to an additional 225,000 shares, were sold to the public at a price of $181.00 per share. The total proceeds received by the Company from this offering, net of underwriting discounts and commissions and other estimated offering expenses payable by the Company, were approximately $297.8 million.

In 2021 we acquired three companies for an aggregate of $149.9 million in cash, net of cash acquired. In connection with the acquisitions, the Company has an obligation to pay up to $62.5 million (undiscounted) in contingent consideration earnout payments in cash over a three-year performance period beginning January 1, 2022 and ending December 31, 2024. See Note 2, *"Fair Value Measurements,"* and Note 4, *"Acquisitions,"* for additional information. In 2020, we acquired three companies for an aggregate of $175.0 million in cash, net of cash acquired. All obligations related to these acquisitions have been settled.

We acquired C Technologies on May 31, 2019 for $239.9 million in cash and shares of our common stock. The C Technologies Acquisition was funded through payment of approximately $195.0 million in cash and issuance of 779,221 unregistered shares of the Company's common stock totaling $53.9 million.

On July 19, 2019, the Company completed a public offering in which 1,587,000 shares of its common stock, including the underwriters' full exercise of an option to purchase an additional 207,000 shares, were sold to the public at a price of $87.00 per share for $131.1 million in net proceeds to the Company, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company (the "July Stock Offering").

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of 2019 Notes, which includes the underwriters' exercise in full of an option to purchase an additional $37.5 million aggregate principal amount of 2019 Notes (the "Notes Offering" and, together with the July Stock Offering, the "Offerings"). The net proceeds of the Notes Offering, after deducting underwriting discounts and commissions and other offering expenses payable by the Company, were $278.5 million. See Note 13, *"Convertible Senior Notes,"* included in this report for more information on this transaction.

On May 3, 2019, the Company completed a public offering in which 3,144,531 shares of its common stock, including the underwriters' full exercise of an option to purchase up to an additional 410,156 shares, were sold to the public at a price of $64.00 per share. The total proceeds received by the Company from this offering, net of underwriting discounts and commissions and other estimated offering expenses payable by the Company, totaled approximately $189.6 million. Proceeds from this public offering were partially used to fund the C Technologies Acquisition on May 31, 2019.

During the fourth quarter of 2021, the closing price of the Company's common stock exceeded 130% of the conversion price of the 2019 Notes for more than 20 trading days of the last 30 consecutive trading days of the quarter. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2022 per the First Supplemental Indenture underlying the 2019 Notes. The 2019 Notes have a face value of $287.5 million and a carrying value of $255.3 million. The Company expects to continue meeting these terms and has again classified the carrying value of the 2019 Notes as current liabilities on the Company's balance sheet as of December 31, 2021 and 2020. As of the date of this filing, the Company has received requests to convert $13,000 aggregate principal amount of 2019 Notes of which $11,000 have been settled and $2,000 still remain in the Observation Period (as defined by the First Supplemental Indenture dated as of December 31, 2021), which the Company will settle during the first quarter of 2022. We intend to pay or deliver, as the case may be, the settlement amount to be determined – paying the amount in excess of the aggregate principal portion of the converted notes in shares of our common stock.

In 2021, we had lease arrangements for certain equipment and facilities including corporate and manufacturing sites. As of December 31, 2021, the Company had fixed lease payment obligations of $110.8 million, with $8.3 million payable within 12 months. See Note 5, *"Leases"*, for additional information.

In 2021, we had other purchase obligations primarily consisting of purchase commitments with certain vendors and open purchase orders for the procurement of raw materials for manufacturing. As of December 31, 2021, the Company had other purchase obligations of $148.7 million, payable within 12 months.

Cash flows

	For the Years Ended December 31,			FY21 vs FY20	FY20 vs FY19
	2021	2020	2019	$ Change	$ Change
	(Amounts in thousands)				
Cash provided by (used in):					
Operating activities	$ 119,016	$ 62,625	$ 67,216	$ 56,391	$ (4,591)
Investing activities	(221,169)	(201,385)	(205,308)	(19,784)	3,923
Financing activities	961	305,916	484,867	(304,955)	(178,951)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(12,286)	12,729	(3,190)	(25,015)	15,919
Net (decrease) increase in cash, cash equivalents and restricted cash	$ (113,478)	$ 179,885	$ 343,585	$ (293,363)	$ (163,700)

Operating activities

For 2021, our operating activities provided cash of $119.0 million reflecting net income of $128.3 million and non-cash charges totaling $92.9 million primarily related to depreciation, amortization, inventory step-up amortization, contingent consideration expense, deferred income taxes, amortization of debt discount and issuance costs and stock-based compensation charges. An increase in accounts receivable consumed $46.5 million of cash and was primarily driven by the 83.1% year-to-date increase in total revenues. An increase in inventory manufactured of $89.8 million supports expected increases in future revenue and an increase in prepaid expenses, specifically insurance and taxes of $10.2 million. The increases in accounts receivable, prepaid expenses and inventory manufactured are offset by an increase in accounts payable of $19.5 million, which is primarily due to increased inventory purchases to support customer orders, an increase in accrued liabilities of $23.2 million, which was due to an increase in the accrual

for expected costs, taxes payable, and to a decrease in deferred revenue related to products shipped during the first half of 2021. The remaining net cash used in operating activities resulted from unfavorable changes in various other working capital accounts.

For 2020, our operating activities provided cash of $62.6 million reflecting net income of $59.9 million and non-cash charges totaling $51.3 million primarily related to depreciation, amortization, non-cash interest expense, deferred taxes and stock-based compensation charges. An increase in accounts receivable consumed $21.0 million of cash and was primarily driven by the 35.5% year-to-date increase in total revenues and an increase in inventory manufactured of $29.3 million to support expected continued growth in future revenues. In addition, $4.9 million was consumed for increases in prepaid expenses for annual software and network contracts, as well as the renewal of the Company's global insurance policies. These were offset by an increase in accounts payable and accrued liabilities of $3.5 million due primarily to increased inventory purchases to support customer orders and year-end tax adjustments, offset by payment of acquisition-related bonuses for C Technologies during the second quarter of 2020. The remaining cash source of operating activities resulted from favorable changes in various other working capital accounts.

For 2019, our operating activities provided cash of $67.2 million reflecting net income of $21.4 million and non-cash charges totaling $46.9 million primarily related to depreciation, amortization, non-cash interest expense, deferred taxes, loss on conversion of debt and stock-based compensation charges. An increase in accounts receivable consumed $7.7 million of cash and was primarily driven by the 39% year-to-date increase in revenues and an increase in inventory consumed $9.3 million to support future revenue, due to the addition of C Technologies on May 31, 2019. These were offset by an increase in accounts payable and accrued liabilities of $13.8 million due to the addition of C Technologies and a decrease in unbilled receivables of $2.1 million. The remaining cash used in operating activities resulted from unfavorable changes in various other working capital accounts.

Investing activities

Our investing activities consumed $221.2 million of cash during 2021. We used $149.9 million in cash (net of cash received) for the acquisitions of Polymem, Avitide, BioFlex and NTM, in the aggregate. Capital expenditures consumed $71.3 million as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $4.2 million represented capitalized costs related to our internal-use software.

Our investing activities consumed $201.4 million of cash during 2020. We used $175.0 million in cash (net of cash received) for the EMT, NMS and ARTeSYN Acquisitions. Capital expenditures consumed $26.3 million as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $3.9 million represented capitalized costs related to our internal-use software.

Our investing activities consumed $205.3 million of cash during 2019. We used $182.2 million in cash (net of cash received) for the C Technologies Acquisition on May 31, 2019. Capital expenditures consumed $23.2 million as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $4.7 million represented capitalized costs related to our internal-use software.

Financing activities

In 2021, cash provided by financing activities of $1.0 million included proceeds from stock option exercises, offset by cash disbursed in relation to shares withheld to cover employee income taxes due upon the vesting and release of restricted stock units. Proceeds from stock option exercises during 2021 were $3.9 million offset by $2.9 million of cash disbursed to pay tax obligation on the vesting of restricted stock units.

In 2020, cash provided by financing activities of $305.9 million included $297.8 million from the issuance of our common stock resulting from our public offerings completed in December 2020. Proceeds from stock option exercises during 2020 were $8.2 million.

In 2019, cash provided by financing activities of $484.9 million included $320.7 million from the issuance of our common stock resulting from our public offerings completed in May and July 2019. In addition, in July 2019 the Company issued $287.5 million aggregate principal amount of the 2019 Notes for net proceeds of $278.5 million. Proceeds from stock option exercises during 2019 were $1.2 million. Offsetting these activities was $115.0 million of cash utilized by the Company in July 2019 to settle the 2016 Notes.

Effect of exchange rate changes on cash, cash equivalents and restricted cash

The effect of exchange rate changes on cash during 2021 is a result of the weakening of the Swedish krona against the U.S. Dollar by 10% and the weakening of the Euro against the U.S. Dollar by 8%.

Off-Balance Sheet Arrangements

We do not have any special purpose entities or off-balance sheet financing arrangements.

Capital Requirements

Our future capital requirements will depend on many factors, including the following:

- the expansion of our bioprocessing business;
- the ability to sustain sales and profits of our bioprocessing products;
- our ability to acquire additional bioprocessing products;
- the scope of and progress made in our research and development activities;
- the extent of any share repurchase activity; and
- the success of any proposed financing efforts.

Absent acquisitions of additional products, product candidates or intellectual property, we believe our current cash balances are adequate to meet our cash needs for at least the next 24 months. We expect operating expenses in 2022 to increase as we continue to expand our bioprocessing business. We expect to incur continued spending related to the development and expansion of our bioprocessing product lines and expansion of our commercial capabilities for the foreseeable future. Our future capital requirements may include, but are not limited to, purchases of property, plant and equipment, the acquisition of additional bioprocessing products and technologies to complement our existing manufacturing capabilities, and continued investment in our intellectual property portfolio.

We plan to continue to invest in our bioprocessing business and in key R&D activities associated with the development of new bioprocessing products. We actively evaluate various strategic transactions on an ongoing basis, including licensing or acquiring complementary products, technologies or businesses that would complement our existing portfolio. We continue to seek to acquire such potential assets that may offer us the best opportunity to create value for our shareholders. In order to acquire such assets, we may need to seek additional financing to fund these investments. If our available cash balances and anticipated cash flow from operations are insufficient to satisfy our liquidity requirements, for example, due to acquisition-related financing needs or lower demand for our products, among potential other events, we may seek to sell common or preferred equity or convertible debt securities, enter into a credit facility or another form of third-party funding, or seek other debt funding. The sale of equity and convertible debt securities may result in dilution to our stockholders, and those securities may have rights senior to those of our common shares. If we raise additional funds through the issuance of preferred stock, convertible debt securities or other debt financing, these securities or other debt could contain covenants that would restrict our operations. Any other third-party funding arrangement could require us to relinquish valuable rights. We may require additional capital beyond our currently anticipated amounts. Additional capital may not be available on reasonable terms, if at all.

Net Operating Loss Carryforwards

At December 31, 2021, the Company had federal net operating loss carryforwards of $46.2 million, state net operating loss carryforwards of $4.0 million, and foreign net operating loss carryforwards of $6.1 million. Federal net operating loss carryforwards of $19.1 million will expire at various dates through 2037. The total state net operating loss carryforwards will expire at various dates through 2041, while the foreign net operating loss carryforwards do not expire. The other $27.1 million of the federal net operating loss carryforwards have unlimited carryforward periods. We had business tax credits carryforwards of $2.7 million available to reduce future federal and state income taxes, if any. The business tax credits carryforwards will continue to expire at various dates through December 2041. Net operating loss carryforwards and available tax credits are subject to review and possible adjustment by the Internal Revenue Service, state and foreign jurisdictions and may be limited in the event of certain changes in the ownership interest of significant stockholders.

Foreign Earnings

As of December 31, 2021, the Company has accumulated undistributed earnings generated by our foreign subsidiaries of approximately $93.3 million. Because $5.7 million of such earnings have previously been subject to the one-time transition tax on foreign earnings required by the 2017 Tax Cuts and Jobs Act enacted in December 2017, any additional taxes due with respect to such earnings or the excess of the amount for financial reporting over the tax basis of our foreign investments would generally be limited to foreign and state taxes. At December 31, 2021, we have not provided for taxes on outside basis differences of our foreign subsidiaries, as we have the ability and intent to indefinitely reinvest the undistributed earnings of our foreign subsidiaries, and there are no needs for such earnings in the United States that would contradict our plan to indefinitely reinvest.

Effects of Inflation

Our assets are primarily monetary, consisting of cash and cash equivalents. Because of their liquidity, these assets are not directly affected by inflation. Since we intend to retain and continue to use our equipment, furniture, fixtures and office equipment, computer hardware and software and leasehold improvements, we believe that the incremental inflation related to replacement costs of such items will not materially affect our operations. However, the rate of inflation affects our expenses, such as those for employee compensation and contract services, which could increase our level of expenses and the rate at which we use our resources.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We are exposed to market risk in the ordinary course of our business. Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. Our market risk exposure is primarily a result of fluctuations in interest rates and foreign currency exchange rates.

Interest Rate Risk

We have historically held investments in commercial paper, U.S. Government and agency securities as well as corporate bonds and other debt securities. As a result, we have been exposed to potential loss from market risks that may occur as a result of changes in interest rates, changes in credit quality of the issuer or otherwise. We do not have any such investments as of December 31, 2021. As a result, a hypothetical 100 basis point increase in interest rates would have no effect on our cash position as of December 31, 2021.

We generally place our marketable security investments in high quality credit instruments, as specified in our investment policy guidelines. We believe that the conservative nature of our investments mitigates our interest rate exposure, and our investment policy limits the amount of our credit exposure to any one issue, issuer (with the exception of U.S. agency obligations) and type of instrument. We do not expect any material loss from our marketable security investments and therefore believe that our potential interest rate exposure is limited.

Foreign Exchange Risk

The reporting currency of the Company is U.S. Dollars, and the functional currency of each of our foreign subsidiaries is its respective local currency. Our foreign currency exposures include the Swedish krona, Euro, British pound, Chinese yuan, Japanese yen, Singapore dollar, South Korean won and Indian rupee; of these, the primary foreign currency exposures are the Swedish kronor, Euro and British pound. Exchange gains or losses resulting from the translation between the transactional currency and the functional currency are included in net income. Fluctuations in exchange rates may adversely affect our results of operations, financial position and cash flows. We currently do not seek to hedge this exposure to fluctuations in exchange rates.

Although a majority of our contracts are denominated in U.S. Dollars, 37.5% and 29.8% of total revenues during 2021 and 2020, respectively, were denominated in foreign currencies while 27.1% and 6.8% of our costs and expenses during 2021 and 2020, respectively, were denominated in foreign currencies, primarily operating expenses associated with cost of revenue, sales and marketing and general and administrative. In addition, 17.7% and 21.8% of our consolidated tangible assets were subject to foreign currency exchange fluctuations as of each of December 31, 2021 and 2020, respectively, while 9.6% and 5.7% of our consolidated liabilities were exposed to foreign currency exchange fluctuations as of each of December 31, 2021 and 2020, respectively.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

Financial statements and supplementary data required by Item 8 are set forth at the pages indicated in Item 15(a) below and are incorporated herein by reference.

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

None.

ITEM 9A. CONTROLS AND PROCEDURES

(a) Disclosure Controls and Procedures.

The Company's management, with the participation of our principal executive officer and principal financial officer, has evaluated the effectiveness of the Company's disclosure controls and procedures (as defined in Rules 13a-15(e) or 15d-15(e) under the Exchange Act and as required by paragraph (b) of Rules 13a-15 or 15d-15 under the Exchange Act) as of the end of the period covered by this report. Based on such evaluation, our principal executive officer and principal financial officer have concluded that, as of the end of such period, the Company's disclosure controls and procedures were effective at the reasonable assurance level.

(b) Report of Management on Internal Control Over Financial Reporting.

Management of the Company is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rule 13a-15(f) and 15d-15(f) under the Exchange Act as a process designed by, or under the supervision of, the Company's principal executive and principal financial officers and effected by the Company's Board of Directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles and includes those policies and procedures that:

- pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the Company;
- 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
- 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.

Management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2021. In making this assessment, management used the criteria established in *Internal Control – Integrated Framework*, issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (COSO).

We acquired Polymem S.A. ("Polymem") on July 1, 2021, Avitide Inc. ("Avitide") on September 20, 2021 and BioFlex Solutions LLC ("BioFlex") and Newton T&M Corp. ("NTM") on December 16, 2021. The financial results of each of these acquisitions are included in our audited consolidated financial statements as of December 31, 2021. The Company's consolidated total assets as of December 31, 2021 includes $52.4 million, $253.3 million and $33.4 million from the Polymem, Avitide, and NTM and BioFlex businesses, respectively. The Company's consolidated revenue for the year ended December 31, 2021 includes $2.3 million, $1.3 million and $0.1 million, from Polymem, Avitide, NTM and Bioflex businesses, respectively. As these acquisitions occurred in the third or fourth quarter of 2021, the scope of our assessment of our internal control over financial reporting does not include these acquisitions. These exclusions are in accordance with the SEC's general guidance that an assessment of a recently acquired business may be omitted from our scope in the year of such acquisition.

In connection with our initiative to integrate and enhance our global information technology systems and business processes, we continued the phased implementation of a new enterprise resource planning ("ERP") system. The implementation of the ERP system is done in phases and will continue until all current and future subsidiaries are using it. The third phase of this project was completed during the second quarter of 2021. As a result of this implementation, we modified certain existing internal controls over financial reporting as of December 31, 2021.

Other than the foregoing, there have been no changes in our internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Securities Exchange Act Rule 13a-15 or Rule 15d-15 that occurred in the three months ended December 31, 2021 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Subject to the foregoing, based on this assessment, our management concluded that, as of December 31, 2021, our internal control over financial reporting is effective based on those criteria. Ernst & Young LLP, the independent registered public accounting firm that audited our financial statements included in this Form 10-K, has issued an attestation report on our internal control over financial reporting as of December 31, 2021.

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

(c) Attestation Report of the Independent Registered Public Accounting Firm.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Repligen Corporation:

Opinion on Internal Control over Financial Reporting

We have audited Repligen Corporation's internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Repligen Corporation (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on the COSO criteria.

As indicated in the accompanying Report of Management on Internal Control Over Financial Reporting, management's assessment of and conclusion on the effectiveness of internal control over financial reporting did not include the internal controls of Polymem S.A. ("Polymem"), Avitide, Inc. ("Avitide"), Newton T&M Corp ("NTM") and Bio-Flex Solutions, LLC ("Bioflex"), which are included in the 2021 consolidated financial statements of the Company and constituted $52.4 million, $253.3 million and $33.4 million of total assets, respectively, as of December 31, 2021, and $2.3 million, $1.3 million and $0.1 million of revenues, respectively, for the year to date 2021. Our audit of internal control over financial reporting of the Company also did not include an evaluation of the internal control over financial reporting of Polymem, Avitide, NTM and Bioflex.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2021 and 2020, the related consolidated statements of comprehensive income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2021, and the related notes and our report dated February 17, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

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

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

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

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

/s/ Ernst & Young LLP

Boston, Massachusetts
February 17, 2022

(d) Changes in Internal Control Over Financial Reporting

Other than the acquisition of Bioflex and NTM mentioned above, there have been no changes in our internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Securities Exchange Act Rule 13a-15 or Rule 15d-15 that occurred in the three months ended December 31, 2021 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

Pursuant to General Instructions G to Form 10-K, the information required for Part III, Items 10, 11, 12, 13 and 14, is incorporated herein by reference from the Company's proxy statement for the 2022 Annual Meeting of Stockholders.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

The following documents are filed as part of this Form 10-K:

(a) (1) *Financial Statements*:

The financial statements required by this item are submitted in a separate section beginning on page 64 of this report, as follows:

(a) (2) *Financial Statement Schedules*:

None.

(a) (3) *Exhibits*:

The Exhibits which are filed as part of this Form 10-K or which are incorporated by reference are set forth in the Exhibit Index hereto.

EXHIBIT INDEX

Exhibit Number	Document Description
2.1#	Stock Purchase Agreement, dated April 25, 2019, by and among Repligen Corporation, C Technologies and Craig Harrison (filed as Exhibit 2.1 to Repligen Corporation's Current Report on Form 8-K filed on April 26, 2019 and incorporated herein by reference).
3.1	Restated Certificate of Incorporation dated June 30, 1992, as amended September 17, 1999 (filed as Exhibit 3.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended September 30, 1999 and incorporated herein by reference).
3.2	Certificate of Amendment to the Certificate of Incorporation of Repligen Corporation, effective as of May 16, 2014 (filed as Exhibit 3.1 to Repligen Corporation's Current Report on Form 8-K filed on May 19, 2014 and incorporated herein by reference).
3.3	Third Amended and Restated Bylaws (filed as Exhibit 3.1 to Repligen Corporation's Current Report on Form 8-K filed on January 28, 2021 and incorporated herein by reference).
4.1	Specimen Stock Certificate (filed as Exhibit 4.1 to Repligen Corporation's Annual Report on Form 10-K for the year ended March 31, 2002 and incorporated herein by reference).
4.2	Base Indenture, dated as of July 19, 2019, by and between Repligen Corporation and Wilmington Trust, National Association (filed as Exhibit 4.1 to Repligen Corporation's Current Report on Form 8-K filed on July 22, 2019 and incorporated herein by reference).
4.3	First Supplemental Indenture, dated as of July 19, 2019, by and between Repligen Corporation and Wilmington Trust, National Association (filed as Exhibit 4.2 to Repligen Corporation's Current Report on Form 8-K filed on July 22, 2019 and incorporated herein by reference).
4.4	Form of 0.375% Convertible Senior Note due 2024 (included in Exhibit 4.3).
4.5	Description of Certain Registrant's Securities (filed as Exhibit 4.5 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2019 and incorporated by reference).
10.1*	Repligen Executive Incentive Compensation Plan (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on December 14, 2005 and incorporated herein by reference).
10.2*	Second Amended and Restated 2001 Repligen Corporation Stock Plan (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on September 18, 2008 and incorporated herein by reference).
10.3.1*	Amended and Restated 2001 Repligen Corporation Stock Option Plan, Form of Incentive Stock Option Agreement (filed as Exhibit 10.14 to Repligen Corporation's Annual Report on Form 10-K for the year ended March 31, 2005 and incorporated herein by reference).
10.3.2*	Amended and Restated 2001 Repligen Corporation Stock Plan, Form of Restricted Stock Agreement (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on January 9, 2006 and incorporated herein by reference).
10.4	Lease Between Repligen Corporation as Tenant and West Seyon LLC as Landlord, 35 Seyon Street, Waltham, MA (as amended to date) (filed as Exhibit 10.4 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2019 and incorporated herein by reference).

10.5#	Strategic Supplier Alliance Agreement dated January 28, 2010 by and between Repligen Corporation and GE Healthcare Bio-Sciences AB (as amended to date) (filed as Exhibit 10.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2016 and incorporated herein by reference).
10.6*	Repligen Corporation Amended and Restated 2012 Stock Option and Incentive Plan (filed as Exhibit 99.1 to Repligen Corporation's Form S-8 filed on June 2, 2014 and incorporated herein by reference).
10.7*	Letter Agreement, dated as of June 10, 2014, by and between Repligen Corporation and Jon K. Snodgres (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on July 15, 2014 and incorporated herein by reference).
10.8*	Repligen Corporation Amended and Restated Non-Employee Directors' Compensation Policy (filed as Exhibit 10.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2021 and incorporated herein by reference).
10.9	Form of Indemnification Agreement (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on May 12, 2016 and incorporated herein by reference).
10.10	Lease Agreement, dated February 6, 2018, by and between Repligen Corporation and U.S. REIF 111 Locke Drive Massachusetts, LLC (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on February 8, 2018 and incorporated herein by reference).
10.11*	2018 Repligen Corporation Stock Option and Incentive Plan (filed as Exhibit 10.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 and incorporated herein by reference).
10.12*	Letter Agreement, dated as of September 3, 2016 by and between Repligen Corporation and Ralf Kuriyel (filed as Exhibit 10.17 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2018 and incorporated herein by reference).
10.13*	Repligen Corporation Named Executive Officer Severance and Change in Control Plan, effective as of June 13, 2019 (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on June 19, 2019 and incorporated herein by reference).
10.14*	Second Amended and Restated Employment Agreement, dated as of June 15, 2019, by and between Repligen Corporation and Tony J. Hunt (filed as Exhibit 10.2 to Repligen Corporation's Current Report on Form 8-K filed on June 19, 2019 and incorporated herein by reference).
10.15	First Amendment to Lease Agreement, dated as of July 7, 2020 by and between Repligen Corporation and U.S. REIF 111 Locke Drive Massachusetts, LLC (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on July 10, 2020 and incorporated herein by reference).
10.16*	Repligen Corporation 2018 Stock Option and Incentive Plan, Sub-Plan for French-Qualified Restricted Stock Units (filed as Exhibit 10.1 to Repligen Corporation's Form 10-Q for the quarter ended June 30, 2021 and incorporated herein by reference).
21.1+	Subsidiaries of the Registrant.
23.1+	Consent of Ernst & Young LLP, Independent Registered Accounting Firm.
24.1+	Power of Attorney (included on signature page).
31.1+	Rule 13a-14(a)/15d-14(a) Certification.
31.2+	Rule 13a-14(a)/15d-14(a) Certification.

32.1+	Certification Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS+	Inline XBRL Instance Document-the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH+	Inline XBRL Taxonomy Extension Schema Document.
101.CAL+	Inline XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF+	Inline XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB+	Inline XBRL Taxonomy Extension Label Linkbase Document.
101.PRE+	Inline XBRL Taxonomy Extension Presentation Linkbase Document.
104+	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101.*).

Confidential treatment obtained as to certain portions.
* Management contract or compensatory plan or arrangement.
+ Filed electronically herewith.

The exhibits listed above are not contained in the copy of the Annual Report on Form 10-K distributed to stockholders. Upon the request of any stockholder entitled to vote at the 2022 Annual Meeting, the Registrant will furnish that person without charge a copy of any exhibits listed above. Requests should be addressed to Repligen Corporation, 41 Seyon Street, Waltham, MA 02453.

ITEM 16. 10-K SUMMARY

We may voluntarily include a summary of information required by Form 10-K under Item 16. We have elected not to include such summary information.

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.

REPLIGEN CORPORATION

Date: February 17, 2022

By: /S/ TONY J. HUNT

Tony J. Hunt
President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below hereby makes, constitutes and appoints Tony J. Hunt and Jon K. Snodgres with full power to act without the other, his true and lawful attorney-in-fact and agent, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities to sign any or all amendments to this Form 10-K, and to file the same with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorney-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorney-in-fact and agents of any of them, or any substitute or substitutes, lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/S/ TONY J. HUNT **Tony J. Hunt**	President, Chief Executive Officer and Director (Principal executive officer)	February 17, 2022
/S/ JON K. SNODGRES **Jon K. Snodgres**	Chief Financial Officer (Principal financial and accounting officer)	February 17, 2022
/S/ KAREN DAWES **Karen Dawes**	Chairperson of the Board	February 17, 2022
/S/ NICOLAS M. BARTHELEMY **Nicolas M. Barthelemy**	Director	February 17, 2022
/S/ CARRIE EGLINTON MANNER **Carrie Eglinton Manner**	Director	February 17, 2022
/S/ ROHIN MHATRE **Rohin Mhatre**	Director	February 17, 2022
/S/ GLENN P. MUIR **Glenn P. Muir**	Director	February 17, 2022
/S/ THOMAS F. RYAN, JR. **Thomas F. Ryan, Jr.**	Director	February 17, 2022

INDEX TO FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Repligen Corporation:

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Repligen Corporation (the Company) as of December 31, 2021 and 2020, the related consolidated statements of comprehensive income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2021, and the related notes (collectively referred to as the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 17, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

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

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

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

Accounting for acquisitions

Description of the Matter

As disclosed in Note 4 to the consolidated financial statements, during 2021, the Company completed three acquisitions for total aggregate consideration of approximately $321.3 million, net of cash acquired. The most significant of these was the acquisition of Avitide, Inc. for consideration of approximately $245.7 million, net of cash acquired. The transactions were accounted for as business combinations. In the acquisition of Avitide, Inc, the Company has recognized a liability for acquisition consideration that is contingent upon achieving certain performance targets. The Company determines the fair value of these arrangements, both as part of the initial purchase price allocation, and on an ongoing basis each reporting period until the arrangements are settled. As of December 31, 2021, the amount for future estimated contingent consideration is $94.2 million.

Auditing the Company's accounting for its acquisitions was complex due to the significant estimation uncertainty in the Company's determination of the fair value of identified intangible assets of $72.9 million, which principally consisted of customer relationships and developed technology. The significant estimation uncertainty was primarily due to the sensitivity of the respective fair values to underlying assumptions about the future performance of the acquired business. The Company used a discounted cash flow model to measure the customer relationship and developed technology intangible assets. The significant assumptions used to estimate the value of the intangible assets included discount rates and certain assumptions that form the basis of the forecasted results, including revenue growth rates. The significance of the estimations used by management to determine the fair value of contingent consideration was primarily due to the sensitivity of the respective fair values to the significant underlying assumptions. The significant assumptions include estimation of the probability and timing of payment, future revenue forecasts, as well as the appropriate discount rate based on the estimated timing of payments. These significant assumptions are forward looking and could be affected by future economic and market conditions.

How We Addressed the Matter in Our Audit

We tested the Company's controls over its accounting for acquisitions. Our tests included controls over the process supporting the recognition and measurement of consideration transferred, customer relationship, and developed technology intangible assets. We also tested management's review of assumptions used in the valuation models.

For each of the Company's acquisitions, we read the purchase agreements, evaluated the significant assumptions and methods used in developing the fair value estimates, and tested the recognition of (1) the tangible assets acquired and liabilities assumed at fair value; (2) the identifiable intangible assets acquired at fair value; and (3) goodwill measured as a residual.

To test the estimated fair value of the customer relationship and developed technology intangible assets, we performed audit procedures that included, among others, evaluating the Company's selection of the valuation methodology, evaluating the methods and significant assumptions used by the Company, and evaluating the completeness and accuracy of the underlying data supporting the significant assumptions and estimates. This includes comparing the significant assumptions to current industry, market and economic trends, to the assumptions used to value similar assets in other acquisitions, to the historical results of the acquired business and to other guidelines used by companies within the same industry. We involved our valuation professionals to assist in our evaluation of the methodology used by the Company and significant assumptions included in the fair value estimates.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2002

Boston, Massachusetts

February 17, 2022

REPLIGEN CORPORATION
CONSOLIDATED BALANCE SHEETS
(Amounts in thousands, except share data)

	December 31, 2021	December 31, 2020
ASSETS		
Current assets:		
Cash and cash equivalents	$ 603,814	$ 717,292
Accounts receivable, net of reserves of $1,417 and $762 at December 31, 2021 and December 31, 2020, respectively	117,420	71,389
Inventories, net	184,494	95,025
Prepaid expenses and other current assets	25,949	18,676
Total current assets	931,677	902,382
Noncurrent assets:		
Property, plant and equipment, net	124,964	66,870
Intangible assets, net	337,274	287,100
Goodwill	860,362	618,305
Deferred tax assets	1,903	2,481
Operating lease right of use assets	101,559	25,176
Other noncurrent assets	615	573
Total noncurrent assets	1,426,677	1,000,505
Total assets	$ 2,358,354	$ 1,902,887
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 36,203	$ 16,880
Operating lease liability	8,303	5,254
Accrued liabilities	75,498	53,085
Convertible senior notes, current portion, net	255,258	243,737
Total current liabilities	375,262	318,956
Noncurrent liabilities:		
Deferred tax liabilities	33,480	27,032
Noncurrent operating lease liability	102,492	26,425
Noncurrent contingent consideration	94,238	—
Other noncurrent liabilities	2,815	1,324
Total noncurrent liabilities	233,025	54,781
Total liabilities	608,287	373,737
Commitments and contingencies (Note 12)		
Stockholders' equity:		
Preferred stock, $0.01 par value, 5,000,000 shares authorized, no shares issued or outstanding	—	—
Common stock, $0.01 par value; 80,000,000 shares authorized; 55,321,457 shares at December 31, 2021 and 54,760,837 shares at December 31, 2020 issued and outstanding	553	548
Additional paid-in capital	1,572,340	1,460,748
Accumulated other comprehensive (loss) income	(16,886)	2,085
Accumulated earnings	194,060	65,769
Total stockholders’ equity	1,750,067	1,529,150
Total liabilities and stockholders’ equity	$ 2,358,354	$ 1,902,887

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(Amounts in thousands, except per share data)

	For the Years Ended December 31,		
	2021	**2020**	**2019**
Revenue:			
Products	$ 670,319	$ 366,136	$ 270,097
Royalty and other revenue	215	124	148
Total revenue	670,534	366,260	270,245
Costs and operating expenses:			
Cost of product revenue	279,280	156,634	119,099
Research and development	34,274	20,182	19,450
Selling, general and administrative	183,866	119,621	95,613
Contingent consideration expense	5,865	—	—
Total costs and operating expenses	503,285	296,437	234,162
Income from operations	167,249	69,823	36,083
Other (expenses) income:			
Investment income	176	1,741	5,324
Loss on conversion of debt	(13)	—	(5,650)
Interest expense	(12,714)	(12,133)	(9,292)
Other expenses	(1,155)	(214)	(314)
Other expenses, net	(13,706)	(10,606)	(9,932)
Income before income taxes	153,543	59,217	26,151
Income tax provision (benefit)	25,252	(709)	4,740
Net income	$ 128,291	$ 59,926	$ 21,411
Earnings per share:			
Basic	$ 2.33	$ 1.14	$ 0.44
Diluted	$ 2.24	$ 1.11	$ 0.44
Weighted average common shares outstanding:			
Basic	55,015	52,554	48,343
Diluted	57,264	53,892	49,206
Net income	$ 128,291	$ 59,926	$ 21,411
Other comprehensive income (loss):			
Foreign currency translation adjustment	(18,971)	17,112	(3,134)
Comprehensive income	$ 109,320	$ 77,038	$ 18,277

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(Amounts in thousands, except share data)

	Common Stock					
	Number of Shares (#)	Par Value	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Earnings/ (Deficit)	Total Stockholders' Equity
Balance at December 31, 2018	43,917,378	$ 439	$ 642,590	$ (11,893)	$ (15,568)	$ 615,568
Net income	—	—	—	—	21,411	21,411
Issuance of common stock for debt conversion	2,316,229	23	198,734	—	—	198,757
Reduction of equity component from debt conversion, net of tax	—	—	(200,079)	—	—	(200,079)
Exercise of stock options and vesting of stock units	339,329	3	1,164	—	—	1,167
Issuance of common stock pursuant to the acquisition of C Technologies, Inc.	779,221	8	53,930	—	—	53,938
Tax withholding on vesting of restricted stock	(5,430)	(0)	(490)	—	—	(490)
Equity component of 0.375% senior convertible notes, net of tax	—	—	39,070	—	—	39,070
Proceeds from issuance of common stock, net of issuance costs of $18,607	4,731,531	48	320,665	—	—	320,713
Stock-based compensation expense	—	—	12,847	—	—	12,847
Translation adjustment	—	—	—	(3,134)	—	(3,134)
Balance at December 31, 2019	52,078,258	$ 521	$ 1,068,431	$ (15,027)	$ 5,843	$ 1,059,768
Net income	—	—	—	—	59,926	59,926
Exercise of stock options and vesting of stock units	584,589	6	8,134	—	—	8,140
Issuance of common stock pursuant to the acquisition of ARTeSYN Biosolutions	372,990	4	69,418	—	—	69,422
Proceeds from issuance of common stock, net of issuance costs of $0.4 million	1,725,000	17	297,758	—	—	297,775
Stock-based compensation expense	—	—	17,007	—	—	17,007
Translation adjustment	—	—	—	17,112	—	17,112
Balance at December 31, 2020	54,760,837	$ 548	$ 1,460,748	$ 2,085	$ 65,769	$ 1,529,150
Net income	—	—	—	—	128,291	128,291
Issuance of common stock for debt conversion	7	0	2	—	—	2
Exercise of stock options and vesting of stock units	300,721	3	3,876	—	—	3,879
Issuance of common stock pursuant to the acquisition of Avitide Inc.	271,096	2	82,966	—	—	82,968
Tax withholding on vesting of restricted stock	(11,204)	(0)	(2,897)	—	—	(2,897)
Stock-based compensation expense	—	—	27,500	—	—	27,500
True-up of costs related to the December 2020 issuance of common stock	—	—	145	—	—	145
Translation adjustment	—	—	—	(18,971)	—	(18,971)
Balance at December 31, 2021	55,321,457	$ 553	$ 1,572,340	$ (16,886)	$ 194,060	$ 1,750,067

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Amounts in thousands)

	For the Years Ended December 31,		
	2021	**2020**	**2019**
Cash flows from operating activities:			
Net income	$ 128,291	$ 59,926	$ 21,411
Adjustments to reconcile net income to net cash provided by operating activities:			
Inventory step-up charges	2,130	734	1,483
Depreciation and amortization	38,447	27,067	20,868
Amortization of debt discount and issuance costs	11,530	10,970	7,536
Stock-based compensation expense	27,500	17,007	12,847
Contingent consideration expense	5,865	—	—
Deferred income taxes, net	6,517	(3,992)	(624)
Loss on conversion of debt	13	—	5,650
Other	851	267	663
Changes in operating assets and liabilities, excluding impact of acquisitions:			
Accounts receivable	(46,523)	(20,892)	(7,830)
Unbilled receivables	(2)	456	2,146
Inventories	(89,781)	(29,994)	(10,797)
Prepaid expenses and other assets	(10,192)	(4,870)	(595)
Operating lease right of use assets	(4,315)	3,583	(4,662)
Other assets	432	(281)	(66)
Accounts payable	19,523	2,462	662
Accrued expenses	23,196	1,037	13,096
Operating lease liability	6,958	(1,964)	5,447
Long-term liabilities	(1,424)	1,109	(19)
Total cash provided by operating activities	119,016	62,625	67,216
Cash flows from investing activities:			
Additions to capitalized software costs	(4,187)	(3,889)	(4,650)
Acquisitions, net of cash acquired	(149,893)	(175,041)	(182,154)
Purchases of property, plant and equipment	(67,089)	(22,455)	(18,504)
Total cash used in investing activities	(221,169)	(201,385)	(205,308)
Cash flows from financing activities:			
Proceeds from issuance of senior convertible notes, net of issuance costs	—	—	278,466
Proceeds from issuance of common stock, net of issuance costs	—	297,775	320,713
Exercise of stock options	3,879	8,151	1,167
Repayment of senior convertible notes	(21)	—	(114,989)
Payment of tax withholding obligation on vesting of restricted stock	(2,897)	(10)	(490)
Total cash provided by financing activities	961	305,916	484,867
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(12,286)	12,729	(3,190)
Net (decrease) increase in cash, cash equivalents and restricted cash	(113,478)	179,885	343,585
Cash, cash equivalents and restricted cash, beginning of period	717,292	537,407	193,822
Cash, cash equivalents and restricted cash, end of period	$ 603,814	$ 717,292	$ 537,407
Supplemental disclosure of cash flow information:			
Income taxes paid	$ 16,515	$ 10,279	$ 6,505
Interest paid	$ 1,066	$ 1,066	$ 1,484
Supplemental disclosure of non-cash investing and financing activities:			
Assets acquired under operating leases	$ 85,312	$ 3,349	$ 8,663
Fair value of 271,096 shares of common stock issued for acquisition of Avitide, Inc.	$ 82,968	$ —	$ —
Fair value of earnouts related to the acquisition of Avitide, Inc.	$ 94,238	$ —	$ —
Fair value of 372,990 shares of common stock issued for acquisition of ARTeSYN Biosolutions Holdings Ireland Limited	$ —	$ 69,422	$ —
Fair value of 2,316,229 shares of common stock issued for conversion of convertible notes	$ —	$ —	$ 198,757
Fair value of common stock issued for acquisition of C Technologies, Inc.	$ —	$ —	$ 53,938

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

1. Organization and Nature of Business

Repligen Corporation (NASDAQ:RGEN) is a global life sciences company that develops and commercializes highly innovative bioprocessing technologies and systems that increase efficiencies and flexibility in the process of manufacturing biological drugs. The Company's franchises include filtration (XCell ATF® systems, TangenX™ SIUS® flat sheet cassettes, Spectrum® Hollow Fibers, KrosFlo® systems and ProConnex® single-use flow path assemblies), chromatography (OPUS® Columns, chromatography resins, ELISA kits), process analytics (SoloVPE®, FlowVPE® and Flow VPX®) and proteins (Protein A affinity ligands and cell culture growth factors). The Company's bioprocessing products are sold to major life sciences companies, biopharmaceutical development companies and contract manufacturing organizations worldwide. The Company operates under one reportable segment. The Company's chief operating decision maker ("CODM") reviews financial information presented on a consolidated basis for purposes of allocating resources and evaluating financial performance. See Note 2, *"Summary of Significant Accounting Policies – Segment Reporting,"* for more information on the Company's segment.

A majority of our 16 key manufacturing sites are located in the United States (California, Massachusetts, New Jersey and New York). Outside the United States, we have manufacturing sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden.

The Company is subject to a number of risks typically associated with companies in the biotechnology industry. These risks principally include the Company's dependence on key customers, development by the Company or its competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with the FDA and other governmental regulations and approval requirements, as well as the ability to grow the Company's business and obtain adequate funding to finance this growth.

2. Summary of Significant Accounting Policies

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States ("GAAP") requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting periods.

Significant estimates and assumptions by management affect the Company's revenue recognition for multiple element arrangements, allowance for credit losses, the net realizable value of inventory, valuations and purchase price allocations related to business combinations, expected future cash flows including growth rates, discount rates, terminal values and other assumptions and estimates used to evaluate the recoverability of long-lived assets, contingent consideration, estimated fair values of intangible assets and goodwill, amortization methods and periods, warranty reserves, certain accrued expenses, stock-based compensation, tax reserves and recoverability of the Company's net deferred tax assets and related valuation allowance.

Although the Company regularly assesses these estimates, actual results could differ materially from these estimates. Changes in estimates are recorded in the period in which they become known. The Company bases its estimates on historical experience and various other assumptions that it believes to be reasonable under the circumstances.

Basis of Presentation

The consolidated financial statements include the accounts of the Company and its wholly-owned subsidiaries, Repligen Sweden AB, Repligen GmbH, Spectrum® LifeSciences LLC and its subsidiaries ("Spectrum"), C Technologies, Inc. ("C Technologies"), ARTeSYN Biosolutions Holdings Ireland Limited and its subsidiaries ("ARTeSYN"), Polymem S.A. ("Polymem"), Avitide, Inc. ("Avitide"), Newton T&M Corp ("NTM"), Bio-Flex Solutions, LLC ("BioFlex") and Repligen Singapore Pte. Ltd. All significant intercompany accounts and transactions have been eliminated in consolidation. Certain prior year balances have changed to reflect current year presentation.

Foreign Currency

The Company translates the assets and liabilities of its foreign subsidiary at rates in effect at the end of the reporting period. Revenues and expenses are translated at average rates in effect during the reporting period. Translation adjustments, including adjustments related to the Company's various intercompany loans. Any intercompany loans with foreign subsidiaries are remeasured at each period end and included in accumulated other comprehensive loss on the consolidated balance sheets.

Revenue Recognition

We generate revenue from the sale of bioprocessing products, equipment devices, and related consumables used with these equipment devices to customers in the life sciences and biopharmaceutical industries. Under Accounting Standard Codification No. ("ASC") 606, "*Revenue from Contracts with Customers,"* 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 expected value method or the most likely amount method, depending on the facts and circumstances relative to the contract. 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. Applying the practical expedient in paragraph 606-10-32-18, 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. None of the Company's contracts contained a significant financing component as of December 31, 2021.

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.

The Company recognizes product revenue under the terms of each customer agreement upon transfer of control to the customer, which occurs at a point in time.

Shipping and handling fees are recorded as a component of product revenue, with the associated costs recorded as a component of cost of product revenue.

Risks and Uncertainties

The Company evaluates its operations periodically to determine if any risks and uncertainties exist that could impact its operations in the near term. The Company does not believe that there are any significant risks that have not already been disclosed in the consolidated financial statements. A loss of certain suppliers could temporarily disrupt operations, although alternate sources of supply exist for these items. The Company has mitigated these risks by working closely with key suppliers, identifying alternate sources and developing contingency plans.

Cash, Cash Equivalents and Restricted Cash

Cash and cash equivalents include cash on hand and on deposit. Highly liquid investments in money market mutual funds with an original maturity of three months or less are classified as cash equivalents. All cash equivalents are carried at cost, which approximates fair value. Restricted cash represents cash that is restricted as to withdrawal or usage. There was no restriction on the Company's cash balance as of December 31, 2021 and 2020. In connection with the Company's acquisition of C Technologies on May 31, 2019, cash was held and due to employees based on their continued employment with the Company one year after the date of the close of the acquisition. As of December 31, 2019, $9.0 million, which represented this amount

due to employees, was carried as restricted cash on the Company's consolidated balance sheet. Subsequently, during the second quarter of 2020, this $9.0 million was paid to employees.

The following is a summary of the Company's cash, cash equivalents, and restricted cash total as presented in the Company's consolidated statements of cash flows for the years ended December 31, 2021, 2020 and 2019:

	For the Years Ended December 31,		
	2021	2020	2019
	(Amounts in thousands)		
Cash and cash equivalents	$ 603,814	$ 717,292	$ 528,392
Restricted cash	—	—	9,015
Total cash, cash equivalents, and restricted cash	$ 603,814	$ 717,292	$ 537,407

There were no realized gains or losses on investments for the years ended December 31, 2021, 2020 and 2019.

Fair Value Measurement

In determining the fair value of its assets and liabilities, the Company uses various valuation approaches. The Company employs a hierarchy for inputs used in measuring fair value that maximizes the use of observable inputs and minimizes the use of unobservable inputs by requiring that observable inputs be used when available. Observable inputs are inputs that market participants would use in pricing the asset or liability based on market data obtained from sources independent of the Company. Unobservable inputs are inputs that reflect the Company's assumptions about the inputs that market participants would use in pricing the asset or liability and are developed based on the best information available in the circumstances. The fair value hierarchy is broken down into three levels based on the source of inputs as follows:

Level 1 – Valuations based on unadjusted quoted prices in active markets for identical assets or liabilities that the Company has the ability to access.

Level 2 – Valuations based on quoted prices for similar assets or liabilities in active markets, quoted prices for identical or similar assets or liabilities in markets that are not active and models for which all significant inputs are observable, either directly or indirectly.

Level 3 – Valuations based on inputs that are unobservable and significant to the overall fair value measurement.

The availability of observable inputs can vary among the various types of financial assets and liabilities. To the extent that the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. In certain cases, the inputs used to measure fair value may fall into different levels of the fair value hierarchy. In such cases, for financial statement disclosure purposes, the level in the fair value hierarchy within which the fair value measurement is categorized is based on the lowest level input that is significant to the overall fair value measurement.

Allowance for credit losses

We establish an allowance for credit losses through a review of several factors, including historical collection experience, current aging status of the customer accounts, and current financial condition of our customers. Losses are charged against the allowance when the customer accounts are determined to be uncollectible.

Inventories

Inventories relate to the Company's bioprocessing business. The Company values inventory at cost or, if lower, net realizable value, using the first-in, first-out method. The Company reviews its inventories at least quarterly and records a provision for excess and obsolete inventory based on its estimates of expected sales volume, production capacity and expiration dates of raw materials, work-in-process and finished products. The Company writes down inventory that has become obsolete, inventory that has a cost basis in excess of its expected net realizable value, and inventory in excess of expected requirements to cost of product revenue. Manufacturing of bioprocessing finished goods is done to order and tested for quality specifications prior to shipment.

A change in the estimated timing or amount of demand for the Company's products could result in additional provisions for excess inventory quantities on hand. Any significant unanticipated changes in demand or unexpected quality failures could have a significant impact on the value of inventory and reported operating results. During all periods presented in the accompanying consolidated financial statements, there have been no material adjustments related to a revised estimate of inventory valuations.

Work-in-process and finished products inventories consist of material, labor, outside processing costs and manufacturing overhead.

Lease Accounting

The Company adopted Accounting Standards Update No. ("ASU") 2016-02, *"Leases (Topic 842)*" ("ASC 842") as of January 1, 2019. Under ASC 842, the Company determines whether the arrangement contains a lease at the inception of an arrangement. If a lease is identified in an arrangement, the Company recognizes a right-of-use asset and liability on its consolidated balance sheet and determines whether the lease should be classified as a finance or operating lease. The Company does not recognize assets or liabilities for leases with lease terms of less than 12 months.

A lease qualifies as a finance lease if any of the following criteria are met at the inception of the lease: (i) there is a transfer of ownership of the leased asset to the Company by the end of the lease term, (ii) the Company holds an option to purchase the leased asset that it is reasonably certain to exercise, (iii) the lease term is for a major part of the remaining economic life of the leased asset, (iv) the present value of the sum of lease payments equals or exceeds substantially all of the fair value of the leased asset, or (v) the nature of the leased asset is specialized to the point that it is expected to provide the lessor no alternative use at the end of the lease term. All other leases are recorded as operating leases.

Finance and operating lease assets and liabilities are recognized at the lease commencement date based on the present value of the lease payments over the lease term using the discount rate implicit in the lease. If the rate implicit is not readily determinable, the Company utilizes its incremental borrowing rate at the lease commencement date. Operating lease assets are further adjusted for prepaid or accrued lease payments. Operating lease payments are expensed using the straight-line method as an operating expense over the lease term. Finance lease assets are amortized to depreciation expense using the straight-line method over the shorter of the useful life of the related asset or the lease term. Finance lease payments are bifurcated into (i) a portion that is recorded as imputed interest expense and (ii) a portion that reduces the finance liability associated with the lease.

The Company does not separate lease and non-lease components when determining which lease payments to include in the calculation of its lease assets and liabilities. Variable lease payments are expensed as incurred. If a lease includes an option to extend or terminate the lease, the Company reflects the option in the lease term if it is reasonably certain it will exercise the option.

Finance leases are recorded in property, plant and equipment, net, other current liabilities and long-term finance lease liabilities and operating leases are recorded in operating lease right of use assets, operating lease liability and operating lease liability, long-term on the Company's consolidated balance sheet.

Certain of the Company's operating leases where the Company is the lessee provide for minimum annual payments that increase over the life of the lease. Some of these leases include obligations to pay for other services, such as operations and maintenance. For leases of property, the Company accounts for these other services as a component of the lease. The aggregate minimum annual payments are expensed on the straight-line basis beginning when the Company takes possession of the property and extending over the term of the related lease, including renewal options when the exercise of the option is reasonably certain as an economic penalty may be incurred if the option is not exercised. The Company also accounts in its straight-line computation for the effect of any "rental holidays."

Operating lease assets represent the Company's right to use an underlying asset for the lease term and lease liabilities represent the Company's obligation to make lease payments arising from the lease. Operating lease assets and liabilities are recognized at the lease commencement date based on the estimated present value of the fixed lease payments, reduced by landlord incentives using a discount rate based on similarly secured borrowings available to the Company. Most of the leases do not provide implicit interest rates and therefore the Company determines the discount rate based on its incremental borrowing

rate. The incremental borrowing rate for the Company's leases is determined based on lease term and currency in which the lease payments are made.

Accrued Liabilities

The Company estimates accrued liabilities by identifying services performed on the Company's behalf, estimating the level of service performed and determining the associated cost incurred for such service as of each balance sheet date. For example, the Company would accrue for professional and consulting fees incurred with law firms, audit and accounting service providers and other third-party consultants. These expenses are determined by either requesting those service providers to estimate unbilled services at each reporting date for services incurred or tracking costs incurred by service providers under fixed fee arrangements.

The Company has processes in place to estimate the appropriate amounts to record for accrued liabilities, which principally involve the applicable personnel reviewing the services provided. In the event that the Company does not identify certain costs that have begun to be incurred or the Company under or over-estimates the level of services performed or the costs of such services, the reported expenses for that period may be too low or too high. The date on which certain services commence, the level of services performed on or before a given date, and the cost of such services often require the exercise of judgment. The Company makes these judgments based upon the facts and circumstances known at the date of the financial statements.

Income Taxes

Deferred taxes are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect in the years in which the differences are expected to reverse. Valuation allowances are provided, if, based upon the weight of available evidence, it is more likely than not that some or all of the 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 evaluation of uncertain tax positions is based on 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, new audit activity and changes in facts or circumstances related to a tax position. The Company evaluates this tax position on a quarterly basis. The Company also accrues for potential interest and penalties related to unrecognized tax benefits in income tax expense.

Property, Plant & Equipment

Property, plant & equipment is recorded at cost less allowances for depreciation. Depreciation is calculated using the straight-line method over the estimated useful life of the asset as follows:

Classification	**Estimated Useful Life**
Buildings	Thirty years
Leasehold improvements	Shorter of the term of the lease or estimated useful life
Equipment	Three to twelve years
Furniture, fixtures and office equipment	Three to eight years
Computer hardware and software	Three to seven years or estimated useful life

Upon disposal of property, plant & equipment, the cost of the asset and the accumulated depreciation are removed from the accounts and the resulting gain or loss is reflected in our results of operations. Fully depreciated assets are not removed from the accounts until they are physically disposed of.

Certain systems development costs related to the purchase, development and installation of computer software developed or obtained for internal use are capitalized and depreciated over the estimated useful life of the related project. Costs incurred prior to the development stage, as well as maintenance, training costs, and general and administrative expenses are expensed as incurred.

Earnings Per Share

Basic earnings per share is computed by dividing net income available to common shareholders by the weighted average number of common shares outstanding during the period. Diluted earnings per share is computed by dividing net income available to common shareholders by the weighted-average number of common shares and dilutive common share equivalents then outstanding. Potential common share equivalents consist of restricted stock awards and the incremental common shares

issuable upon the exercise of stock options and warrants. Under the treasury stock method, unexercised "in-the-money" stock options are assumed to be exercised at the beginning of the period or at issuance, if later. The assumed proceeds are then used to purchase common shares at the average market price during the period. In periods when the Company has a net loss, stock awards are excluded from the calculation of earnings per share as their inclusion would have an antidilutive effect.

A reconciliation of basic and diluted share amounts is as follows:

	For the Years Ended December 31,		
	2021	2020	2019
	(Amounts in thousands, except per share data)		
Net income	$ 128,291	$ 59,926	$ 21,411
Weighted average shares used in computing net income per share - basic	55,015	52,554	48,343
Effect of dilutive shares:			
Options and stock units	915	971	864
Convertible senior notes	1,253	367	—
Dilutive effect of unvested performance stock units	81	—	—
Dilutive potential common shares	2,249	1,338	864
Weighted average shares used in computing net income per share - diluted	57,264	53,892	49,206
Earnings per share:			
Basic	$ 2.33	$ 1.14	$ 0.44
Diluted	$ 2.24	$ 1.11	$ 0.44

At December 31, 2021, there were outstanding options to purchase 625,107 shares of the Company's common stock at a weighted average exercise price of $54.15 per share and 606,685 shares of common stock issuable upon the vesting of stock units which include restricted stock units and performance stock units. For the year ended December 31, 2021, 68,968 shares of the Company's common stock were excluded from the calculation of diluted earnings per share because they would have had an anti-dilutive effect.

At December 31, 2020, there were outstanding options to purchase 696,711 shares of the Company's common stock at a weighted average exercise price of $43.88 per share and 665,540 shares of common stock issuable upon the vesting of stock units. For the year ended December 31, 2020, 98,048 shares of the Company's common stock were excluded from the calculation of diluted earnings per share because the exercise prices of the stock options were greater than or equal to the average price of the common shares and were therefore, anti-dilutive.

At December 31, 2019, there were outstanding options to purchase 957,559 shares of the Company's common stock at a weighted average exercise price of $30.81 per share and 734,984 shares of common stock issuable upon the vesting of stock units. For the year ended December 31, 2019, 104,316 shares of the Company's common stock were excluded from the calculation of diluted earnings per share because the exercise prices of the stock options were greater than or equal to the average price of the common shares and were therefore, anti-dilutive.

In July 2019, the Company issued $287.5 million aggregate principal amount of the 2019 Notes. As provided by the terms of the indenture underlying the 2019 Notes, conversion of the 2019 Notes will be settled in cash, shares of the Company's common stock or a combination thereof, at the Company's election. As of December 31, 2021, the 2019 Notes were convertible. The Company currently intends to settle the par value of the 2019 Notes in cash and any excess conversion premium in shares.

The Company applies the provisions of ASC 260, *"Earnings Per Share",* Subsection 10-45-44, to determine the diluted weighted average shares outstanding as it relates to the conversion spread on its convertible notes. Accordingly, the par value of the 2019 Notes is not included in the calculation of diluted income per share, but the dilutive effect of the conversion premium is considered in the calculation of diluted net income per share using the treasury stock method. The dilutive impact of the 2019 Notes is based on the difference between the Company's current period average stock price and the conversion price of the convertible notes, provided there is a premium. Pursuant to this accounting standard, there is no dilution from the accreted principal of the 2019 Notes. For the years ended December 31, 2021, 2020 and 2019, the dilutive effect of the conversion premium included in the calculation of diluted earnings was 1,253,168 shares, 366,534 shares and 1,123,139 shares,

respectively. In 2022, the Company will adopt Accounting Standards Update No. ("ASU") 2020-06, *"Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40)."* Once adopted, the 2019 Notes will be subject to the "if-converted" method for calculating diluted earnings per share. Under the "if-converted" method, diluted earnings per share will be calculated assuming that all of the convertible notes were converted solely into shares of common stock at the beginning of the reporting period, unless the result would be anti-dilutive. The Company is currently evaluating the impact of the adoption of ASU 2020-06 on the Company's consolidated financial statements.

Segment Reporting

The Company views its operations, makes decisions regarding how to allocate resources and manages its business as one reportable segment and one reporting unit. As a result, the financial information disclosed herein represents all of the material financial information related to the Company.

The following table represents product revenues by product line:

	For the Years Ended December 31,		
	2021[1]	2020[2]	2019[3]
	(Amounts in thousands)		
Filtration products	$ 403,505	$ 174,851	$ 119,464
Chromatography products[4]	91,037	70,677	60,662
Process analytics products	48,019	33,346	16,405
Proteins products[4]	123,707	83,317	69,004
Other	4,051	3,945	4,562
Total product revenue	$ 670,319	$ 366,136	$ 270,097

(1) 2021 revenue for filtration products includes revenue related to Polymem from July 1, 2021 as well as BioFlex and NTM from December 16, 2021 through December 31, 2021. 2021 revenue for proteins products includes revenue related to Avitide from September 20, 2021 through December 31, 2021.
(2) 2020 revenue for filtration products includes revenue related to EMT from July 13, 2020, NMS from October 20, 2020 and ARTeSYN from December 3, 2020 through December 31, 2020.
(3) 2019 revenue includes process analytics revenue related to C Technologies from June 1, 2019 through December 31, 2019.
(4) Revised 2020 and 2019 revenue in the table above reflects a shift in revenue from chromatography products to proteins products of approximately $3 million and $4 million, respectively. These changes are consistent with the current year presentation of product revenue.

Revenue from filtration products includes the XCell ATF systems and consumables as well as the KrosFlo and SIUS filtration products. Revenue from chromatography products includes the OPUS chromatography PPCs, chromatography resins and ELISA test kits. Revenue from process analytics products includes the SoloVPE, FlowVPE and FlowVPX devices. Revenue from protein products includes the Protein A affinity ligands and cell culture growth factors. Other revenue primarily consists of revenue from the sale of operating room products to hospitals as well as freight revenue.

The following table represents the Company's total revenue by geographic area (based on the location of the customer):

	For the Years Ended December 31,		
	2021	2020	2019
Revenue by customers' geographic locations:			
North America	41%	48%	51%
Europe	40%	38%	37%
APAC/Other	19%	14%	12%
Total revenue	100%	100%	100%

The following table represents the Company's total assets by geographic area:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Total assets by geographic locations:		
North America	$ 2,082,721	$ 1,697,149
Europe	243,076	188,698
APAC	32,557	17,040
Total assets by geographic location	$ 2,358,354	$ 1,902,887

The following table represents the Company's long-lived assets by geographic area:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Long-lived assets by geographic locations:		
North America	$ 198,436	$ 78,429
Europe	27,168	12,918
APAC	1,534	1,272
Total long-lived assets by geographic location	$ 227,138	$ 92,619

Concentrations of Credit Risk and Significant Customers

Financial instruments that subject the Company to significant concentrations of credit risk primarily consist of cash and cash equivalents, marketable securities and accounts receivable. Per the Company's investment policy, cash equivalents and marketable securities are invested in financial instruments with high credit ratings and credit exposure to any one issue, issuer (with the exception of U.S. Treasury obligations) and type of instrument is limited. At December 31, 2021, the Company had no investments associated with foreign exchange contracts, options contracts or other foreign hedging arrangements.

Concentration of credit risk with respect to accounts receivable is limited to customers to whom the Company makes significant sales. While a reserve for the potential write-off of accounts receivable is maintained, the Company has not written off any significant accounts to date. To control credit risk, the Company performs regular credit evaluations of its customers' financial condition.

Revenue from significant customers that represent 10% or more of the Company's total revenue is as follows:

	For the Years Ended December 31,		
	2021	2020	2019
Pfizer Inc.	10%	N/A	N/A
MilliporeSigma	N/A	11%	13%
Cytiva	N/A	N/A	12%

Significant accounts receivable balances representing 10% or more of the Company's total trade accounts receivable balances at December 31, 2021 and 2020 is as follows:

	December 31,	
	2021	2020
Pfizer Inc.	14%	N/A
Cytiva	N/A	11%

Business Combinations, Goodwill and Intangible Assets

Business Combinations

Total consideration transferred for acquisitions is allocated to the tangible and intangible assets acquired and liabilities assumed, if any, based on their fair values at the dates of acquisition. This purchase price allocation process requires management to make significant estimates and assumptions with respect to intangible assets and deferred revenue. The fair value of identifiable intangible assets is based on detailed valuations that use information and assumptions determined by

management. Any excess of purchase price over the fair value of the net tangible and intangible assets acquired is allocated to goodwill. While the Company uses its best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as any contingent consideration, where applicable, the Company's estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, the Company records adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded to the Company's consolidated statements of comprehensive income. Any excess of the fair value of the net tangible and intangible assets acquired over the purchase price is recognized in the consolidated statements of comprehensive income. The fair value of contingent consideration includes estimates and judgments made by management regarding the probability that future contingent payments will be made and the extent of royalties to be earned in excess of the defined minimum royalties. Management updates these estimates and the related fair value of contingent consideration at each reporting period. These changes in the fair value of contingent consideration are recorded to contingent consideration expense in our consolidated statements of comprehensive income. For the year ended December 31, 2021, we recorded $5.9 million of contingent consideration expense related to the change in estimated contingent consideration obligation related to the Avitide Acquisition.

The Company uses the income approach to determine the fair value of certain identifiable intangible assets including customer relationships and developed technology. This approach determines fair value by estimating after-tax cash flows attributable to these assets over their respective useful lives and then discounting these after-tax cash flows back to a present value. The Company bases its assumptions on estimates of future cash flows, expected growth rates, expected trends in technology, etc. Discount rates used to arrive at a present value as of the date of acquisition are based on the time value of money and certain industry-specific risk factors. The Company believes the estimated purchased customer relationships, developed technologies, trademark/tradename, patents, non-compete agreements and in-process R&D amounts so determined represent the fair value at the date of acquisition, and do not exceed the amount a third-party would pay for such assets.

Goodwill

Goodwill is not amortized and is tested for impairment at least annually at the reporting unit level. In 2019, the Company reorganized its reporting structure and changed the way the CODM views the Company's operations and allocates its resources. Accordingly, the Company operates as one reporting unit as of the goodwill impairment measurement date of December 31, 2021. During the qualitative assessment of the Company's one reporting unit during the 2021 goodwill impairment testing, it was determined that it was not more likely than not that its fair value was less than its carrying amount. As such, a quantitative impairment assessment was not required as of December 31, 2021. If an event occurs or circumstances change that would more likely than not reduce the fair value of its reporting unit below its carrying value, the Company will evaluate its goodwill for impairment between annual tests. There was no impairment to goodwill and therefore no impairment charge recorded for the years ended December 31, 2021, 2020 and 2019.

Intangible Assets

Intangible assets with a definite life are amortized over their useful lives using the straight-line method and the amortization expense is recorded within cost of product revenue, research and development and selling, general and administrative expense in the consolidated statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any adverse conditions exist that would indicate the carrying value of these assets may not be recoverable. More frequent impairment assessments are conducted if certain conditions exist, including a change in the competitive landscape, any internal decisions to pursue new or different technology strategies, a loss of a significant customer, or a significant change in the marketplace, including changes in the prices paid for the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition of the asset. If the estimate of an intangible asset's remaining useful life is changed, the remaining carrying amount of the intangible asset is amortized prospectively over the revised remaining useful life. The Company continues to believe that its definite-lived intangible assets are recoverable at December 31, 2021.

Indefinite-lived intangible assets are reviewed for impairment at least annually. There has been no impairment of our intangible assets for the periods presented.

Stock Based Compensation

The Company measures stock-based compensation cost at the grant date based on the estimated fair value of the award and recognizes it as an expense over the employee's requisite service period on a straight-line basis. The Company records the expense for share-based awards subject to performance-based milestone vesting over the remaining service period when management determines that achievement of the milestone is probable. Management evaluates whether the achievement of a performance-based milestone is probable as of the reporting date. The Company has no awards that are subject to market conditions. The Company recognizes stock-based compensation expense based upon options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted by an amount of estimated forfeitures.

The Company uses the Black-Scholes option pricing model to calculate the fair value of share-based awards on the grant date. The following assumptions are used in calculating the fair value of share-based awards:

Expected term – The expected term of options granted represents the period of time for which the options are expected to be outstanding. For purposes of estimating the expected term, the Company has aggregated all individual option awards into one group as the Company does not expect substantial differences in exercise behavior among its employees.

Expected volatility – The expected volatility is a measure of the amount by which the Company's stock price is expected to fluctuate during the expected term of options granted. The Company determines the expected volatility based primarily upon the historical volatility of the Company's common stock over a period commensurate with the option's expected term.

Risk-free interest rate – The risk-free interest rate is the implied yield available on U.S. Treasury zero-coupon issues with a remaining term equal to the option's expected term on the grant date.

Expected dividend yield – The Company has never declared or paid any cash dividends on any of its capital stock and does not expect to do so in the foreseeable future. Accordingly, the Company uses an expected dividend yield of zero to calculate the grant-date fair value of a stock option.

Estimated forfeiture rates – The Company has applied, based on an analysis of its historical forfeitures, annual forfeiture rates of 8% for awards granted to non-executive level employees, 3% for awards granted to executive level employees and 0% for awards granted to non-employee members of the Board of Directors to all unvested stock options as of December 31, 2021. The Company reevaluates this analysis periodically and adjusts these estimated forfeiture rates as necessary. Ultimately, the Company will only recognize an expense for those shares that vest.

Advertising Costs

The Company expenses advertising costs as they are incurred. Advertising expense for the years ended December 31, 2021, 2020 and 2019 was less than $0.6 million, $0.3 million and $0.1 million, respectively.

Recent Accounting Standards Updates

We consider the applicability and impact of all Accounting Standards Updates on the Company's consolidated financial statements. Updates not listed below were assessed and determined to be either not applicable or are expected to have minimal impact on the Company's consolidated financial position or results of operations. Recently issued Accounting Standards Updates that we feel may be applicable to the Company are as follows:

Recently Issued Accounting Standard Updates – Not Yet Adopted

In October 2021, the Financial Accounting Standards Board ("FASB") issued ASU 2021-08, *"Business Combinations (Topic 805) – Accounting for Contract Assets and Contract Liabilities from Contracts with Customers."* ASU 2021-08 requires contract assets and contract liabilities acquired in a business combination to be recognized and measured by the acquirer on the acquisition date in accordance with ASC 606, *"Revenue from Contracts with Customers,"* as if it had originated the contracts. This approach differs from the current requirement to measure contract assets and contract liabilities acquired in a business combination at fair value. ASU 2021-08 will be effective for us for the first quarter of 2023, with early adoption permitted. The adoption impact of the new standard will depend on the magnitude of future acquisitions. The standard will not impact acquired contract assets or liabilities from business combinations occurring prior to the adoption date.

In August 2020, the FASB issued ASU 2020-06, "*Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40).*" ASU 2020-06 simplifies the accounting for convertible debt instruments and convertible preferred stock by reducing the number of accounting models and the number of embedded conversion features that could be recognized separately from the primary contract. ASU 2020-06 also enhances transparency and improves disclosures for convertible instruments and earnings per share guidance. ASU 2020-06 is effective for annual reporting periods beginning after December 15, 2021, including interim periods within those fiscal years. Early adoption is permitted, but no earlier than fiscal years beginning after December 15, 2020. This update permits the use of either the modified retrospective or fully retrospective method of transition. The Company does not believe the impact of the adoption of ASU 2020-06 will have a significant impact on its consolidated financial statements when adopted, beginning in the first quarter of 2022.

Fair Value Measurements

Fair Value Measured on a Recurring Basis

Financial assets and financial liabilities measured at fair value on a recurring basis consist of the following as of December 31, 2021 and 2020:

	As of December 31, 2021			
	Level 1	**Level 2**	**Level 3**	**Total**
Assets:				
Money market accounts	$ 460,936	$ —	$ —	$ 460,936
Liabilities:				
Contingent consideration - earnout obligation	$ —	$ —	$ 94,238	$ 94,238

	As of December 31, 2020			
	Level 1	**Level 2**	**Level 3**	**Total**
Assets:				
Money market accounts	$ 549,030	$ —	$ —	$ 549,030

Cash and cash equivalents

As of December 31, 2021 and 2020, cash and cash equivalents on the Company's consolidated balance sheets included $460.9 million and $549.0 million, respectively, in money market accounts. These funds are valued on a recurring basis using Level 1 inputs.

Contingent Consideration – Earnout

On September 20, 2021, the Company completed the acquisition of Avitide (the "Avitide Acquisition"), a privately-held affinity ligand discovery and development company headquartered in Lebanon, New Hampshire. The transaction consisted of upfront payments of $150.0 million and up to an additional $125.0 million (undiscounted) in contingent consideration earnout payments made equally in cash and the Company's common stock over a three-year performance period beginning January 1, 2022 and ending December 31, 2024. See Note 4, *"Acquisitions"* below for additional information.

A reconciliation of the change in fair value of contingent consideration – earnout is included in the following table (amounts in thousands):

Balance as of December 31, 2020	$ —
Acquisition date fair value of contingent consideration - earnout	88,373
Contingent consideration expense	5,865
Balance as of December 31, 2021	$ 94,238

The recurring Level 3 fair value measurement of our contingent consideration – earnout that we expect to be required to settle, include the following significant unobservable inputs:

Contingent Consideration Earnout	Fair Value as of December 31, 2021 (amounts in thousands)	Valuation Technique	Unobservable Input	Range	Weighted Average[(1)]
Commercialization-based payments	$ 29,717	Monte Carlo Simulation	Probability of Success	100%	100%
			Earnout Discount Rate	1.6%-2.4%	2%
Revenue and Volume-based payments	$ 64,521	Monte Carlo Simulation	Volatility	22.8%	22.8%
			Revenue & Volume Discount Rate	7.1%	7.1%
			Earnout Discount Rate	1.6%-2.4%	2%

(1) Unobservable inputs were weighted by the relative fair value of the contingent consideration liability.

The Company estimates the fair value of the contingent consideration earnouts using a Monte Carlo simulation. Changes in the projected performance of the acquired business could result in a higher or lower contingent consideration obligation in the future.

During the fourth quarter of 2021, we recorded a contingent consideration expense of $5.9 million to the Company's consolidated statement of comprehensive income.

Fair Value Measured on a Nonrecurring Basis

During 2021, there were no re-measurements to fair value of financial assets and liabilities that are measured at fair value on a nonrecurring basis.

Convertible Senior Notes

In July 2019, the Company issued $287.5 million aggregate principal amount of the Company's 0.375% Convertible Senior Notes due July 15, 2024 (the "2019 Notes"). Interest is payable semi-annually in arrears on January 15 and July 15 of each year. The 2019 Notes will mature on July 15, 2024 unless earlier converted or repurchased in accordance with their terms. At December 31, 2021 and 2020, the carrying value of the 2019 Notes was $255.3 million and $243.7 million, respectively, net of unamortized discount, and the fair value of the 2019 Notes was $678.5 million and $501.0 million, respectively. The fair value of the 2019 Notes is a Level 1 valuation and was determined based on the most recent trade activity of the 2019 Notes as of December 31, 2021. The 2019 Notes are discussed in more detail in Note 13, *"Convertible Senior Notes,"* to these consolidated financial statements.

There were no remeasurements to fair value during the year ended December 31, 2021 of financial assets and liabilities that are not measured at fair value on a recurring basis.

4. Acquisitions

2021 Acquisitions

BioFlex Solutions LLC and Newton T&M Corp.

On November 29, 2021, the Company entered into an Equity Purchase Agreement with Bioflex, NTM and each of Ralph Meola and Jason Nisler, to acquire 100% of the outstanding securities of Bioflex and NTM (collectively, the "NTM Acquisition"). The transaction closed on December 16, 2021.

NTM, which is headquartered in Newton, New Jersey, is the parent company of BioFlex and focuses on manufacturing of products, while BioFlex, also headquartered in Newton, New Jersey, commercializes branded products to biotech customers. The NTM Acquisition complements and expands our filtration offering paths as the industry migrates to single-use flow paths

solutions for monoclonal antibody ("mAb"), vaccine and cell and gene therapy ("C&GT") applications, with a focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. The NTM Acquisition streamlines and increases control over many components in our single-use supply chain which ultimately should drive reduced lead-times for Repligen customers in the coming years.

Consideration Transferred

The NTM Acquisition was accounted for as a purchase of businesses under ASC 805, *"Business Combinations"* and engaged a third-party valuation firm to assist with the valuation of the business acquired. Under the terms of the Equity Purchase Agreement, all outstanding shares of capital stock of BioFlex were acquired for consideration with a value totaling $31.8 million, which includes $3.0 million deposited into an escrow against which the Company may make claims for indemnification.

Under the acquisition method of accounting, the assets acquired and liabilities assumed of BioFlex were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net assets acquired assumed is estimated to be $4.4 million, the fair value of the intangible assets acquired is estimated to be $17.2 million, and the residual goodwill is estimated to be $10.2 million. The estimated consideration and preliminary purchase price information has been prepared using a preliminary valuation. Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $0.3 million of transaction and integration costs associated with the NTM Acquisition from the date of acquisition to December 31, 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the period ended December 31, 2021.

The preparation of the valuation required the use of significant assumptions and estimates. Critical estimates included, but were not limited to, future expected cash flows, including projected revenues and expenses, and the applicable discount rates. These estimates were based on assumptions that the Company believes to be reasonable. However, actual results may differ from these estimates.

Fair Value of Net Assets Acquired

The preliminary allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. The purchase accounting for this acquisition is not finalized. As additional information becomes available, the Company may further revise its preliminary purchase price allocation during the remainder of the measurement period. Any such revisions or changes may have a material impact on our accounting treatment of the NTM Acquisition. The final allocation may include changes to: (1) deferred revenue; (2) inventory; (3) deferred tax assets, net; (4) allocations to intangible assets such as trademark and tradename, developed technology and customer relationships as well as goodwill; (5) final consideration paid related to working capital adjustments; and (6) other assets and liabilities.

The components and estimated allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	2,870
Accounts receivable		1,408
Inventory		741
Prepaid expenses and other current assets		126
Property and equipment		34
Operating lease right of use asset		1,034
Customer relationships		13,240
Developed technology		3,540
Trademark and tradename		310
Non-competition agreements		60
Goodwill		10,180
Long term deferred tax asset		111
Accounts payable		(224)
Accrued liabilities		(574)
Operating lease liability		(1,030)
Operating lease liability, long-term		(3)
Fair value of net assets acquired	$	31,823

Acquired Goodwill

The goodwill of $10.2 million represents future economic benefits expected to arise from anticipated synergies from the integration of BioFlex and NTM into the Company. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the NTM Acquisition. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the NTM Acquisition and their estimated useful lives:

	Useful life	Fair Value (Amounts in thousands)
Customer relationships	10 years	$ 13,240
Developed technology	11 years	3,540
Trademark and tradename	15 years	310
Non-competition agreements	3 years	60
		$ 17,150

Avitide, Inc.

On September 16, 2021, the Company entered into an Agreement and Plan of Merger and Reorganization ("Avitide Merger Agreement") with Avalon Merger Sub, Inc., a Delaware corporation and a wholly owned direct subsidiary of the Company, Avalon Merger Sub LLC, a Delaware limited liability company and a wholly owned direct subsidiary of the Company, Avitide, Inc. ("Avitide"), a Delaware corporation, and Shareholder Representative Services LLC, a Colorado limited liability company, solely in its capacity as the representative, agent and attorney-in-fact of Avitide's securityholders to purchase Avitide. The transaction closed on September 20, 2021 and on the terms set forth in the Avitide Merger Agreement (the "Avitide Acquisition").

Avitide, which is headquartered in Lebanon, New Hampshire, offers diverse libraries and leading technology in affinity ligand discovery and development resulting in best-in-class ligand discovery and development lead-times. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company's proteins and chromatography franchise to address the unique purification needs of gene therapies and other emerging modalities.

Consideration Transferred

The Avitide Acquisition was accounted for as a purchase of a business under ASC 805, *"Business Combinations"* and engaged a third-party valuation firm to assist with the valuation of the business acquired. Under the terms of the Merger Agreement, all outstanding shares of capital stock of Avitide were cancelled and converted into the right to receive merger consideration with a value totaling up to $275.0 million, which consisted of upfront payments in aggregate of $150.0 million ($149.4 million, net of cash acquired) and up to an additional $125.0 million (undiscounted) in contingent consideration earnout payments if certain performance targets are achieved. Total consideration paid also included $0.8 million deposited into an escrow account against which the Company may make claims for indemnification. The Avitide Acquisition was funded through payment of $75.0 million in cash, the issuance of 271,096 unregistered shares of the Company's common stock totaling $83.0 million and contingent consideration with fair value of approximately $88.4 million.

Under the acquisition method of accounting, the assets acquired and liabilities assumed of Avitide were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net assets acquired is estimated to be $0.4 million, fair value of the intangible assets acquired is estimated to be $46.7 million, and the residual goodwill is estimated to be $199.2 million. The estimated consideration and preliminary purchase price information has been prepared using a preliminary valuation. Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $2.6 million of transaction and integration costs associated with the Avitide Acquisition from the date of acquisition to December 31, 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the period ended December 31, 2021. During the fourth quarter of 2021, the Company also recorded a contingent consideration expense of $5.9 million to the Company's consolidated statement of comprehensive income. See Note 3, *"Fair Value Measurements"* for additional information.

The preparation of the valuation required the use of significant assumptions and estimates. Critical estimates included, but were not limited to, future expected cash flows, including projected revenues and expenses, and the applicable discount rates. These estimates were based on assumptions that the Company believes to be reasonable. However, actual results may differ from these estimates.

Total consideration transferred is as follows (amounts in thousands):

Cash consideration	$	74,962
Equity consideration		82,968
Contingent consideration - earnout		88,373
Fair value of net assets acquired	$	246,303

Fair Value of Net Assets Acquired

The preliminary allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. As additional information becomes available, the Company may further revise its preliminary purchase price allocation during the remainder of the measurement period (which will not exceed 12 months from September 20, 2021). Any such revisions or changes may have a material impact on our accounting treatment of the Avitide Acquisition. The final allocation may include changes to long term deferred tax liabilities and goodwill. Upon conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments will be recorded to our consolidated statement of comprehensive income.

The components and estimated allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	572
Accounts receivable		228
Inventory		332
Prepaid expenses and other current assets		114
Property and equipment		1,862
Operating lease right of use asset		3,648
Customer relationships		24,580
Developed technology		20,650
Trademark and tradename		1,210
Non-competition agreements		210
Goodwill		199,245
Accounts payable		(215)
Accrued liabilities		(2,183)
Operating lease liability		(698)
Operating lease liability, long-term		(2,950)
Long term deferred tax liability		(244)
Other liabilities		(58)
Fair value of net assets acquired	$	246,303

Acquired Goodwill

The goodwill of $199.2 million represents future economic benefits expected to arise from anticipated synergies from the integration of Avitide. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the Avitide Acquisition. Substantially all of the goodwill recorded is expected to be nondeductible for income tax purposes.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the Avitide Acquisition and their estimated useful lives:

	Useful life	Fair Value (Amounts in thousands)
Customer relationships	13 years	$ 24,580
Developed technology	15 years	20,650
Trademark and tradename	18 years	1,210
Non-competition agreements	3 years	210
		$ 46,650

Polymem S.A.

On June 22, 2021, the Company entered into a Stock Purchase Agreement with Polymem S.A. ("Polymem"), a company

organized under the laws of France, and Jean-Michel Espenan and Franc Saux, acting together jointly and severally as the representatives of the sellers pursuant to which Repligen acquired all of the outstanding common stock of Polymem for $47.0 million in cash. The transaction closed on July 1, 2021 (the "Polymem Acquisition.").

Polymem, which is headquartered in, Toulouse, France, is a manufacturer of hollow fiber membranes, membrane modules and systems for industrial and bioprocessing applications. Polymem products will complement and expand the Company's portfolio of HF systems and consumables. The acquisition substantially increases Repligen's membrane and module manufacturing capacity and establishes a world-class center of excellence in Europe to address the accelerating global demand for these innovative products.

Consideration Transferred

The Company accounted for the Polymem Acquisition as a purchase of a business under ASC 805, *"Business Combinations"* and engaged a third-party valuation firm to assist with the valuation of the business acquired. Payment for the transaction was denominated in Euros but is reflected here in U.S. Dollars for presentation purposes based on an exchange rate of 0.8437 as of July 1, 2021, the date of acquisition. Total consideration paid was approximately $47.0 million, which included approximately $4.3 million deposited into an escrow account against which the Company may make claims for indemnification. The fair value of the net assets acquired is approximately $2.2 million, the fair value of the intangible assets acquired is approximately $9.1 million, and the residual goodwill is approximately $35.7 million. Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $3.1 million of transaction and integration costs associated with the Polymem Acquisition from the date of acquisition to December 31, 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the period ended December 31, 2021.

Fair Value of Net Assets Acquired

The preliminary allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. As additional information becomes available, the Company may further revise its preliminary purchase price allocation during the remainder of the measurement period (which will not exceed 12 months from July 1, 2021). The final allocation may include changes to final payments made related to working capital adjustments, long term deferred tax liabilities and goodwill. Any such revisions or changes may have a material impact on our accounting treatment of the Polymem Acquisition.

The components and estimated allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	353
Net working capital (excluding cash and inventory step-up)		414
Inventory step-up		543
Operating lease right of use assets		1,424
Property and equipment		3,145
Other assets		41
Developed technology		8,274
Trademark and tradenames		510
Non-compete agreements		312
Goodwill		35,680
Operating lease liability		(1,253)
Long term deferred tax liability		(2,327)
Other long-term liabilities		(143)
Fair value of net assets acquired	**$**	**46,973**

Acquired Goodwill

The goodwill of approximately $35.7 million represents future economic benefits expected to arise from anticipated synergies from the integration of Polymem. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the Polymem Acquisition. Substantially all of the goodwill recorded is expected to be nondeductible for income tax purposes.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the Polymem Acquisition and their estimated useful lives:

	Useful life	Fair Value
		(Amounts in thousands)
Developed technology	13 years	$ 8,274
Trademark and tradename	14 years	510
Non-competition agreements	5 years	312
		$ 9,096

2020 Acquisitions

ARTeSYN Biosolutions Holdings Ireland Limited

On October 27, 2020, the Company entered into an Equity and Asset Purchase Agreement with ARTeSYN, a company organized under the laws of Ireland, Third Creek Holdings, LLC, a Nevada limited liability company, Alphinity, LLC, a Nevada limited liability company ("Alphinity", and together with Third Creek Holdings, LLC the "Sellers"), and Michael Gagne, solely in his capacity as the representative of the Sellers, pursuant to which the Company acquired (i) all of the outstanding equity securities of ARTeSYN and (ii) certain assets from Alphinity related to the business of ARTeSYN (collectively, the "ARTeSYN Acquisition") for approximately $200 million, comprised of approximately $130 million in cash to the Sellers and approximately $70 million in Repligen common stock to Third Creek. The transaction closed on December 3, 2020.

ARTeSYN is headquartered in Waterford, Ireland and conducts its operations in Ireland, the United States and Estonia. Its suite of single-use solutions has been created with the goal of enabling "abundance in medicine" by allowing 10x greater efficiency in biologics manufacturing. The ARTeSYN team has created a number of solutions targeting the single-use space from single-use valves with fully disposable valve liners, XO® skeletal supports, a hybrid small parts offering for de-bottlenecking traditional facilities, and fully automated SU process systems that have quickly become leading solutions in the bioprocessing industry. In addition to its single-use solutions, ARTeSYN also engages in the manufacture of large-scale systems to be used for biologics manufacturing. ARTeSYN has established downstream processing leadership with a suite of state of the art single-use systems for chromatography, filtration, continuous manufacturing and media/buffer prep workflows. In addition, the Company has integrated unique flow path assemblies utilizing the Company's silicone extrusion and molding technology, to deliver highly

differentiated, low hold-up volume systems that minimize product loss during processing. The ARTeSYN portfolio expands on the market success of the Company's hollow fiber systems and complements its chromatography and TFF filtration product lines.

Consideration Transferred

The ARTeSYN Acquisition was accounted for as a purchase of a business under ASC 805, *"Business Combinations"*. The ARTeSYN Acquisition was funded through payment of $130.7 million in cash, as well as issuance of 372,990 unregistered shares of the Company's common stock totaling $69.4 million, contingent consideration of approximately $1.5 million, and settlement of preexisting invoices with the Company of approximately $2.3 million, for a total purchase price of $204.0 million. Under the acquisition method of accounting, the assets acquired and liabilities assumed of ARTeSYN were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net tangible assets acquired is estimated to be $8.0 million, the fair value of the intangible assets acquired is estimated to be $67.4 million, and the residual goodwill is estimated to be $128.6 million. The estimated consideration and purchase price information was prepared using a valuation. Payment of the final consideration for working capital was made in April 2021.

The preparation of the valuation required the use of significant assumptions and estimates. Critical estimates included, but were not limited to, future expected cash flows, including projected revenues and expenses, and the applicable discount rates. These estimates were based on assumptions that the Company believes to be reasonable. However, actual results may differ from these estimates.

Total consideration transferred is as follows (amounts in thousands):

Cash consideration	$	130,713
Equity consideration		69,422
Contingent consideration		1,548
Settlement of preexisting liabilities		2,310
Fair value of net assets acquired	**$**	**203,993**

Acquisition related costs are not included as a component of consideration transferred but are expensed in the periods in which the costs are incurred. The Company incurred $4.0 million in transaction and integration costs associated with the ARTeSYN Acquisition from the date of acquisition to December 31, 2020, and an additional $4.7 million of transaction and integration costs during 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the period ended December 31, 2021.

The consideration transferred includes approximately $1.5 million related to consideration that was deferred at the acquisition date, with payment to the ARTeSYN Sellers contingent upon recognizing revenue on a large-scale system within 120 days of the acquisition date. This consideration is recorded at its estimated fair value as of the acquisition date, which includes the assumption of high probability of such revenue being recognized.

Fair Value of Net Assets Acquired

The allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. We have made appropriate adjustments to the purchase price allocation during the measurement period, which ended on December 3, 2021.

During 2021, the Company recorded net working capital adjustments of $0.1 million related to settlement of pre-acquisition liabilities, which offset goodwill in the table below.

The components and estimated allocation of the purchase price consists of the following amounts (amounts in thousands):

Cash and cash equivalents	$	2,982
Accounts receivable		4,811
Inventory		8,592
Prepaid expenses and other current assets		5,561
Property and equipment		1,836
Operating lease right of use asset		1,611
Other noncurrent assets		26
Customer relationships		38,400
Developed technology		27,060
Trademark and tradename		1,630
Non-competition agreements		300
Goodwill		128,598
Accounts payable		(2,251)
Accrued liabilities		(8,706)
Deferred revenue		(3,583)
Deferred tax liabilities, net		(1,240)
Notes payable		(24)
Operating lease liability		(417)
Operating lease liability, long-term		(1,193)
Fair value of net assets acquired	**$**	**203,993**

Acquired Goodwill

The goodwill of $128.6 million represents future economic benefits expected to arise from synergies from combining operations and commercial organizations to increase market presence and the extension of existing customer relationships. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the ARTeSYN Acquisition and their estimated useful lives:

	Useful life	Fair Value (Amounts in thousands)
Customer relationships	17 years	$ 38,400
Developed technology	15 years	27,060
Trademark and tradename	21 years	1,630
Non-competition agreements	3 years	300
		$ 67,390

Non-Metallic Solutions, Inc.

On October 15, 2020, the Company entered into a Stock Purchase Agreement with NMS, a Massachusetts corporation, and each of William Malloneé and Derek Masser, the legal and beneficial owners of NMS, to purchase NMS, which transaction subsequently closed on October 20, 2020 (the “NMS Acquisition”).

NMS, headquartered in Auburn, Massachusetts, is a manufacturer of fabricated plastics, custom containers, and related assemblies and components used in the manufacturing of biologic drugs. The acquisition of NMS allows Repligen to expand its line of single-use systems and associated integrated flow path assemblies and streamline the supply chain for current products, providing more flexibility to scale and expand the Company's single-use and systems portfolios.

Consideration Transferred

The NMS Acquisition was accounted for as a purchase of a business under ASC 805, *“Business Combinations.”* Total consideration paid was $16.1 million, which included $1.3 million deposited into an escrow account against which the Company may make claims for indemnification. The fair value of the net tangible assets acquired was $0.9 million, the fair value of the intangible assets acquired was $8.5 million, and the residual goodwill was $6.7 million. Acquisition-related costs are not

included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $0.2 million of transaction and integration costs associated with the NMS Acquisition from the date of acquisition to December 31, 2020, and $0.5 million in 2021. The transaction costs are included in SG&A expenses in the consolidated statements of comprehensive income.

Fair Value of Net Assets Acquired

The allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. We have made appropriate adjustments to the purchase price allocation during the measurement period, which ended on October 20, 2021.

The components and allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	1,163
Accounts receivable		415
Inventory		334
Prepaid expenses and other current assets		13
Property and equipment		73
Operating lease right of use asset		194
Customer relationships		6,370
Developed technology		1,810
Trademark and tradename		190
Non-competition agreements		90
Goodwill		6,713
Deferred tax assets		24
Accounts payable		(96)
Accrued liabilities		(999)
Operating lease liability		(136)
Operating lease liability, long-term		(59)
Fair value of net assets acquired	**$**	**16,099**

Acquired Goodwill

The goodwill of $6.7 million represents future economic benefits expected to arise from anticipated synergies from the integration of NMS. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the NMS Acquisition. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the NMS Acquisition and their estimated useful lives:

	Useful life		**Fair Value**
			(Amounts in thousands)
Customer relationships	14 years	$	6,370
Developed technology	12 years		1,810
Trademark and tradename	15 years		190
Non-competition agreements	3 years		90
		$	8,460

Revenue, Net Income and Pro Forma Presentation

The Company has included the operating results of our 2021 acquisitions of Polymem, Avitide and NTM and the 2020 acquisitions of ARTeSYN, NMS and EMT in its consolidated statements of comprehensive income since their respective acquisition dates. The Company does not consider these acquisitions to be material to its consolidated statements of comprehensive income and therefore has not included pro forma results.

Effective July 11, 2021, EMT was absorbed into the Company by way of “short-form” merger pursuant to New York and Delaware law, which did not require a vote of the Company’s shareholders.

5. Leases

The Company is a lessee under leases of manufacturing facilities, office spaces, machinery, certain office equipment and vehicles. A majority of the Company's leases are operating leases with remaining lease terms between one month and 13 years. Finance leases are immaterial to the Company's consolidated financial statements. The Company determines if an arrangement qualifies as a lease and what type of lease it is at inception. The Company elected the package of practical expedients permitted under the transition guidance within the new lease standard, which among other things, allowed it to continue to account for existing leases based on the historical lease classification. The Company also elected the practical expedients to combine lease and non-lease components and to exclude right of use assets and lease liabilities for leases with an initial term of 12 months or less from the balance sheet.

Some of the lease agreements the Company enters into include Company options to either extend and/or early terminate the lease, the costs of which are included in the Company's operating lease liabilities to the extent that such options are reasonably certain of being exercised. Leases with renewal options allow the Company to extend the lease term typically between 1 and 5 years per option, some of its leases have multiple options to extend. When determining if a renewal option is reasonably certain of being exercised, the Company considers several economic factors, including but not limited to, the significance of leasehold improvements incurred on the property, whether the asset is difficult to replace, underlying contractual obligations, or specific characteristics unique to that particular lease that would make it reasonably certain that the Company would exercise such options.

As of December 31, 2021 and 2020, operating lease right of use assets were $101.6 million and $25.2 million, respectively and operating lease liabilities were $110.8 million and $31.7 million, respectively. The Company acquired Polymem, Avitide, BioFlex and NTM in 2021 and entered into their respective facility leases as well as a few immaterial leases on their respective acquisition dates. As a result, the operating right of use asset and operating lease liability balances increased by a total of $6.1 million in 2021 related to these acquisitions. Effective November 1, 2021, the Company extended its lease for the Waltham, Massachusetts facility to October 2030 and expanded into a vacated space within the same building, adding another 21,244 square feet to the Company's headquarters. As a result, the operating right of use asset and operating lease liability balances increased by a total of $43.0 million and $47.2 million, respectively. Amounts related to financing leases were immaterial. The maturities of the Company's operating lease liabilities as of December 31, 2021 are as follows (amounts in thousands):

As of December 31, 2021	Amount
2022	$ 8,807
2023	15,223
2024	16,452
2025	16,035
2026	15,788
2027 and thereafter	58,832
Total future minimum lease payments	131,137
Less: amount of lease payment representing interest	20,342
Total operating lease liabilities	$ 110,795

Total operating lease liabilities included on the Company's consolidated balance sheet are as follows (amounts in thousands):

	December 31,	
	2021	2020
Operating lease liability	$ 8,303	$ 5,254
Operating lease liability, long-term	102,492	26,425
Minimum operating lease payments	$ 110,795	$ 31,679

Lease expense for these leases is recognized on a straight-line basis over the lease term, with variable lease payments recognized in the period those payments are incurred. For the year ended December 31, 2021 and 2020, total lease cost is comprised of the following:

	For the Years Ended December 31,	
Lease Cost	**2021**	**2020**
	(Amounts in thousands)	
Operating lease cost	$ 9,838	$ 5,645
Variable operating lease cost	7,118	2,033
Lease cost	$ 16,956	$ 7,678

The following information represents supplemental disclosure for the consolidated statements of cash flows related to operating leases (amounts in thousands):

	For the Years Ended December 31,	
	2021	**2020**
Operating lease cost	$ (8,863)	$ (5,647)

Most of the leases do not provide implicit interest rates and therefore the Company determines the discount rate based on its incremental borrowing rate. The incremental borrowing rate for the Company's leases is determined based on lease term and currency in which the lease payments are made.

The weighted average remaining lease term and the weighted average discount rate used to measure the Company's operating lease liabilities as of December 31, 2021 were:

Weighted average remaining lease term (years)	8.16
Weighted average discount rate	3.65%

6. Revenue Recognition

The Company generates revenue from the sale of bioprocessing products, equipment devices, and related consumables used with these equipment devices to customers in the life science and biopharmaceutical industries. Under ASC 606, *"Revenue from Contracts with Customers,"* 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.

Disaggregation of Revenue

Revenue for the years ended December 31, 2021, 2020 and 2019 was as follows:

	For the Years Ended December 31,		
	2021	**2020**	**2019**
	(Amounts in thousands)		
Product revenue	$ 670,319	$ 366,136	$ 270,097
Royalty and other income	215	124	148
Total revenue	$ 670,534	$ 366,260	$ 270,245

When disaggregating revenue, the Company considered all of the economic factors that may affect its revenues. Because all of its revenues are from bioprocessing customers, there are no differences in the nature, timing and uncertainty of the Company's revenues and cash flows from any of its product lines. However, given that the Company's revenues are generated in different geographic regions, factors such as regulatory and geopolitical factors within those regions could impact the nature, timing and uncertainty of the Company's revenues and cash flows. In addition, a significant portion of the Company's revenues are generated from two customers; therefore, economic factors specific to these two customers could impact the nature, timing and uncertainty of the Company's revenues and cash flows.

Disaggregated revenue from contracts with customers by geographic region can be found in Note 2, *"Summary of Significant Accounting Policies – Segment Reporting,"* above.

Revenue from significant customers that represent 10% or more of the Company's total revenue is as follows (amounts in thousands):

	For the Years Ended December 31,		
	2021	2020	2019
Pfizer Inc.	$ 68,273	N/A	N/A
MilliporeSigma	N/A	$ 39,511	$ 36,190
Cytiva	N/A	N/A	$ 31,441

Filtration Products

The Company's filtration products generate revenue through the sale of KrosFlo® HF TFF systems, TangenX® flat sheet cassettes, Spectrum® HF filters, membranes and modules, XCell ATF systems and related consumables. Supporting our systems, we also sell ProConnex single-use flow path assemblies and custom silicone-based, single-use flow path assemblies and components from Polymem, BioFlex, NMS and ARTeSYN, four acquisitions completed in 2021 and 2020.

The Company's KrosFlo systems are used in the filtration, isolation, purification and concentration of biologics and diagnostic products. TFF is a rapid and efficient method for separation and purification of biomolecules that is widely used in laboratory, process development and process scale applications in biopharmaceutical manufacturing. Sales of large-scale systems generally include components and consumables as well as training and installation services at the request of the customer. Because the initial sale of components and consumables is necessary for the operation of the system, such items are combined with the systems as a single performance obligation. Training and installation services do not significantly modify or customize these systems and therefore represent a distinct performance obligation.

The Company's TangenX flat sheet cassettes (SIUS®, SIUS Gamma® and PRO) are not highly interdependent on one another and are therefore considered distinct products that represent separate performance obligations. Product revenue from the sale of TangenX flat sheet cassettes is generally recognized at a point in time upon transfer of control of the customer.

The Company's other filtration product offerings are not highly interdependent of one another and are therefore considered distinct products that represent separate performance obligations. Revenue on these products is generally recognized at a point in time upon transfer of control to the customer. The Company invoices the customer for the installation and training services in an amount that directly corresponds with the value to the customer of the Company's performance to date; therefore, revenue recognized is based on the amount billable to the customer in accordance with the practical expedient under ASC 606-10-55-18.

The Company also markets the XCell ATF system, a technologically advanced filtration device used in upstream processes to continuously remove cellular metabolic waste products during the course of a fermentation run, freeing healthy cells to continue producing the biologic drug of interest. XCell ATF systems typically include a filtration system and consumables (i.e., tubing sets, metal stands) as well as training and installation services at the request of the customer. The filtration system and consumables are considered distinct products and therefore represent separate performance obligations. First time purchasers of the systems typically purchase a controller that is shipped with the tubing set(s) and metal stand(s). The controller is not considered distinct as it is a proprietary product that is highly interdependent with the filtration system; therefore, the controller is combined with the filtration system and accounted for as a single performance obligation. The training and installation services do not significantly modify or customize the XCell ATF system and therefore represent a distinct performance obligation. XCell ATF system product revenue related to the filtration system (including the controller if applicable) and consumables is generally recognized at a point in time upon transfer of control to the customer. XCell ATF system service revenue related to training and installation services is generally recognized over time, as the customer simultaneously receives and consumes the benefits as the Company performs. The Company invoices the customer for the installation and training services in an amount that directly corresponds with the value to the customer of the Company's performance to date; therefore, revenue recognized is based on the amount billable to the customer in accordance with the practical expedient under ASC 606-10-55-18.

On October 20, 2020, the Company completed the NMS Acquisition and added their fabricated plastics, custom containers and related assemblies and components to its filtration franchise. These products will complement and expand Repligen's single-use product offerings.

On December 3, 2020, the Company completed the ARTeSYN Acquisition and added its suite of single-use solutions with the goal of enabling “abundance of medicine” by allowing ten times greater efficiency in biologics manufacturing.

On July 1, 2021, the Company completed the Polymem Acquisition and added its hollow fiber membranes, membrane modules and systems for industrial and bioprocessing applications to its filtration franchise.

On December 16, 2021, the Company completed the NTM Acquisition and added its single-use flow paths solutions for solution for mAb, vaccine and C&GT applications to its filtration franchise, including single-use clamps, adapters, end caps and hose assemblies.

Chromatography Products

The Company’s chromatography products include a number of products used in the downstream purification and quality control of biological drugs. The majority of chromatography revenue relates to the OPUS® pre-packed chromatography column line. OPUS columns are designed to be disposable following a production campaign. Each OPUS column is delivered pre-packaged with the customer’s choice of chromatography resin, which is either provided by the Company for the customer or customer supplied. In either scenario, the OPUS column and resin are not interdependent of one another and are therefore considered distinct products that represent separate performance obligations. Chromatography product revenue is generally recognized at a point in time upon transfer of control to the customer.

Process Analytics Products

The process analytics franchise generates revenue primarily through the sale of the SoloVPE, FlowVPE and FlowVPX slope spectroscopy systems, consumables and service. These products complement and support the Company’s existing filtration, chromatography and proteins franchises as they allow end-users to make in-line protein concentration measurements in filtration, chromatography and fill-finish applications, designed to allow for real-time process monitoring. Process analytics product revenue is generally recognized at a point in time upon transfer of control to the customer.

Protein Products

The Company’s protein franchise generates revenue through the sale of Protein A affinity ligands and growth factors. Protein A ligands are an essential component of Protein A chromatography resins (media) used in the purification of virtually all mAb-based drugs on the market or in development. The Company manufactures multiple forms of Protein A ligands under long-term supply agreements with major life sciences companies, who in turn sell their Protein A chromatography media to end users (biopharmaceutical manufacturers). The Company also manufactures growth factors for sale under long-term supply agreements with certain life sciences companies as well as for direct sales to its customers. Each protein product is considered distinct and therefore represents a separate performance obligation. Protein product revenue is generally recognized at a point in time upon transfer of control to the customer.

On September 20, 2021, the Company completed the Avitide Acquisition and added its diverse libraries and leading technology in affinity ligand discovery and development to its proteins franchise. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company’s proteins and chromatography franchises to address the unique purification needs of gene therapies and other emerging modalities.

Other Products

The Company’s other products include operating room products sold to hospitals. Other product revenue is generally recognized at a point in time upon transfer of control to the customer.

Transaction Price Allocated to Future Performance Obligations

Remaining performance obligations represent the transaction price of contracts for which work has not been performed or has been partially performed. The Company’s future performance obligations relate primarily to the installation and training of certain of its systems sold to customers. These performance obligations are completed within one year of receipt of a purchase order from its customers. Accordingly, the Company has elected to not disclose the value of these unsatisfied performance obligations as provided under ASC 606-10-50-14.

Contract Balances from Contracts with Customers

The following table provides information about receivables and deferred revenue from contracts with customers as of December 31, 2021 (amounts in thousands):

	2021	2020
Balances from contracts with customers only:		
Accounts receivable	$ 117,420	$ 71,257
Deferred revenue (included in accrued liabilities in the consolidated balance sheets)	$ 14,848	$ 15,318
Revenue recognized during years presented relating to:		
The beginning deferred revenue balance	$ 13,708	$ 3,361

The timing of revenue recognition, billings and cash collections results in the accounts receivable and deferred revenue balances on the Company's consolidated balance sheets.

A contract asset is created when the Company satisfies a performance obligation by transferring a promised good to the customer. Contract assets may represent conditional or unconditional rights to consideration. The right is conditional and recorded as a contract asset if the Company must first satisfy another performance obligation in the contract before it is entitled to payment from the customer. Contract assets are transferred to billed receivables once the right becomes unconditional. If the Company has the unconditional right to receive consideration from the customer, the contract asset is accounted for as a billed receivable and presented separately from other contract assets. A right is unconditional if nothing other than the passage of time is required before payment of that consideration is due.

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, a contract liability is recorded. 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.

Costs to Obtain or Fulfill a Customer Contract

The Company's sales commission structure is based on achieving revenue targets. The commissions are driven by revenue derived from customer purchase orders which are short term in nature.

Applying the practical expedient in paragraph 340-40-25-4, the Company recognizes the incremental costs of obtaining contracts as an expense when incurred if the amortization period of the assets that the Company otherwise would have recognized is one year or less. These costs are included in selling, general, and administrative expenses in our consolidated statement of comprehensive income. When shipping and handling costs are incurred after a customer obtains control of the products, the Company accounts for these as costs to fulfill the promise and not as a separate performance obligation.

7. Credit Losses

Effective January 1, 2020, the Company adopted ASU 2016-13, "Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments," prospectively. ASU 2016-13 replaces the incurred loss impairment model with an expected credit loss impairment model for financial instruments, including trade receivables. The guidance requires entities to consider forward-looking information to estimate expected credit losses, resulting in earlier recognition of losses for receivables that are current or not yet due. Upon adoption, changes in the allowance were not material for the transition period starting January 1, 2020 through December 31, 2020.

The Company is exposed to credit losses primarily through sales of products and services. The Company's expected loss allowance methodology for accounts receivable is developed using historical collection experience, current and future economic and market conditions and a review of the current status of customers' trade accounts receivable. Customers are pooled based on sharing specific risk factors, including geographic location. Due to the short-term nature of such receivables, the estimated accounts receivable that may not be collected is based on aging of the accounts receivable balances.

Customers are assessed for credit worthiness upfront through a credit review, which includes assessment based on the Company's analysis of their financial statements when a credit rating is not available. The Company evaluates contract terms and conditions, country and political risk, and may require prepayment to mitigate risk of loss. Specific allowance amounts are

established to record the appropriate provision for customers that have a higher probability of default. The Company monitors changes to the receivables balance on a timely basis, and balances are written off as they are determined to be uncollectable after all collection efforts have been exhausted. Estimates of potential credit losses are used to determine the allowance. It is based on assessment of anticipated payment and all other historical, current and future information that is reasonably available.

The accounts receivable balance on the Company's consolidated balance sheet as of December 31, 2021 was $117.4 million, net of $1.4 million of allowances. The following table provides a roll-forward of the allowance for credit losses in 2021 that is deducted from the amortized cost basis of accounts receivable to present the net amount expected to be collected (amounts in thousands):

	For the Years Ended December 31,	
	2021	2020
Balance of allowance for credit losses, beginning of period	$ (762)	$ (525)
Current period change for write-offs	173	102
Current period change for expected credit losses	(828)	(339)
Balance of allowance for credit losses, end of period	$ (1,417)	$ (762)

8. Goodwill and Intangible Assets

Goodwill

Goodwill represents the difference between the purchase price and the estimated fair value of identifiable assets acquired and liabilities assumed. Goodwill acquired in a business combination and determined to have an indefinite useful life is not amortized, but instead is tested for impairment at least annually in accordance with ASC 350. The following table represents the changes in the carrying value of goodwill for the years ended December 31, 2021 and 2020 (amounts in thousands):

Balance as of December 31, 2019	$ 468,413
Measurement period adjustment - C Technologies	293
Acquisition of EMT	12,585
Acquisition of NMS	6,784
Acquisition of ARTeSYN	128,658
Cumulative translation adjustment	1,572
Balance as of December 31, 2020	$ 618,305
Measurement period adjustment - NMS	(71)
Measurement period adjustment - ARTeSYN	(60)
Acquisition of Polymem	35,680
Acquisition of Avitide	199,245
Acquisition of NTM	10,180
Cumulative translation adjustment	(2,917)
Balance as of December 31, 2021	$ 860,362

During each of the fourth quarters of 2021, 2020 and 2019, the Company completed its annual impairment assessments and concluded that goodwill was not impaired in any of those years.

Intangible Assets

Intangible assets with a definitive life are amortized over their useful lives using the straight-line method, and the amortization expense is recorded within cost of product revenue and selling, general and administrative expense in the Company's consolidated statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any adverse conditions exist that would indicate the carrying value of these assets may not be recoverable. More frequent impairment assessments are conducted if certain conditions exist, including a change in the competitive landscape, any internal decisions to pursue new or different technology strategies, a loss of a significant customer, or a significant change in the marketplace, including changes in the prices paid for the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition of the asset. If the estimate of an intangible asset's remaining useful life is

changed, the remaining carrying amount of the intangible asset is amortized prospectively over the revised remaining useful life. The Company continues to believe that its definite-lived intangible assets are recoverable at December 31, 2021.

Indefinite-lived intangible assets are tested for impairment at least annually. There has been no impairment of our intangible assets for the periods presented.

Intangible assets, net consisted of the following at December 31, 2021:

	December 31, 2021			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology - developed	$ 146,097	$ (21,553)	$ 124,544	17
Patents	240	(240)	—	8
Customer relationships	254,699	(50,719)	203,980	15
Trademarks	7,699	(877)	6,822	19
Other intangibles	2,839	(1,611)	1,228	4
Total finite-lived intangible assets	411,574	(75,000)	336,574	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$ 412,274	$ (75,000)	$ 337,274	

Intangible assets consisted of the following at December 31, 2020:

	December 31, 2020			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology - developed	$ 114,217	$ (14,444)	$ 99,773	17
Patents	240	(240)	—	8
Customer relationships	217,790	(37,333)	180,457	16
Trademarks	5,893	(541)	5,352	20
Other intangibles	2,142	(1,324)	818	3
Total finite-lived intangible assets	340,282	(53,882)	286,400	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$ 340,982	$ (53,882)	$ 287,100	

Amortization expense for finite-lived intangible assets was $22.1 million, $16.1 million and $13.6 million for the years ended December 31, 2021, 2020 and 2019, respectively. As of December 31, 2021, the Company expects to record the following amortization expense (amounts in thousands):

For the Years Ended December 31,	Estimated Amortization Expense
2022	$ 26,503
2023	26,385
2024	25,800
2025	25,461
2026	25,461
2027 and thereafter	206,964
Total	$ 336,574

9. Consolidated Balance Sheet Detail

Inventories, net

Inventories, net consists of the following:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Raw materials	$ 123,321	$ 48,746
Work-in-process	8,119	8,084
Finished products	53,054	38,195
Total inventories, net	$ 184,494	$ 95,025

Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets consist of the following:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Equipment maintenance and services	$ 10,857	$ 4,601
Prepaid income taxes	3,970	2,649
Prepaid insurance	2,713	1,936
Other	8,409	9,490
Total prepaid expenses and other current assets	$ 25,949	$ 18,676

Property, Plant and Equipment

Property, plant and equipment consist of the following:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Land	$ 1,023	$ 1,023
Buildings	764	764
Leasehold improvements	52,505	31,574
Equipment	70,983	43,072
Furniture, fixtures and office equipment	9,137	8,714
Computer hardware and software	22,380	15,397
Construction in progress	38,446	14,927
Other	443	455
Total property, plant and equipment	195,681	115,926
Less - Accumulated depreciation	(70,717)	(49,056)
Total property, plant and equipment, net	$ 124,964	$ 66,870

Depreciation expense totaled $16.4 million, $10.9 million and $7.3 million in the fiscal years ended December 31, 2021, 2020 and 2019, respectively.

Accrued Liabilities

Accrued liabilities consist of the following:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Employee compensation	$ 42,147	$ 20,288
Income taxes payable	4,984	1,423
Royalty and license fees	1,461	466
Warranties	1,722	1,576
Professional fees	1,274	1,425
Deferred revenue	14,848	15,318
Other	9,062	12,589
Total accrued liabilities	$ 75,498	$ 53,085

10. Income Taxes

The components of income before income taxes are as follows:

	For the Years Ended December 31,		
	2021	2020	2019
	(Amounts in thousands)		
Domestic	$ 81,984	$ 27,545	$ (5,432)
Foreign	71,559	31,672	31,583
Income before income taxes	$ 153,543	$ 59,217	$ 26,151

The components of the income tax provision are as follows:

	For the Years Ended December 31,		
	2021	2020	2019
	(Amounts in thousands)		
Components of the income tax provision (benefit):			
Current	$ 20,166	$ 5,193	$ 8,290
Deferred	5,086	(5,902)	(5,287)
Equity	—	—	1,737
Total	$ 25,252	$ (709)	$ 4,740
Jurisdictional components of the income tax provision (benefit):			
Federal	$ 8,321	$ (4,741)	$ (965)
State	1,251	(3,011)	(1,764)
Foreign	15,680	7,043	7,469
Total	$ 25,252	$ (709)	$ 4,740

At December 31, 2021, the Company had federal net operating loss carryforwards of $46.2 million, state net operating loss carryforwards of $4.0 million, and foreign net operating loss carryforwards of $6.1 million. Federal net operating loss carryforwards of $19.1 million will expire at various dates through 2037. The total state net operating loss carryforwards will expire at various dates through 2041, while the foreign net operating loss carryforwards do not expire. The other $27.1 million of the federal net operating loss carryforwards have unlimited carryforward periods. At December 31, 2021, the Company had state business tax credits carryforwards of $2.7 million available to reduce future domestic income taxes. The business tax credit carryforwards will expire at various dates through 2041. The net operating loss and business tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service and may be limited in the event of certain changes in the ownership interest of significant shareholders.

The components of deferred income taxes are as follows:

	December 31,	
	2021	2020
	(Amounts in thousands)	
Deferred tax assets:		
Temporary timing differences:		
Stock-based compensation expense	$ 5,144	$ 3,320
Operating leases	26,264	7,257
Other	6,586	5,774
Total temporary timing differences	37,994	16,351
Net operating loss carryforwards	10,841	1,539
Tax business credits carryforwards	1,834	5,553
Total deferred tax assets	50,669	23,443
Less: valuation allowance	(718)	(727)
Net deferred tax assets	49,951	22,716
Deferred tax liabilities:		
Fixed assets	(7,779)	(4,233)
Acquired intangible assets	(43,227)	(28,639)
Operating lease right of use assets	(24,114)	(5,744)
Conversion option on convertible notes	(6,408)	(8,651)
Total deferred tax liabilities	(81,528)	(47,267)
Total net deferred tax liabilities	$ (31,577)	$ (24,551)

The net change in the total valuation allowance for the year ended December 31, 2021 and 2020 was a decrease of approximately $9,000 and an increase of $0.7 million, respectively.

The reconciliation of the federal statutory rate to the effective income tax rate for the years ended December 31, 2021, 2020 and 2019 is as follows:

	For the Years Ended December 31,					
	2021		2020		2019	
	Amount	%	Amount	%	Amount	%
	(Amounts in thousands, except percentages)					
Income before income taxes	$ 153,543		$ 59,217		$ 26,151	
Expected tax at statutory rate	32,247	21.0%	12,436	21.0%	5,492	21.0%
Adjustments due to:						
Difference between U.S. and foreign tax	530	0.3%	618	1.0%	436	1.7%
State income and franchise tax	1,462	1.0%	133	0.2%	(179)	(0.7%)
Business tax credits	(2,239)	(1.5%)	(4,660)	(7.9%)	(2,746)	(10.5%)
Permanent differences:						
Stock-based compensation expense	(9,049)	(5.9%)	(9,243)	(15.6%)	(1,877)	(7.2%)
U.S. taxation of foreign earnings	30	0.0%	51	0.1%	3,096	11.8%
Foreign-derived intangible income	(2,547)	(1.7%)	—	0.0%	(869)	(3.3%)
Executive compensation	3,397	2.2%	1,401	2.4%	841	3.2%
Other	1,930	1.3%	896	1.5%	92	0.4%
Change in U.S. and foreign tax rates	32	0.0%	(2,650)	(4.5%)	(193)	(0.7%)
Uncertain tax provisions	(443)	(0.3%)	(168)	(0.3%)	1,069	4.1%
Change in valuation allowance	(48)	(0.0%)	(12)	(0.0%)	(125)	(0.5%)
Return to provision adjustments	(50)	(0.0%)	(89)	(0.2%)	(79)	(0.3%)
Other	(0)	(0.0%)	578	1.0%	(218)	(0.9%)
Income tax provision	$ 25,252	16.4%	$ (709)	(1.2%)	$ 4,740	18.1%

The Company's tax returns are subject to examination by federal, state and foreign tax authorities. The Company's two major tax jurisdictions are subject to examination for the following periods:

Jurisdiction	Fiscal Years Subject to Examination
United States - federal and state	2017-2021
Sweden	2016-2021

The following is a tabular reconciliation of the total amounts of unrecognized tax benefits:

	For the Years Ended December 31,	
	2021	2020
	(Amounts in thousands)	
Balance of gross unrecognized tax benefits, beginning of period	$ 3,200	$ 3,422
Gross amounts of increases in unrecognized tax benefits as a result of tax positions taken in the current period	133	154
Gross amounts of decreases in unrecognized tax benefits as a result of tax positions taken in the prior period	(500)	(337)
Gross amounts of decrease due to release	(47)	(39)
Balance of gross unrecognized tax benefits, end of period	$ 2,786	$ 3,200

Included in the balance of unrecognized tax benefits as of December 31, 2021 are $2.8 million of tax benefits that, if recognized, would affect the effective tax rate. The Company classifies interest and penalties related to income taxes as components of its income tax provision. In 2021, a net benefit of approximately $29,000 was recorded to the income tax provision related to interest and penalties while in 2020 and 2019, net expenses of approximately $17,000 and $5,000, respectively, were recorded. The amount of interest and penalties recorded in the accompanying consolidated balance sheets was approximately $29,000 and $58,000 as of December 31, 2021 and 2020, respectively. The Company does not anticipate the amount of unrecognized tax benefits to change over the next twelve months.

On March 27, 2020, President Trump signed the $2.2 trillion bipartisan Coronavirus Aid, Relief, and Economic Security ("CARES") Act. The CARES Act, the third congressional bill to address COVID-19, provides for loans and other benefits to businesses, expanded unemployment insurance, direct payments to those with middle-income and below wages, new appropriations funding for healthcare and other priorities, and tax changes, including deferrals of employer payroll tax liabilities, coupled with an employee retention tax credit and rollbacks of TCJA limitations on net operating losses ("NOLs") and the Section 163(j) business interest limitation and a TCJA technical correction on qualified improvement property. The Company evaluated the provisions of the CARES Act and no provision had a material effect on the Company's financial position or results of operations at December 31, 2020 and for the year then ended.

The Company is subject to a territorial tax system under the Tax Cuts and Jobs Act ("TCJA") enacted in December 2017 (the "2017 Tax Act"), in which the Company is required to provide for tax on Global Intangible Low-Taxed Income ("GILTI") earned by certain foreign subsidiaries. The Company has adopted an accounting policy to provide for the tax expense related to GILTI in the year the tax is incurred as a period expense.

The Company also considered the impact of the newly issued tax regulations in recording its income tax accounts for the year ended December 31, 2020 which reduced the foreign earnings subject to taxation under GILTI provisions for the year ended December 31, 2018 and prospectively.

As of December 31, 2021, the Company has accumulated undistributed earnings generated by its foreign subsidiaries of approximately $93.3 million. Because $5.7 million of such earnings have previously been subject to the one-time transition tax on foreign earnings required by the 2017 Tax Act, any additional taxes due with respect to such earnings or the excess of the amount for financial reporting over the tax basis of the Company's foreign investments would generally be limited to foreign and state taxes. At December 31, 2021, the Company has not provided for taxes on outside basis differences of its foreign subsidiaries, as the Company has the ability and intent to indefinitely reinvest the undistributed earnings of its foreign subsidiaries, and there are no needs for such earnings in the United States that would contradict its plan to indefinitely reinvest.

11. Stockholders' Equity

Public Offerings of Common Stock

On December 8, 2020, the Company completed a public offering in which 1,725,000 shares of its common stock, including the underwriters' exercise in full of an option to purchase an additional 225,000 shares, were sold to the public at a price of $181.00 per share (the "December Stock Offering"). The net proceeds of the December Stock Offering, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company, were approximately $297.8 million.

On July 19, 2019, the Company completed a public offering in which 1,587,000 shares of its common stock, including the underwriters' exercise in full of an option to purchase an additional 207,000 shares, were sold to the public at a price of $87.00 per share (the "July Stock Offering"). The net proceeds of the July Stock Offering, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company, were approximately $131.1 million.

On May 3, 2019, the Company completed a public offering in which 3,144,531 shares of its common stock, including the underwriters' full exercise of an option to purchase up to an additional 410,156 shares, were sold to the public at a price of $64.00 per share (the "May Stock Offering"). The total proceeds received by the Company from the May Stock Offering, net of underwriting discounts and commissions and other estimated offering expenses payable by the Company, totaled approximately $189.6 million.

Stock Option and Incentive Plans

At the Company's 2018 Annual Meeting of Stockholders held on May 16, 2018, the Company's shareholders approved the 2018 Stock Option and Incentive Plan (the "2018 Plan"). Under the 2018 Plan the number of shares of the Company's common stock that are reserved and available for issuance shall be 2,778,000 plus the number of shares of common stock available for issuance under the Company's Amended and Restated 2012 Stock Option and Incentive Plan (the "2012 Plan"). The shares of common stock underlying any awards under the 2018 Plan, 2012 Plan and the Second Amended and Restated 2001 Repligen Corporation Stock Plan (the "2001 Plan," and together with the 2018 Plan and 2012 Plan, the "Plans") that are forfeited, canceled or otherwise terminated (other than by exercise) shall be added back to the shares of stock available for issuance under the 2018 Plan. At December 31, 2021, 2,127,217 shares were available for future grants under the 2018 Plan.

Stock-Based Compensation

The Company recorded stock-based compensation expense of $27.5 million, $17.0 million and $12.8 million for the years ended December 31, 2021, 2020 and 2019, respectively, for share-based awards granted under the Plans. The following table presents stock-based compensation expense in the Company's consolidated statements of comprehensive income:

	For the Years Ended December 31,		
	2021	2020	2019
	(Amounts in thousands)		
Cost of product revenue	$ 2,021	$ 1,929	$ 1,368
Research and development	2,856	1,534	1,373
Selling, general and administrative	22,623	13,544	10,106
Total stock-based compensation	$ 27,500	$ 17,007	$ 12,847

The 2018 Plan allows for the granting of incentive and nonqualified options to purchase shares of common stock, restricted stock and other equity awards. Except for the grant to the Company's Chief Executive Officer ("CEO") in 2018 mentioned below, employee grants under the Plans generally vest over a three- to five-year period, with 20%-33% vesting on the first anniversary of the date of grant and the remainder vesting in equal yearly installments thereafter. Nonqualified options issued to non-employee directors under the Plans generally vest over one year. In the first quarter of 2018, to create a longer-term retention incentive, the Company's Compensation Committee granted long-term incentive compensation awards to its CEO which consisted of both stock options and restricted stock units that are subject to time-based vesting over nine years. Options granted under the Plans have a maximum term of ten years from the date of grant and generally, the exercise price of the stock options equals the fair market value of the Company's common stock on the date of grant. At December 31, 2021, options to purchase 625,107 shares and 606,685 stock units were outstanding under the Plans.

Stock Options

The Company uses the Black-Scholes option pricing model to calculate the fair value of stock option awards on the grant date, and measures stock-based compensation costs of stock options at the grant date based on the estimated fair value of the award. The Company recognizes expense on awards with service-based vesting over the employee's requisite service period on a straight-line basis. The Company recognizes stock-based compensation expense for options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted for estimated forfeitures.

The fair value of stock option awards granted during the years ended December 31, 2021, 2020 and 2019 were calculated using the following estimated assumptions:

	For the Years Ended December 31,		
	2021	**2020**	**2019**
Expected term (in years)	5.5-6.5	5.5-6.5	5.5-6.5
Expected volatility (range)	44.57-45.27%	45.14-50.87%	45.14-50.87%
Risk-free interest rate	0.77-1.07%	0.34-1.15%	1.55-2.56%
Expected dividend yield	0%	0%	0%

Information regarding option activity for the year ended December 31, 2021 under the Plans is summarized below:

	Shares	**Weighted average exercise price**	**Weighted-Average Remaining Contractual Term (in Years)**	**Aggregate Intrinsic Value (in Thousands)**
Options outstanding at December 31, 2020	696,711	$ 43.88	6.90	$ 102,958
Granted	38,824	$ 202.88		
Exercised	(98,428)	$ 39.36		
Forfeited/expired/cancelled	(12,000)	$ 60.95		
Options outstanding at December 31, 2021	625,107	$ 54.15	6.29	$ 131,707
Options exercisable at December 31, 2021	326,416	$ 37.41	5.61	$ 74,238
Vested and expected to vest at December 31, 2021[(1)]	606,465		6.28	$ 127,889

(1) Represents the number of vested options as of December 31, 2021 plus the number of unvested options expected to vest as of December 31, 2021 based on the unvested outstanding options at December 31, 2021 adjusted for estimated forfeiture rates of 8% for awards granted to non-executive level employees and 3% for awards granted to executive level employees.

The aggregate intrinsic value in the table above represents the total pre-tax intrinsic value (the difference between the closing price of the common stock on December 31, 2021, the last business day of 2021, of $264.84 per share and the exercise price of each in-the-money option) that would have been received by the option holders had all option holders exercised their options on December 31, 2021. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2021, 2020 and 2019 was $20.3 million, $36.6 million and $5.5 million, respectively.

The weighted average grant date fair value of options granted during the years ended December 31, 2021, 2020 and 2019 was $88.01, $53.06 and $31.27, respectively. The total fair value of stock options that vested during the years ended December 31, 2021, 2020 and 2019 was $3.0 million, $2.8 million and $3.1 million, respectively.

Stock Units

The fair value of stock units is calculated using the closing price of the Company's common stock on the date of grant. The Company recognizes expense on awards with service-based vesting over the employee's requisite service period on a straight-line basis. Prior to 2020, the Company issued performance stock units to certain employees which are tied to the achievement of certain Company financial goal metrics and the passage of time. Since 2020, the Company has implemented formal programs that issue performance stock units to certain employees set to vest upon the achievement of individual goals and financial goals

of the Company, as well as the passage of time. The Company recognizes expense on performance-based awards over the vesting period based on the probability that the performance metrics will be achieved. Information regarding stock unit activity, which includes activity for restricted stock units and performance stock units, for the year ended December 31, 2021 under the Plans is summarized below:

	Shares	Weighted-Average Remaining Contractual Term (in Years)	Aggregate Intrinsic Value (in Thousands)
Unvested at December 31, 2020	665,540	3.32	$ 127,904
Awarded	187,588		
Vested	(212,329)		
Forfeited/expired/cancelled	(34,114)		
Unvested at December 31, 2021	606,685	3.07	$ 160,674
Vested and expected to vest at December 31, 2021[(1)]	613,606	2.48	$ 162,507

(1) Represents the number of vested stock units as of December 31, 2021 plus the number of unvested stock units expected to vest as of December 31, 2021 based on the unvested outstanding stock units at December 31, 2021 adjusted for estimated forfeiture rates of 8% for awards granted to non-executive level employees and 3% for awards granted to executive level employees.

The aggregate intrinsic value in the table above represents the total pre-tax intrinsic value (equal to the closing price of the common stock on December 31, 2021, the last business day of 2021, of $264.84 per share, as stock units do not have an exercise price) that would have been received by the stock unitholders had all holders exercised on December 31, 2021. The aggregate intrinsic value of stock units vested during the years ended December 31, 2021, 2020 and 2019 was $46.5 million, $28.3 million and $17.5 million, respectively.

The weighted average grant date fair value of stock units granted during the years ended December 31, 2021, 2020 and 2019 was $222.17, $109.69 and $67.22, respectively. The total fair value of stock units that vested during the years ended December 31, 2021, 2020 and 2019 was $13.9 million, $10.8 million and $8.5 million, respectively.

As of December 31, 2021, there was $59.2 million of total unrecognized compensation cost related to unvested share-based awards. This cost is expected to be recognized over a weighted average remaining requisite service period of 3.16 years. The Company expects 1,953,733 unvested options and stock units to vest over the next five years.

12. Commitments and Contingencies

Licensing and Research Agreements

The Company licenses certain technologies that are, or may be, incorporated into its technology under several agreements and also has entered into several clinical research agreements that require the Company to fund certain research projects. Generally, the license agreements require the Company to pay annual maintenance fees and royalties on product sales once a product has been established using the technologies. Research and development expenses associated with license agreements were immaterial amounts for the years ended December 31, 2021, 2020 and 2019.

In June 2018, the Company secured an agreement with Navigo Proteins GmbH (“Navigo”) for the exclusive co-development of multiple affinity ligands for which Repligen holds commercialization rights. The Company is manufacturing and supplying the first of these ligands, NGL-Impact®, exclusively to Purolite - an Ecolab Inc. company ("Purolite"), who is pairing the Company’s high-performance ligand with Purolite’s agarose jetting base bead technology used in their Jetted A50 Protein A resin product. The Company also signed a long-term supply agreement with Purolite for NGL-Impact and other potential additional affinity ligands that may advance from the Company’s Navigo collaboration. In September 2020, the Company and Navigo successfully completed co-development of an affinity ligand targeting the SARS-CoV-2 spike protein, to be utilized in the purification of COVID-19 vaccines. The Company has proceeded with scaling up and manufacturing this ligand and the development and validation of the related affinity chromatography resin, which is marketed by the Company. In September 2021, the Company

and Navigo successfully completed co-development of a novel affinity ligand that addresses aggregation issues associated with pH sensitive antibodies and Fc-fusion proteins. The Company is manufacturing and supplying this ligand, NGL-Impact® HipH, to Purolite. The Navigo and Purolite agreements are supportive of the Company's strategy to secure and reinforce the Company's proteins business. The Company made payments to Navigo of $2.3 million and $0.9 million in the years ended December 31, 2021 and 2020, respectively, in connection with this program, which are recorded to research and development expenses in the Company's consolidated statements of comprehensive income.

Purchase Orders, Supply Agreements and Other Contractual Obligations

In the normal course of business, the Company has entered into purchase orders and other agreements with manufacturers, distributors and others. Outstanding obligations at December 31, 2021 of $148.7 million are expected to be completed within one year.

Legal Proceedings

From time to time, in the normal course of its operations, the Company is subject to litigation matters and claims relating to employee relations, business practices and patent infringement. Litigation can be expensive and disruptive to normal business operations. Moreover, the results of complex legal proceedings are difficult to predict and the Company's view of these matters may change in the future as the litigation and events related thereto unfold. The Company expenses legal fees as incurred. The Company records a provision for contingent losses when it is both probable that a liability has been incurred and the amount of the loss can be reasonably estimated. An unfavorable outcome to any legal matter, if material, could have an adverse effect on the Company's operations or its financial results.

13. Convertible Senior Notes

The carrying value of the Company's convertible senior notes is as follows:

	December 31,	
	2021	2020
	(Amounts in thousands)	
0.375% convertible senior notes due 2024:		
Principal amount	$ 287,489	$ 287,500
Unamortized debt discount	(28,220)	(38,317)
Unamortized debt issuance costs	(4,011)	(5,446)
Net carrying amount	$ 255,258	$ 243,737

0.375% Convertible Senior Notes due 2024

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of 0.375% Convertible Senior Notes due 2024 ("2019 Notes"), which includes the underwriters' exercise in full of an option to purchase an additional $37.5 million aggregate principal amount of 2019 Notes (the "Notes Offering"). The net proceeds of the Notes Offering, after deducting underwriting discounts and commissions and other related offering expenses payable by the Company, were approximately $278.5 million.

The 2019 Notes are senior, unsecured obligations of the Company, and bear interest at a rate of 0.375% per year. Interest is payable semi-annually in arrears on January 15 and July 15 of each year, beginning on January 15, 2020. The 2019 Notes will mature on July 15, 2024, unless earlier repurchased or converted in accordance with their terms. The initial conversion rate for the 2019 Notes is 8.6749 shares of the Company's common stock per $1,000 principal amount of 2019 Notes (which is equivalent to an initial conversion price of approximately $115.28 per share). Prior to the close of business on the business day immediately preceding April 15, 2024, the 2019 Notes will be convertible at the option of the holders of 2019 Notes only upon the satisfaction of specified conditions and during certain periods. Thereafter until the close of business on the second scheduled trading day immediately preceding the maturity date, the 2019 Notes will be convertible at the options of the holders of 2019 Notes at any time regardless of these conditions. Conversion of the 2019 Notes will be settled in cash, shares of the Company's common stock or a combination thereof, at the Company's election. The 2019 Notes are not redeemable by the Company prior to maturity.

Holders of 2019 Notes may require the Company to repurchase their 2019 Notes upon the occurrence of a fundamental change prior to maturity at a repurchase price equal to 100% of the principal amount thereof, plus accrued and unpaid interest to, but excluding, the date of repurchase. In connection with certain corporate events, the Company will, under certain circumstances,

increase the conversion rate for holders of 2019 Notes who elect to convert their 2019 Notes in connection with such corporate events.

During the fourth quarter of 2021, the closing price of the Company's common stock exceeded 130% of the conversion price of the 2019 Notes for more than 20 trading days of the last 30 consecutive trading days of the quarter. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2022, the quarter immediately following the quarter when the conditions are met, as stated in the terms of the 2019 Notes. Expecting to continue meeting these terms, the Company will continue to classify the carrying value of the 2019 Notes as a current liability on the Company's consolidated balance sheet as of December 31, 2021. These conditions have been met since the third quarter of 2020. As a result, $11,000 aggregate principal amount of the 2019 Notes have been converted by the noteholders since December 31, 2020. The conversions resulted in the issuance of a nominal number of shares of the Company's common stock to the note holders, and the Company recorded a loss of approximately $13,000 on the conversion of these notes, which is included in other expenses, net on our consolidated statements of comprehensive income in 2021. As of the date of this filing, the Company received requests to convert an additional $2,000 aggregate principal amount of 2019 Notes which we intend to pay or deliver, as the case may be, the settlement amount to be determined – paying the amount in excess of the aggregate principal portion of the converted notes in shares of our common stock. These conversions will be settled during the first quarter of 2022.

The Company accounts for the 2019 Notes as separate liability and equity components. The Company determined the carrying amount of the liability component as the present value of its cash flows using a discount rate of 4.5% based on comparative convertible transactions for similar companies. The proceeds allocated to the debt conversion feature were $52.1 million. This amount was calculated by deducting the carrying value of the liability component from the principal amount of the 2019 Notes as a whole. The difference represents a debt discount that is amortized to interest expense on the Company's consolidated statements of comprehensive income over the term of the 2019 Notes using the effective interest rate method. The Company will assess the equity classification of the cash conversion feature quarterly, and it is not remeasured as long as it continues to meet the conditions for equity classification.

The Company allocates transaction costs related to the issuance of the 2019 Notes to the liability and equity components using the same proportions as the initial carrying value of the 2019 Notes. Transaction costs related to the liability component were $7.4 million and are being amortized to interest expense using the effective interest method over the term of the 2019 Notes. Transaction costs attributable to the equity component were $1.6 million and are netted with the equity component of the 2019 Notes in stockholders' equity of the Company's consolidated balance sheet at December 31, 2021.

Interest expense recognized on the 2019 Notes in 2021 was $1.1 million, $10.1 million and $1.4 million for the contractual coupon interest, the accretion of the debt discount and the amortization of the debt issuance costs, respectively. The effective interest rate on the 2019 Notes is 5.1%, which included the interest on the 2019 Notes, amortization of the debt discount and debt issuance costs. As of December 31, 2021, the carrying value of the 2019 Notes was $255.3 million and the fair value of the principal was $678.5 million. The fair value of the 2019 Notes was determined based on the most recent trade activity of the 2019 Notes as of December 31, 2021.

The 2019 Notes agreement contains customary terms and events of default. If an event of default (other than certain events of bankruptcy, insolvency or reorganization involving the Company) occurs and is continuing, the holders of at least 25% in aggregate principal amount of the outstanding 2019 Notes may declare 100% of the principal of, and any accrued and unpaid interest on, all of the 2019 Notes to be due and payable. Upon the occurrence of certain events of bankruptcy, insolvency or reorganization involving the Company, 100% of the principal of and accrued and unpaid interest, if any, on all of the 2019 Notes will become due and payable automatically. Notwithstanding the foregoing, the 2019 Notes provide that, to the extent the Company elects and for up to 270 days, the sole remedy for an event of default relating to certain failures by the Company to comply with certain reporting covenants consist exclusively of the right to receive additional interest on the 2019 Notes. The Company is not aware of any events of default, current events or market conditions that would allow holders to call or convert the 2019 Notes as of December 31, 2021.

Conversion of the 2.125% Convertible Senior Notes due 2021

The Company utilized a portion of the proceeds from the issuance of the 2019 Notes to settle its outstanding 2.125% Convertible Senior Notes due 2021 (the "2016 Notes") during the third quarter of 2019. On July 16, 2019, the Company entered into separate privately negotiated agreements with certain holders of the 2016 Notes to exchange an aggregate of $92.0 million

principal aggregate amount of the 2016 Notes for shares of the Company's common stock, together with cash, in private placement transactions (the "Note Exchanges"). On July 19, 2019 and July 22, 2019, the Company used approximately $92.3 million (including $0.3 million of accrued interest) and 1,850,155 shares of its common stock valued at $161.0 million to settle the Note Exchanges for total consideration of $253.3 million, of which $163.6 million was allocated to reacquiring the equity component of the 2016 Notes. The Company allocated the consideration transferred to the liability and equity components using the same proportions as the initial carrying value of the 2016 Notes. The transaction resulted in a loss on extinguishment of debt of $4.6 million in the Company's consolidated statements of comprehensive income in 2019.

On July 19, 2019, the Company issued a Notice of Redemption in respect of the 2016 Notes, which provided that, on September 23, 2019, the Company would redeem all 2016 Notes that had not been converted, repurchased or exchanged prior to such date at a redemption price in cash equal to 100% of the principal amount thereof plus accrued and unpaid interest. On September 23, 2019, the Company used $23.0 million and 466,045 shares of its common stock valued at $37.8 million to settle the remaining 2016 Notes for a total of $60.8 million, of which $38.3 million was allocated to reacquiring the equity component of the 2016 Notes. This transaction resulted in a loss on extinguishment of debt of $1.1 million recorded on the Company's consolidated statements of comprehensive income. The total loss in 2019 of $5.7 million represents the difference between the fair value of the liability component of the 2016 Notes and its related carrying value immediately before the exchange.

14. Accumulated Other Comprehensive Income (Loss)

Changes in accumulated other comprehensive income (loss) consisted of the following for the years ended December 31, 2021 and 2020 (amounts in thousands):

	Foreign Currency Translation Adjustment
Balance at December 31, 2019	$ (15,027)
Other comprehensive income	17,112
Balance at December 31, 2020	2,085
Other comprehensive loss	(18,971)
Balance at December 31, 2021	$ (16,886)

15. Employee Benefit Plans

In the United States, the Repligen Corporation 401(k) Savings and Retirement Plan (the "401(k) Plan") is a qualified defined contribution plan in accordance with Section 401(k) of the Internal Revenue Code. All U.S. employees over the age of 21 are eligible to make pre-tax contributions up to a specified percentage of their compensation. Under the 401(k) Plan, the Company may, but is not obligated to match a portion of the employees' contributions up to a defined maximum. The match is calculated on a calendar year basis. The Company matched $1.8 million, $1.4 million and $1.0 million in the years ended December 31, 2021, 2020 and 2019, respectively.

In Sweden, the Company contributes to a government-mandated occupational pension plan that is a qualified defined contribution plan. All employees in Sweden are eligible for this pension plan. The Company pays premiums to a third-party occupational pension specialist who administers the pension plan. These premiums are based on various factors including each employee's age, salary, employment history and selected benefits in the pension plan. When an employee terminates or retires, these premium payments cease for that employee and the Company has no further pension-related obligations for that employee. The Company contributed $1.0 million to the defined contribution plan in 2021 and $0.6 million for each of the years ended December 31, 2020 and 2019.

16. Related Party Transactions

Certain facilities leased by Spectrum, a company we acquired in 2017, are owned by Roy Eddleman, the former owner of Spectrum. As of December 31, 2021, Mr. Eddleman owned greater than 5% of the Company's outstanding shares and the Company considers him to be a related party. The lease amounts paid to this shareholder prior to the public offering were negotiated in connection with the acquisition of Spectrum. The Company incurred rent expense related to these leases totaling $0.7 million for the years ended December 31, 2021, 2020 and 2019.

At December 31, 2020, the Company had an outstanding tax liability of $0.5 million due to the seller of C Technologies. This tax liability was paid subsequent to year end in January 2021 and concluded the remaining tax liability the Company had with the seller due to the 338(h)(10) tax election. The Company paid the seller a total of $0.3 million and $1.6 million related to the tax liability associated with the 338(h)(10) election as of December 31, 2020 and 2019, respectively.

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Subsidiary Name	Subsidiary Jurisdiction
Repligen Sweden AB	Sweden
Repligen GmbH	Germany
Repligen Singapore Pte. Ltd.	Singapore
Repligen Europe B.V.	Netherlands
Repligen (Shanghai) Biotechnology Co. Ltd.	China
Repligen Japan LLC	Japan
Repligen India Private Limited	India
Repligen Korea Co., Ltd.	South Korea
ARTeSYN Biosolutions Holdings Ireland Limited	Ireland
ARTeSYN Biosolutions Ireland Limited	Ireland
ARTeSYN Biosolutions Estonia OÜ	Estonia
Repligen Ireland Limited	Ireland
ARTeSYN Biosolutions USA, LLC	United States
Spectrum Life Sciences, LLC	United States
C Technologies, Inc.	United States
Polymem S.A.	France
Avitide LLC	United States
Newton T&M Corp	United States
Bio-Flex Solutions, L.L.C.	United States

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the following Registration Statements:

(1) Registration Statements (Form S-8 No. 333-224978) pertaining to the 2018 Stock Option and Incentive Plan of Repligen Corporation,

(2) Registration Statements (Form S-8 No. 333-196456) pertaining to the Repligen Corporation Amended and Restated 2012 Stock Option and Incentive Plan,

(3) Registration Statements (Form S-8 No. 333-157168) pertaining to the Second Amended and Restated 2001 Repligen Corporation Stock Plan, and

(4) Registration Statement (Form S-3 No. 333-231098) of Repligen Corporation

of our reports dated February 17, 2022 with respect to the consolidated financial statements of Repligen Corporation and the effectiveness of internal control over financial reporting of Repligen Corporation, included in this Annual Report (Form 10-K) of Repligen Corporation for the year ended December 31, 2021.

/s/ Ernst & Young LLP

Boston, Massachusetts
February 17, 2022

Exhibit 31.1

CERTIFICATION

I, Tony Hunt, certify that:

1. I have reviewed this Annual Report on Form 10-K of Repligen Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 17, 2022

/S/ TONY J. HUNT

Tony J. Hunt
Chief Executive Officer and President
(Principal executive officer)

Exhibit 31.2

CERTIFICATION

I, Jon K. Snodgres, certify that:

1. I have reviewed this Annual Report on Form 10-K of Repligen Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 17, 2022

/S/ JON K. SNODGRES

Jon K. Snodgres
Chief Financial Officer
(Principal financial officer)

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 of Repligen Corporation (the "Company") on Form 10-K for the period ending December 31, 2021 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned officers of the Company hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, to my knowledge, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

This certification is being provided pursuant to 18 U.S.C. 1350 and is not to be deemed a part of the Report, nor is it to be deemed to be "filed" for any purpose whatsoever.

Date: February 17, 2022 By: /S/ TONY J. HUNT

Tony J. Hunt
Chief Executive Officer and President
(Principal executive officer)

Date: February 17, 2022 By: /S/ JON K. SNODGRES

Jon K. Snodgres
Chief Financial Officer
(Principal financial officer)

[This page intentionally left blank]

Board of Directors

Karen A. Dawes
Chairperson
President, Knowledgeable Decisions, LLC

Nicolas M. Barthelemy
Former President and CEO,
bioTheranostics

Carrie Eglinton Manner
Senior Vice President,
Advanced & General Diagnostics
and Clinical Solutions,
Quest Diagnostics

Tony J. Hunt
President and Chief Executive Officer,
Repligen Corporation

Rohin Mhatre, Ph.D.
Senior Vice President,
Product and Technology Development,
Biogen Inc.

Glenn P. Muir
Former Chief Financial Officer
and Executive Vice President,
Hologic, Inc.

Thomas F. Ryan, Jr.
Former President and
Chief Operating Officer,
American Stock Exchange

Investor Information

Copies of our annual reports on Form 10-K, proxy statements, quarterly reports on Form 10-Q and current reports on Form 8-K are available to shareholders upon request without charge.

Please visit our website at www.repligen.com or direct requests to:

Repligen Corporation
41 Seyon Street, Building #1, Suite 100
Waltham, MA 02453
ATTN: Investor Relations
Phone: 781.250.0111
investors@repligen.com

Executive Management

Executive Officers:

Tony J. Hunt
President and Chief Executive Officer

Jon K. Snodgres
Chief Financial Officer

James R. Bylund
Chief Operating Officer

Christine Gebski
Senior Vice President,
Filtration and Chromatography

Ralf Kuriyel
Senior Vice President,
Research & Development

Senior Management:

Gautam Choudhary
Senior Vice President, Systems

Kimberly Cornwell
Global Head of Legal, General Counsel

Craig Harrison
Senior Vice President, Process Analytics

Kola Otitoju
Senior Vice President, Strategy
and Business Development

James Slaughter
Chief Human Resources Officer

Stephen Tingley
Vice President, Head of Global Sales

Market for Repligen Stock

NASDAQ Global Select Market: RGEN

Transfer Agent and Registrar

American Stock Transfer
& Trust Company, LLC
59 Maiden Lane, Plaza Level
New York, NY 10038
Phone: 877.777.0800, option 1
info@amstock.com

The Transfer Agent is responsible for handling shareholder questions regarding lost certificates, address changes and change of ownership or name in which shares are held.

Outside Corporate Counsel

Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210

Independent Accountants

Ernst & Young LLP
200 Clarendon Street
Boston, MA 02116

Virtual Annual Meeting

The Annual Meeting of Shareholders
will be held on Thursday, May 26, 2022, 8:00 a.m. EDT

Location
Our 2022 Annual Meeting will be held online (only) at http://www.virtualshareholdermeeting.com/RGEN2022

You can vote your shares if you were a shareholder of record at the close of business on April 1, 2022 (the "Record Date").

DISCLAIMER: This Annual Report contains forward-looking statements within the meaning of the federal securities laws. When used, the words "anticipate," "assume," "believe," "estimate," "expect," "project," "result," "should," "will" and similar expressions that do not relate solely to historical matters identify forward-looking statements. Forward-looking statements are subject to risks and uncertainties, both known and unknown, and often beyond our control, and are not guarantees of future performance insofar as actual events or results may vary materially from those anticipated. Factors that may cause such a variance include, among others, those discussed in this Annual Report and from time to time in our filings with the Securities and Exchange Commission. We expressly disclaim any responsibility to update forward-looking statements except as required by law.

OPENING
DOORS
TO NEW
OPPORTUNITIES

REPLIGEN CORPORATION

41 Seyon Street, Building 1, Suite 100, Waltham, MA 02453

phone 781.250.0111 | toll-free 800.622.2259 | fax 781.250.0115

www.repligen.com

Design by Double-0 Marketing